



Department for
Communities and
Local Government

Energy Performance of Buildings Directive article 8 equivalence

Second UK biennial report

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ISBN: 978-1-4098-3728-2

Building Standards - Energy Performance of Buildings Directive (EPBD) - Second UK Biennial Report of the Energy Performance Building Directive

Report dated 26 November 2010

ERRATUM IN SECOND UK BIENNIAL REPORT TO EU COMMISSION ON ARTICLE 8 EQUIVALENCE

It has been identified that the following items in report should be corrected.

Page 18, section 3.2.2. Building Standards (Scotland), delete the last three paragraphs and replace with:

“Following publication of The Sullivan Report[1] - ‘A low carbon Building Standards Strategy for Scotland’ the Scottish Government has introduced further improvements to energy standards within building regulations. Standards introduced on 1 October 2010 deliver a 30% reduction on CO₂ emissions from new buildings compared to the previous 2007 standards. These standards also further improve the minimum requirements for heating system performance.

The Sullivan report also sets out recommendation for further staged improvement of energy standards within buildings regulations and the Scottish Government will further review standards for 2013 and 2016.”

REFERENCES

[1]<http://www.scotland.gov.uk/Topics/Built-Environment/Building/Building-standards/publications/sullivan>

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Summary

The Energy Performance of Buildings Directive (EPBD), published in January 2003, is designed to improve the energy efficiency of buildings across Europe. Article 8 of the Directive is specifically aimed at improving the performance of heating systems. The EPBD offers two alternatives for implementing Article 8: Option (a) which involves the implementation of an inspection regime; or Option (b) which involves the provision of advice, but this option can also include “alternative solutions”.

The UK has chosen to adopt Option (b) and is therefore required to prepare a biennial Article 8 equivalence report to demonstrate that this approach has an impact that is “broadly equivalent” to that produced through the provisions of Option (a). This is the second equivalence report for the UK and covers England & Wales, Scotland and Northern Ireland. The UK government is also responsible for Gibraltar with respect to reporting on the implementation of Article 8. However, Gibraltar has chosen to implement Option (a) and so **does not need to demonstrate equivalence** and will only be mentioned in this equivalence report for the sake of completeness.

Communities and Local Government (CLG) is the UK government department responsible for implementing the EPBD in England & Wales and also has lead responsibility for co-ordinating implementation in the UK.

The UK’s overall approach is to express broad equivalence in terms of the total carbon saved by the two options and to show that the saving produced by Option (b) is comparable or greater than that produced by Option (a). Implementation of Option (b) in the UK involves a dual approach: (i) a firm foundation of regulatory and voluntary measures aimed at heating systems which can be considered “alternative solutions”, and (ii) supplements to these measures with information and advice programmes designed to improve heating system efficiency. The stages for demonstrating broad equivalence in this report are:

Review the “alternative solutions” used to implement Option (b). These consist of measures aimed at heating systems implemented since 2003 categorised under four broad headings: regulatory changes, grant programmes, financial instruments and guidance and promotion.

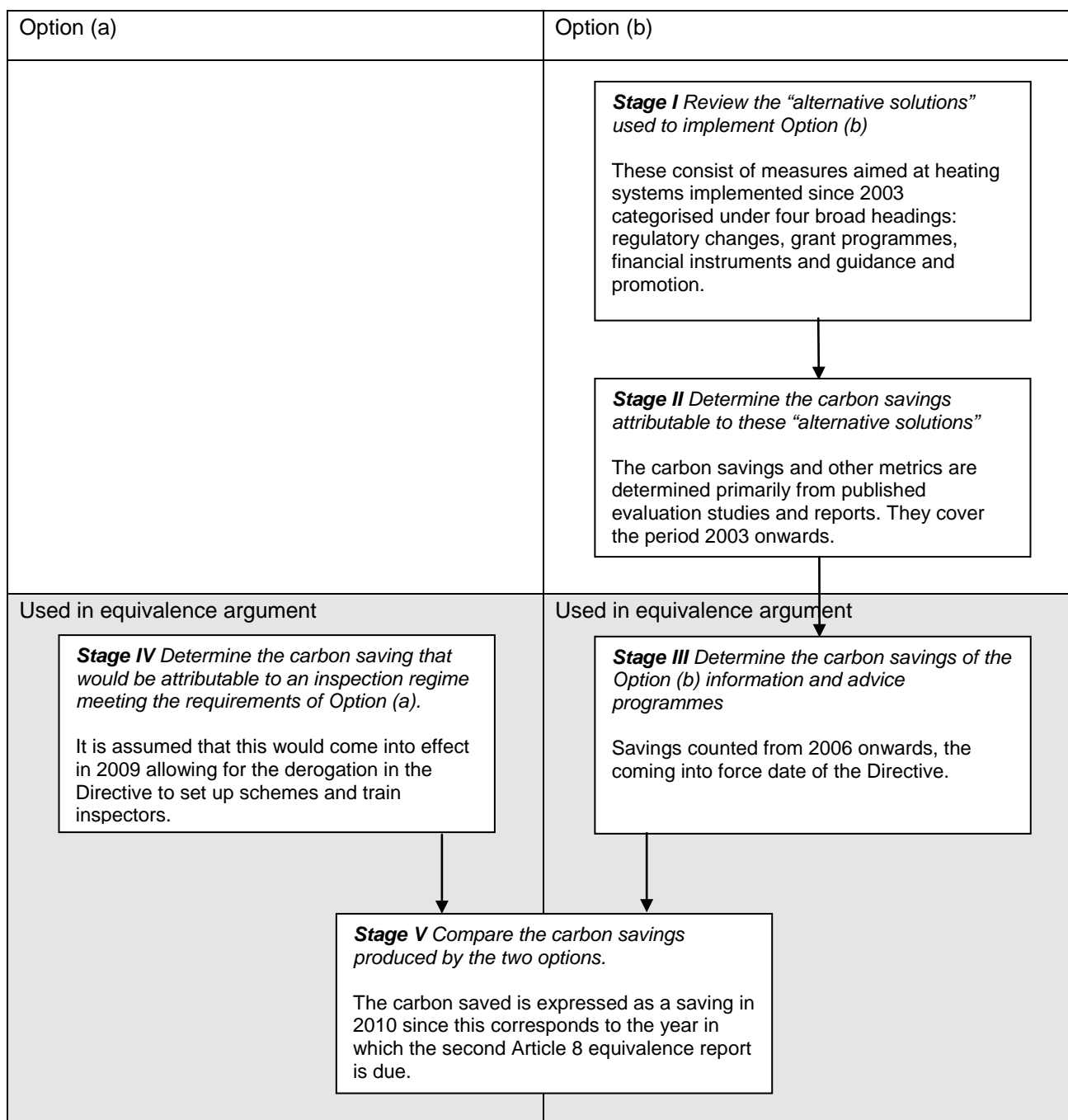
Determine the carbon savings attributable to these “alternative solutions”. The carbon savings and other metrics are determined primarily from published evaluation studies and reports. These are **not** used in the overall equivalence argument but they illustrate the significant impact that they have had. They cover the period 2003 onwards.

Determine the carbon savings of the Option (b) information and advice programmes. These are counted in the overall equivalence argument and cover the period from 2006 onwards (the coming into force date of the Directive).

Determine the carbon saving that would be attributable to an inspection regime meeting the requirements of Option (a). It is assumed that to allow sufficient time to set-up the necessary accreditation schemes and train inspectors - as allowed for within the implementation timetable for the EPBD - this would have come into effect in 2009.

Compare the carbon savings produced by the two options. The carbon saved is expressed as a saving in 2012 since this corresponds to the year in which the second Article 8 equivalence report is due.

These stages are also shown in the flow chart below.



As well as carbon savings the cost-effectiveness of the two options is derived as it is not desirable to implement an option which makes significant carbon savings but is not cost-effective.

In the UK, there is already a substantive boiler service market covering gas, oil and solid fuel fired boilers which is either mandatory (e.g. for gas safety checks) or voluntary (e.g. annual boiler service). A boiler stock model has been developed to determine the total number of boilers for each fuel type and output category and also to so assess the number captured by Option (a).

Implementing Option (b): “alternative solutions”

The two key “alternative solutions” for Option (b) in the UK are changes to the energy efficiency requirements of the Building Regulations and Standards and the requirement underpinning the Energy Efficiency Commitment (EEC). These measures form part of the wider suite of instruments put in place to deliver energy efficiency improvements in the UK aimed at achieving the UK’s climate and energy policy objectives. As noted above, although they qualify as “alternative solutions” and cover the period from 2003 onwards, they have not been used in the final equivalence argument.

For England & Wales, the energy efficiency standards for new and replacement gas fired central heating boilers installed in homes were strengthened in April 2005. From that date, in normal circumstances, these boilers would need to be high efficiency condensing ones. Similar standards applied to oil-fired central heating boilers from 1 April 2007, and comparable standards were introduced in Scotland in May 2007. For both fuels, boiler sales data shows that this has significantly transformed the market with sales of condensing boilers rising sharply in the space of just 2 to 3 months. It is estimated that for gas-fired boilers these standards will save 0.41 MtC (million tonnes of carbon) or 1.51 Mt CO₂ (million tonnes of carbon dioxide) per year in 2010 in the UK.

Under EEC, energy suppliers are required to deliver energy efficiency improvements for their domestic customers through a wide range of measures including replacement boilers and heating controls. Through all its phases the total EEC saving is estimated to be 0.09 MtC or 0.33 Mt CO₂ per year in 2010 in Great Britain (England, Wales and Scotland). Northern Ireland has its Energy Efficiency Levy which is predominately targeted at fuel poor homes.

Therefore, combining the heating related savings for the two measures produces an overall saving of 1.84 Mt CO₂ (or 0.50 MtC) per year in 2010 in the UK.

There are substantial carbon savings produced by other measures such as Warm Front in England, the Home Energy Efficiency Scheme (HEES) in Wales, the Energy Assistance Package in Scotland and Warm Homes in Northern Ireland, but either specific figures are not available or it is not possible to separate out the contribution of improvements to heating systems.

Implementing Option (b): information and advice programmes

The above alternative solutions provide a firm basis from which to implement Option (b).

Carbon savings from information and advice programmes are counted in the overall equivalence argument and cover the period from 2006 onwards (the coming into force date of the Directive).

To reinforce this, CLG launched a new programme in England and Wales designed to improve the efficiency of heating systems in both the domestic and non-domestic sectors that came fully into effect in 2008. The advice given is in the form of checklists and recommendations which have been developed in conjunction with key members of the heating and hot water manufacturing and installation industries. The checklists have been designed to be simple and quick to complete, and the intention is that they are left

with customers. The advice can be included in existing service and maintenance visits and now forms part of industry recommended good practice guidelines.

In Scotland, the Scottish Government: Building Standards Division (BSD) has engaged with the Energy Saving Trust to produce a domestic guidance leaflet which provides advice on boiler replacement, associated heating system modifications, boiler efficiency and appropriate sizing. These leaflets are distributed to householders through a variety of routes, e.g. those interested in improving the energy efficiency of their homes; when applying for building warrants for alterations, extensions and conversions; through local authorities as part of their campaigns to offer a free home energy check, advice and grants etc. In the social housing sector, the boiler guidance leaflets were issued to all local authorities and social landlords in Scotland to assist them in achieving the energy efficient heating aspect of the requirement of the decent homes standard, the Scottish Housing Quality Standard (SHQS).

In the non-domestic sector, the BSD has adopted the Carbon Trust's Energy Saving Factsheet on Boiler Advice which contains advice on boiler selection, installation, inspection and maintenance. The leaflet was issued to some of the organisations who have responsibility in Scotland for key services such as the Scottish Prison Service, National Health Service, Local Authorities in relation to schools, sports facilities and libraries.

Demonstrating broad equivalence

The aforementioned boiler stock model was used to estimate the likely impact of this information and advice programme in comparison to an inspection regime in the UK that would meet the requirements of Option (a). The main result is that the additional measures taken to implement Option (b) will save more carbon compared with implementing Option (a). **Specifically, this is 0.33 Mt CO₂ (0.09 MtC) per year in 2012 compared to 0.12 Mt CO₂ (0.03 MtC) per year in 2012.** All alternatives examined were cost-ineffective but the overall cost per tonne of carbon for the two options were comparable.

The main reason for the differences that arise is because of the respective boiler populations captured by the two options: Option (a) is targeted at a relatively small proportion of boilers (specifically 11.5%) whereas Option (b) addresses all boilers in the UK. Option (a) is likely to be more effective in generating action since Option (b) is dependent on a response to the advice programme, but the far larger population of boilers covered by (b) outweighs the effect. In particular, Option (b) addresses gas-fired boilers <20kW, which make up nearly half of the boilers in the UK.

It should be noted that the annual carbon savings produced by the "alternative solutions" in 2010 at 1.84 MtCO₂ (0.5 MtC) are significantly greater than that produced by either Option (a) or (b). The "alternative solutions" consist of improved standards to install condensing boilers in new dwellings and in existing ones where boilers are replaced, and the promotion of condensing boilers through EEC. Together these two measures are more effective than either boiler inspection or an advice programme. They provide a firm basis on which to develop the information and advice programmes and, as has been shown, this programme will produce more carbon savings than an Option (a) inspection regime in the UK.

These policies have been highly successful. Of the 1,305,000 gas boilers sold for installation in dwellings in the UK in 2009, 98.9% were of the condensing type, and of the 50,000 oil boilers sold in the same period 85.5% were condensing.

In conclusion it is asserted that with regard to implementation of Article 8 of the EPBD in the UK Option (b) is better than broadly equivalent to Option (a). Moreover, the difference between the two options has

widened in favour of (b) since the first equivalence report. Our estimate is that option (b) will produce greater savings than option (a) by a margin of 0.21 MtCO₂ in 2012, whereas in the first report the margin was 0.14 MtCO₂ in 2010.

Future plans

CLG's policy is to make the energy efficiency requirements for buildings in England & Wales more demanding in the future. As has been shown in this equivalence report, building regulations are a very effective vehicle to generate carbon savings, particularly when they are applied to existing buildings subject to building work. Compliant construction forms typically involve high efficiency condensing boilers, and alternative heating systems that have lower carbon emissions are encouraged through the concept of flexible design; ie design to meet an overall carbon emissions target for the building. Heat pumps, micro-CHP, and biomass boilers are examples of alternative technologies that can help meet the target.. Although not within the period of consideration (2006-2009), a new issue of the building regulations in England & Wales in 2010 has raised the minimum allowable efficiency of gas and oil condensing boilers in dwellings still further.

Similarly, the intention is to improve the construction of new buildings in Scotland, including housing, to meet the rigorous energy performance levels imposed in Scandinavia thereby significantly reducing energy use. The Sullivan Report to Scottish Ministers published in late 2007 recommended:

significant percentage improvements in stages to reduce carbon dioxide emissions from buildings;

a route map towards the goal of zero-carbon buildings;

a wide range of energy efficiency and performance measures specific to buildings; and

how measures to promote the use of low carbon equipment, including micro-generation, should progress in tandem with staged reductions of carbon dioxide emissions

The measures adopted from the report have been progressed to include further requirements to improve boiler efficiencies.

CLG has developed a UK national annex to prEN 15378 *Heating systems in buildings - Inspection of boilers and heating systems*, which is the CEN standard designed to assist Member States to implement Option (a). This annex corresponds closely to the CLG boiler checklists and guidance produced with industry in order to provide advice on boilers. Further, CLG has held discussions with industry on how the advice can be provided under the auspices of a competent persons' scheme. Therefore, as the checklists form part of industry recommended good practice guidelines, existing service visits can be regarded as meeting some of the inspection requirements of Option (a).

Finally, CLG is expected to review the impact of the boiler information and advice programme as part of its market surveys of the implementation of Home Information Packs (HIPs) and Article 7 Energy Performance Certificates (EPCs).

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1 Introduction

1.1 Article 8 of the EPBD

Directive 2002/91/EC of the European Parliament and of the council of 16 December 2002 on the energy performance of buildings (hereafter called the 'Directive' or the EPBD) was published in the Official Journal of the European Commission on 4 January 2003.

One of the aims of the EPBD is to improve the performance of heating systems across Europe, acknowledging that many are elderly, inefficient, poorly designed or neglected. This is the focus of Article 8 of the Directive, which provides two alternatives aimed at improving the performance of boiler systems in buildings. Specifically, Article 8 states:

"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."*

However, there are two further requirements associated with Option (b):

"The overall impact of this approach should be broadly equivalent to that arising from the provisions set out in [Option] (a)"; and;

"Member States that choose this option shall submit a report on the equivalence of their approach to the Commission every two years."

The UK (England & Wales, Scotland and Northern Ireland) has chosen to implement Article 8 using Option (b). Gibraltar, which is the responsibility of the UK government with respect to reporting on the implementation of Article 8, has chosen to adopt Option (a). Hereafter in this document 'UK' is used to mean England & Wales, Scotland and Northern Ireland.

UK implementation involves a dual approach: (i) a firm foundation of regulatory and voluntary measures aimed at heating systems which could be considered "alternative solutions", and (ii) supplementary measures with information and advice programmes designed to improve heating system efficiency.

Article 15 of the Directive sets out the timetable for its transposition which requires Member States (MSs) to bring into force the necessary laws, regulations and administrative procedures by January 2006. However, in

the case of Article 8 (as well as for Article 7 *Energy Performance Certificates* and Article 9 *Inspection of air conditioning systems*) MSs were allowed an additional period of up to three years (ie, up to January 2009) in order to train sufficient qualified and/or accredited experts (a requirement of Article 10 *Independent Experts*) to undertake the necessary inspection and certification activities.

Communities and Local Government (CLG) is the government department responsible for implementing the EPBD in England & Wales and also has lead responsibility for co-ordinating implementation in the UK. It is required to submit an equivalence report to the Commission for England & Wales and to assemble similar material supplied by Scotland and Northern Ireland into an overall UK report.

Gibraltar having chosen Option (a) **does not need to demonstrate equivalence** and will only be mentioned in this equivalence report for the sake of completeness.

1.2 Proposed strategy

The UK's overall approach is to express broad equivalence in terms of the total carbon saved by the two options and to show that the saving produced by Option (b) is comparable or greater than that produced by Option (a). The stages for demonstrating broad equivalence in this report are:

Review the "alternative solutions" used to implement Option (b). These consist of measures aimed at heating systems implemented since 2003 categorised under four broad headings: regulatory changes, grant programmes, financial instruments and guidance and promotion.

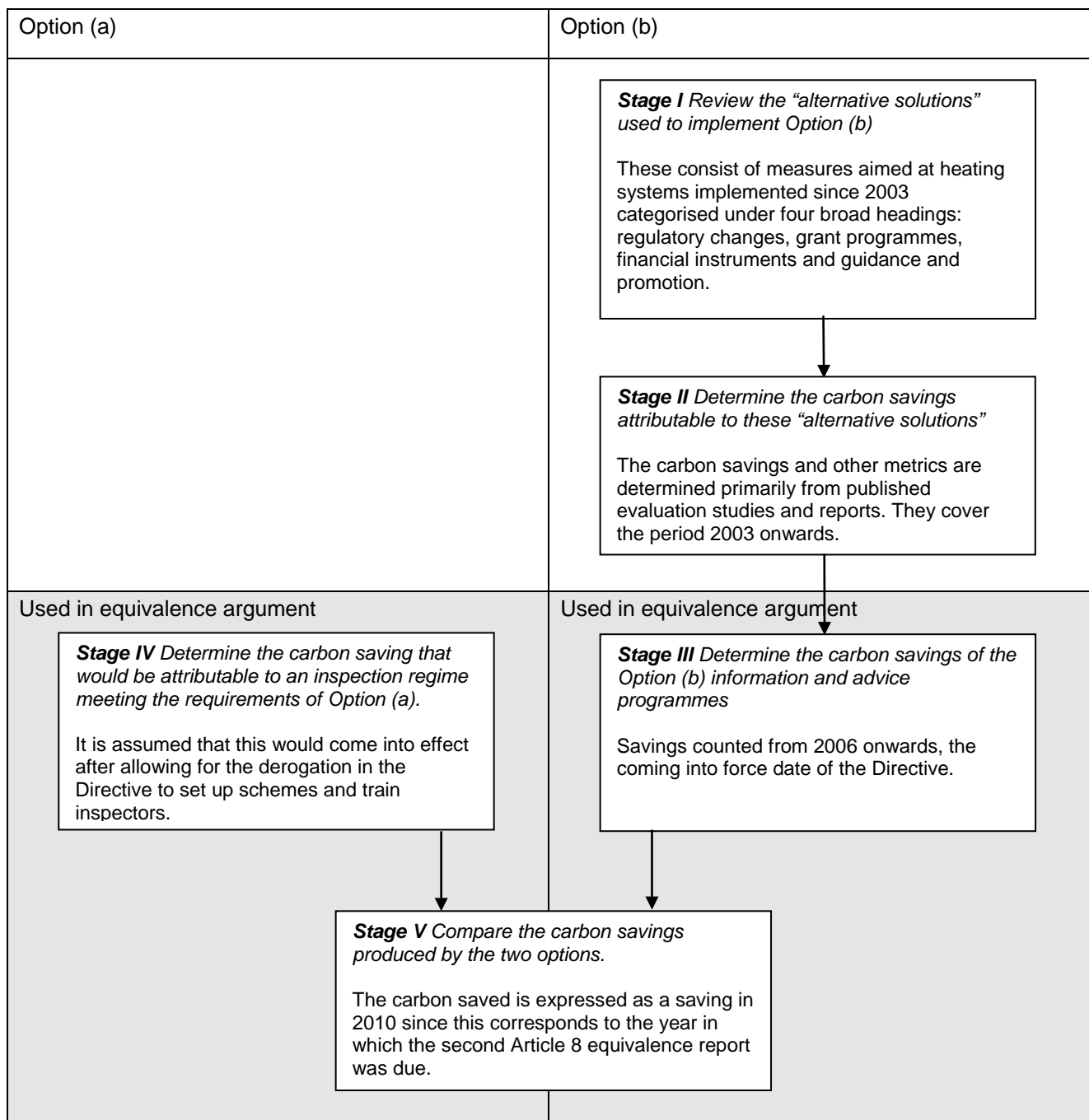
Determine the carbon savings attributable to these "alternative solutions". The carbon savings and other metrics are determined primarily from published evaluation studies and reports. These are **not** used in the overall equivalence argument but they illustrate the significant impact that they have had. They cover the period 2003 onwards.

Determine the carbon savings of the Option (b) information and advice programmes. These are counted in the overall equivalence argument and cover the period from 2006 onwards, the coming into force date of the Directive.

Determine the carbon saving that would be attributable to an inspection regime meeting the requirements of Option (a). It is assumed that to allow sufficient time to set-up the necessary accreditation schemes and train inspectors – as allowed for within the implementation timetable for the EPBD - this would have come into effect in 2009.

Compare the carbon savings produced by the two options. The carbon saved is expressed as a saving in 2012 since this corresponds to the year in which the second Article 8 equivalence report was due.

These stages are also shown in the flow chart overleaf.



This is the second equivalence report for the UK that sets out to demonstrate that the overall impact of its approach is broadly equivalent to that arising from the provisions set out in Option (a). The text generally applies to the UK as a whole but does point out important differences between England & Wales, Scotland and Northern Ireland.

2 Background information on boilers in the UK

2.1 Stock of UK boilers

As a first step towards demonstrating broad equivalence it is necessary to determine the boiler population for UK in order to assess the number of boilers that would be captured by the inspection requirements of Option (a). A boiler stock model for the UK has therefore been produced. In the case of gas and oil-fired domestic boilers in residential premises a large part of this work has already been carried out as part of the Defra (Department of the Environment, Food and Rural Affairs) Market Transformation Programme (MTP)¹.

The Boiler Energy Model contains detailed projections of the future stock of boilers by year of installation. This is based on reconciliation of overall establishment (boiler stock) figures from surveys with Trade Association data on boiler sales. For non-domestic boilers, a stock model was derived by reconciling data from various sources including boiler sales figures, building floor area data, typical heating demand etc. Table 1 overleaf summarises the results. For further details see Appendix A.

Estimates suggest that there are around 25 million boilers and installations in the UK (2010), the vast majority of which (24.4) are in the domestic sector. Just over 92% of domestic boilers are gas-fired (the equivalent figure for the non-domestic sector is 73%) and about one quarter of all boilers are 15 years or older (the equivalent figure for the non-domestic sector is 24%).

It should be pointed out that these figures are dominated by England & Wales as together they make-up 89% of the UK's total population. However, there are differences in the Devolved Administrations across the UK. For example, in Northern Ireland (which makes up less than 3% of the UK's population) a high percentage of domestic boilers are oil-fired as natural gas was only introduced into Northern Ireland in 1996.

Given the predominance of gas-fired boilers in the domestic sector (and the fact that Option (a) only captures gas-fired boilers >100kW as well as those >20kW which are also >15 years old) about 10% of boilers in this sector would be subject to inspections under Option (a). As might be expected, the equivalent figure is much greater in the non-domestic sector: 47% of all boilers and installations in 2010, primarily because of the greater population of higher rated boilers in this sector: 21% of all non domestic boilers or installations have an output >100kW.

For comparison it is estimated that there are some 10,000 boilers in Gibraltar (this is based on a population of 30,000) which is less than 0.05% of the total UK boiler population. Therefore, if the Gibraltarian boilers were to be included in the UK's equivalence argument they would make very little difference.

2.2 Existing UK boiler service market

There is considerable boiler servicing and inspection activity in the UK, either voluntary or because of legislative requirements, which needs to be considered when assessing the broad equivalence of the UK's approach. Installation and repair work on heat producing appliances fired by gas, oil or solid fuel are covered by three industry bodies which are all recognised by the UK government: Gas Safe Register², OFTEC (Oil Fired Technical Association)³ and HETAS (Heating Equipment Testing and Approval Scheme)⁴ respectively.

¹ For details see: <http://www.mtprog.com/>

² For details see: <http://www.gassaferegister.co.uk/>

³ For details see: <http://www.oftec.co.uk/>

⁴ For details see: <http://www.hetas.co.uk/>

Table 1. Estimated boilers installed in the UK ('000s) [2010]

Building and boiler type	Boiler <20kW			20kW<= Boiler <=100 kW			Boiler >100 kW			Installation >100 kW		
	Gas	Oil	Solid fuel	Gas	Oil	Solid fuel	Gas	Oil	Solid fuel	Gas	Oil	Solid fuel
<i>All</i>												
Dwelling (boiler <15 years)	6,040	529	227	10,029	914	12	0.47	0.07	0.003	0.429	0.065	0.003
Dwelling (boiler >=15 years)	3,950	102	34	1,283	179	3	0.28	0.32	0.01	0.26	0.29	0.01
Non-Domestic (boiler <15 years)	522	11	0	418	28	0	95	14	1	64.1	7.9	0.2
Non-Domestic (boiler >=15 years)	341	2	0	90	41	0	56	64	1	42	36	1
Total	10,853	644	261	11,820	1,162	15	152	78	2.1	107	45	0.8
<i>Caught by Article 8(a)</i>												
Dwelling (boiler <15 years)	0	0	0	0	914	12	0.47	0.07	0.00	0.43	0.07	0.00
Dwelling (boiler >=15 years)	0	0	0	1,283	179	3	0.28	0.32	0.01	0.26	0.29	0.01
Non-Domestic (boiler <15 years)	0	0	0	0	28	0	95	14	1	64	8	0
Non-Domestic (boiler >=15 years)	0	0	0	90	41	0	56	64	1	42	36	1
Total	0	0	0	1,373	1,162	15	152	78	2.1	107	45	0.8

NB. Does not include electrical heating

Key:

No action required	Regular boiler inspection	Boiler inspection every 2-4 years	One-off inspection of whole system
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The Council of Registered Gas Installers (CORGI) was founded in 1970 and, initially, gas installers could become affiliated to CORGI on a voluntary basis. In 1991, however, the UK's Health & Safety Executive (HSE) asked CORGI to maintain a mandatory register of competent gas installers in the UK. The functions of CORGI were taken over by a new body, called Gas Safe Register, in England and Wales in April 2009 and in Northern Ireland in April 2010. Registration is now a legal requirement for businesses and self-employed people working on gas fittings or appliances. Around 55,000 gas installation businesses employing approximately 110,000 gas fitting operatives are currently registered.

Social housing providers and landlords in the UK must ensure that their procedures meet legal requirements with regards to the installation and maintenance of gas appliances within their properties. An annual gas safety check is necessary under the requirements of Regulation 36 *Duties of Landlords* of the Gas Safety (Installation and Use) Regulations 1998 (GSIUR). Another duty under these regulations is for maintenance of relevant gas appliances and flues. This is not a legal requirement unless the Gas Safe Register gas installer specifically requests that an appliance service is undertaken at the same time as the annual safety check. Some landlords request a boiler service during the annual gas safety check but many do not. In Northern Ireland, all Housing Executive heating installations receive an annual inspection and servicing.

In addition to these visits for safety checks and servicing in the domestic rented sector there is also substantial servicing activity in the owner occupier sector. Although this is entirely voluntary it is still significant: 3.2m domestic customers have service contracts with British Gas (the largest provider) and a comparable number have contracts with other service providers. In total therefore nearly 75% of domestic gas boilers are already subject to visits of varying degrees of regularity.

It is difficult to break down figures between boilers above and below 20kW because, although most heat loads in dwellings are less than 20kW, many boilers now installed are combination boilers (providing space heating and domestic hot water from a single unit). These have a minimum output of 24kW to provide satisfactory hot water service and it is unknown how many of them there are.

Oil-fired boilers are mainly installed and maintained by OFTEC-registered technicians. The UK Government introduced 'competent persons' schemes in order to give an advantage to operatives within the construction industry that belong to a body that implements a system of assessment and inspection. OFTEC technicians are able to undertake replacement installations and the commissioning of the installation, oil tank installation, associated pipework and major change to flueing systems. They can self-certify that their work meets the requirements of Part J to the Building Regulations (England & Wales) which is concerned with the safe performance of combustion appliances. In total there are some 3,000 registered technicians.

Information from OFTEC indicates that its technicians undertake annual service visits for pressure jet oil boilers because of contract maintenance, annual requests, maintenance reminders or as a result of a distress call. This encompasses all of the domestic stock (both <20kW and >20kW) although some users only have appliances attended to as a "distress call" which may be 3 – 5 year intervals.

Similarly, HETAS is the official body recognised by government to approve solid fuel domestic heating appliances, fuels and services. Its work in approving products covers boilers, cookers, open fires and stoves and room-heaters. HETAS collaborates with the National Association of Chimney Sweeps (NACS)⁵ in supervising a solid fuel orientated course for chimney sweeps which results in successful candidates

⁵ For details see: <http://www.chimneyworks.co.uk/>

being “HETAS Approved”. And, in association with the Solid Fuel Association (SFA)⁶, HETAS operates a registration scheme for heating engineers with special skills in the installation and maintenance of solid fuel heating systems. Most installations of solid fuel and wood biomass appliances and systems are subject to the requirements of the Building Regulations. Like OFTEC technicians, HETAS registered installers can self-certify their work, and it is estimated that there are about 1,500 of them.

Information from HETAS suggests that the vast majority of solid fuel appliances are subject to regular service visits, at least for health and safety purposes, to ensure chimneys and flues are clear in order to prevent incidents of carbon monoxide poisoning and chimney fires.

The interests of the non-domestic sector are represented by the ICOM Energy Association⁷ which developed from the British Combustion Equipment Manufacturers Association (BCEMA). In recent years ICOM adjusted its terms of membership to allow for designers and manufacturers of solid fuel-burning equipment, as well as those involved in the servicing of equipment and supply or storage of fuel, to become eligible. The organisation now engages in all aspects of energy related business activities in the commercial and industrial sectors, working with government, non-governmental offices, research establishments and industry trade associations to address the impacts of EU legislation on the industry.

Figures for the level of servicing activity in the non-domestic sector are less well known but ICOM suggests that 50% of such boilers are already subject to an annual service visit whilst the other 50% of boilers are only visited when they break down.

In conclusion therefore, a considerable proportion of the boiler stock in the UK is already subject to varying degrees of service visits, many of which are undertaken by competent persons who are trained to work to UK government endorsed schemes. Service visits encompass aspects of the inspection requirements of Option (a), and it is these that CLG has targeted for its information and advice programme. CLG is therefore working closely with the aforementioned industry bodies and other stakeholders in order to develop the format and scope of these existing visits as a vehicle to provide specific energy efficiency advice, and so meet the requirements of Article 8. This activity is discussed further in section 4.

⁶ For details see: <http://www.solidfuel.co.uk/>

⁷ For details see: <http://www.icomenergyassociation.org.uk/>

3 Implementing Option (B): “Alternative Solutions”

3.1 Introduction

Before discussing the development of existing service visits into the information and advice programme, it is important to describe the policies and measures taken in the UK since 2003 which are also specifically designed to improve the efficiency of heating systems. A number of them are concerned with the provision of advice, but others are regulatory and whilst they are not an inspection as such they can be considered “alternative solutions” as referred to in the text for Option (b) of Article 8. They provide a firm basis on which to run the information and advice programme and, as will be shown, they have had a significant impact.

For the purposes of this equivalence report these policies and measures have been divided into four broad categories:

- Regulatory changes
- Grant programmes
- Financial instruments
- Guidance and promotion

Each of these is described in turn and their impact on heating systems is, as far as possible, identified. This represents Stages (I) and (II) of the process for demonstrating broad equivalence as described in paragraph 0.

It is worth noting that these policies and measures form part of the wider suite of instruments put in place to deliver energy efficiency improvements in the UK. These instruments are designed to achieve the UK’s climate and energy policy objectives and to meet the 9% energy saving target by 2016 as required by the EU’s Energy End-Use Efficiency and Energy Services Directive. A full description of all of these instruments in the broader context of the UK’s energy efficiency policy is given in the UK Energy Efficiency Action Plan⁸. For the purposes of this equivalence report the focus is on those policies and measures specifically geared towards improvements in heating systems for which energy and carbon savings can be attributed.

⁸ Defra “UK Energy Efficiency Action Plan 2007”. Report available on Defra website at <http://www.defra.gov.uk/environment/climatechange/uk/energy/pdf/action-plan-2007.pdf>

3.2 Regulatory changes

3.2.1 Building Regulations (England & Wales)

Part L of the Building Regulations (England & Wales) *Conservation of fuel and power*⁹ is concerned with the energy performance of new buildings as well as existing buildings subject to 'building work' and is the responsibility of CLG. The edition that came into force in April 2006 was partly to implement Articles 3 to 6 of the EPBD. A later edition, in October 2010, further strengthens the requirements for heating system performance.

The Part L requirements are set out in broad functional terms, and technical guidance on how to meet them is given in a series of Approved Documents (ADs). The ADs, where necessary, refer to a second tier of more detailed guidance material produced by industry. New buildings (both dwellings and other buildings) must meet minimum energy performance requirements and these include specifications for boiler efficiency and heating system controls. 'Building work' is defined within the regulations and ostensibly covers construction of extensions, changes of use etc., but it also covers the replacement and upgrading of building services such as boilers and heating systems in existing buildings.

Energy efficiency standards for boilers were first introduced in the 2002 edition of Part L, but they were strengthened in April 2005¹⁰ to raise the energy efficiency standards for new and replacement gas fired central heating boilers installed in homes in England and Wales. From that date, all gas boilers have to be condensing boilers (unless there are exceptional circumstances) with a SEDBUK (Seasonal Efficiency of Domestic Boilers in the UK) efficiency in band A or B to meet the higher standards of energy efficiency. Similar standards applied to oil fired central heating boilers from 1 April 2007. There are also minimum efficiency standards for solid fuel appliances in new dwellings and when they are replaced in existing dwellings. These were set out in the industry produced *Domestic Heating Compliance Guide (DHCG)*¹¹ which supports Approved Document L1.

In this respect, Part L makes extensive use of SEDBUK and the boiler efficiency database¹². SEDBUK is a measure of the average annual efficiency that a boiler achieves in typical domestic conditions in the UK, making reasonable assumptions about pattern of usage, climate, control and other influences. A significant proportion of gas, oil and LPG-fired boilers (both current and obsolete models) are listed together with their SEDBUK efficiencies on the boiler efficiency database. As well as a SEDBUK efficiency in the range 0-100% a boiler has an A-G rating, with condensing boilers in bands A, B or C. These two tools were developed over a number of years in close collaboration with the heating industry and, given their universal use, gave the UK government confidence to adopt them within the building regulations.

Further changes to the Building Regulations for England and Wales are being implemented in 2010. Revisions to Part G (sanitation, hot water and water efficiency) came into effect on 6 April 2010. Revisions to Part F (ventilation), Part J (heat producing appliances) and Part L (conservation of fuel and power) have

⁹ Can be found on the UK's Planning Portal at <http://www.planningportal.gov.uk/>

¹⁰ Office of the Deputy Prime Minister (ODPM) The Building Act 1984: Amendment to Approved Document L1 *Conservation of fuel and power in dwellings*, April 2005.

¹¹ Since replaced, in 2010, by the *Domestic Building Services Compliance Guide*

¹² For further details see <http://www.sedbuk.com/>

been announced¹³ and will come into effect in October 2010. The announcement follows the approval and publication of six new Approved Documents (ADs F, J and L1A, L1B, L2a and L2B) and the publication of three new compliance guides, two of which cover heating systems. Part L1A 2010¹⁴ aims to reduce CO₂ emissions by 25% over Part L1A 2006. This is a 40% improvement over a dwelling built to the 2002 regulations, and it corresponds roughly with the trigger point for Code for Sustainable Homes Level 3, in line with the government's strategy for getting new build dwellings to zero carbon by 2016.

3.2.2 Building Standards (Scotland)

On the 1st of May 2005 a new building standards system came into operation in Scotland. This was the outcome of a review which lasted approximately six years and the primary legislation resulting from this is the Building (Scotland) Act 2003. The Act makes implementation of the EPBD possible under one piece of legislation. The wider powers of the Building (Scotland) Act 2003 (when compared with the Building (Scotland) Act 1959) allow for energy performance certification and inspection aspects of the Directive to be addressed.

At the introduction of the revised building standards system a level transposition of standards in building regulations was agreed with Scottish Ministers. The rationale was that it would allow industry time to come to terms with the procedural aspects of the new system, without having to cope with more demanding standards. This resulted in no change to the energy standards. However, an exception was made with regard to the efficiency standards for:

- replacement of existing boilers; and
- those forming part of a new heating system.

There were two reasons for raising standards in this area, the first being that the regulations under the old system for around 95% of boilers did not require any improvement in efficiency. They were simply required to be no worse in terms of energy performance than the boilers or heating systems that they were replacing. This approach was therefore not consistent with the policy of Scottish Ministers with regard to addressing CO₂ emissions from buildings. The second reason for improving boiler efficiency standards at this time was as a result of meeting the requirements of Article 8 of EPBD. A decision was taken to follow the Article 8b route in Scotland.

It was recognised that the provision of advice on boiler replacement would have a greater effect if building regulations demanded improved efficiency for any boilers that were replaced or installed as a result of that advice. The first tranche of enhanced boiler efficiencies (SEDBUK) were as follows:

¹³ Circular 06/2010: The Building Act 1984, The Building Regulations 2000: New Approved Documents for F, J and L and guidance documents published in April 2010

¹⁴ <http://www.communities.gov.uk/planningandbuilding/buildingregulations/>

Central heating system fuel and boiler type	Minimum SEDBUK (%)
Mains natural gas (all boiler types)	78
LPG (all boiler types)	80
Oil (combination boilers)	82
Oil (all other types of boilers)	85

Minimum boiler SEDBUK for alterations to building services

The second tranche of enhanced boiler efficiencies were introduced exactly two years later (in May 2007). The industry manufacturing capacity was at a sufficiently advanced level to enable condensing boilers to be introduced into the energy standards. The 'whole building approach' adopted as a result of Article 4 of the EPBD means that, for new buildings, boilers of 90% SEDBUK efficiency are the norm. These new standards contribute a significant proportion of the reduced CO₂ emissions (23-25% better than the 2005 standards) which are attributable to the major review of energy standards. In terms of existing buildings, replacement boilers and those forming part of a new heating system need to have an efficiency of 86% SEDBUK.

Technical Handbook 6 (2009) provides guidance on compliance with the energy efficiency measures for both new and existing dwellings as required by the Building (Scotland) Regulations 2004. For new dwellings, Standard 6.1 states that energy performance is calculated in accordance with a methodology which is asset based, conforms with the European Directive on the Energy Performance of Buildings 2002/91/EC and uses UK climate data; and that the energy performance of the building is capable of reducing CO₂ emissions. For all new and existing dwellings, Standard 6.2 states, 'every building must be designed and constructed in such a way that an insulation envelope is provided which reduces heat loss'. There are similar standards which control the heating/hot water system, insulation to pipework, and artificial lighting. There is also a standard which covers commissioning of the dwelling's fixed services.

Following publication of The Sullivan Report¹⁵ - 'A Low Carbon Building Standards Strategy for Scotland', the Scottish Government has introduced further improvements to energy standards within building regulations. Standards introduced on 1 October 2010 deliver a 30% reduction on CO₂ emissions from new buildings compared to the previous 2007 standards. These standards also further improve the minimum requirements for heating system performance.

The Sullivan Report also sets out recommendations for further staged improvement of energy standards within building regulations and the Scottish Government will further review standards for 2013 and 2016. There are many drivers to improve the dwelling's energy performance beyond that required by the current Building Regulations. The main one is EcoHomes (2006) which shows how environmentally friendly a dwelling or development is.

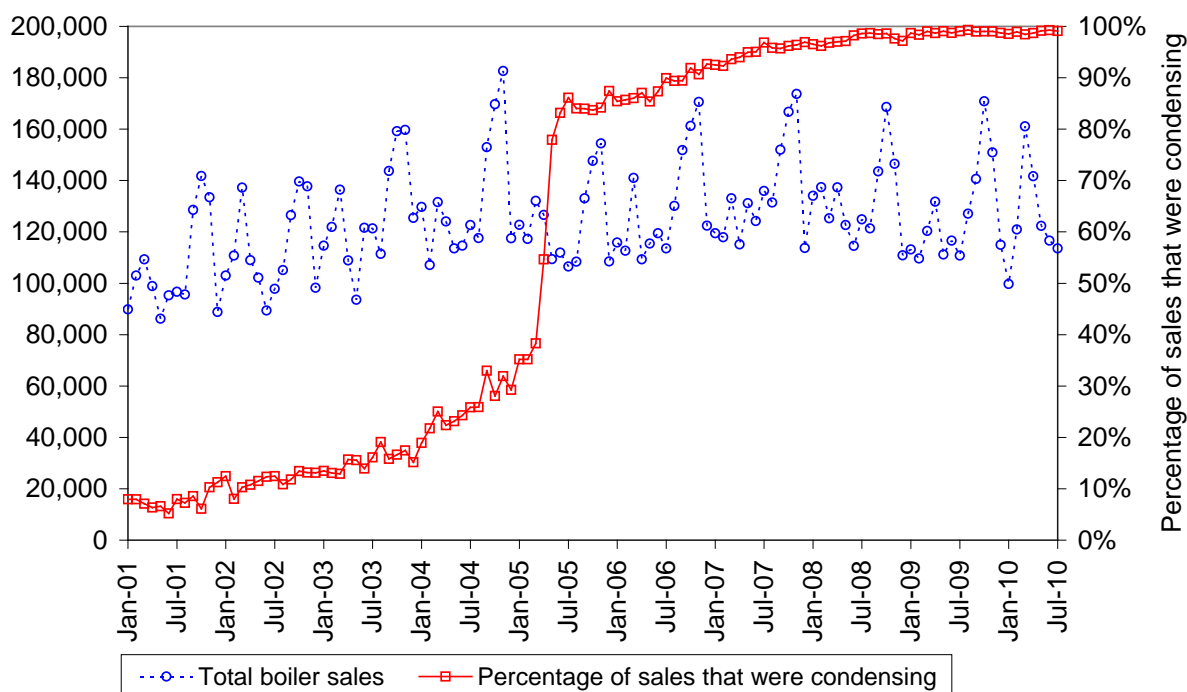
¹⁵ <http://www.scotland.gov.uk/Topics/Built-Environment/Building/Building-standards/about/sullivanreport>

3.2.3 Building Regulations (Northern Ireland)

Technical Booklet F1 has minimum energy efficiency requirements for replacement boilers in dwellings and also refers to the DCHG.

3.2.4 Impact of building regulation changes

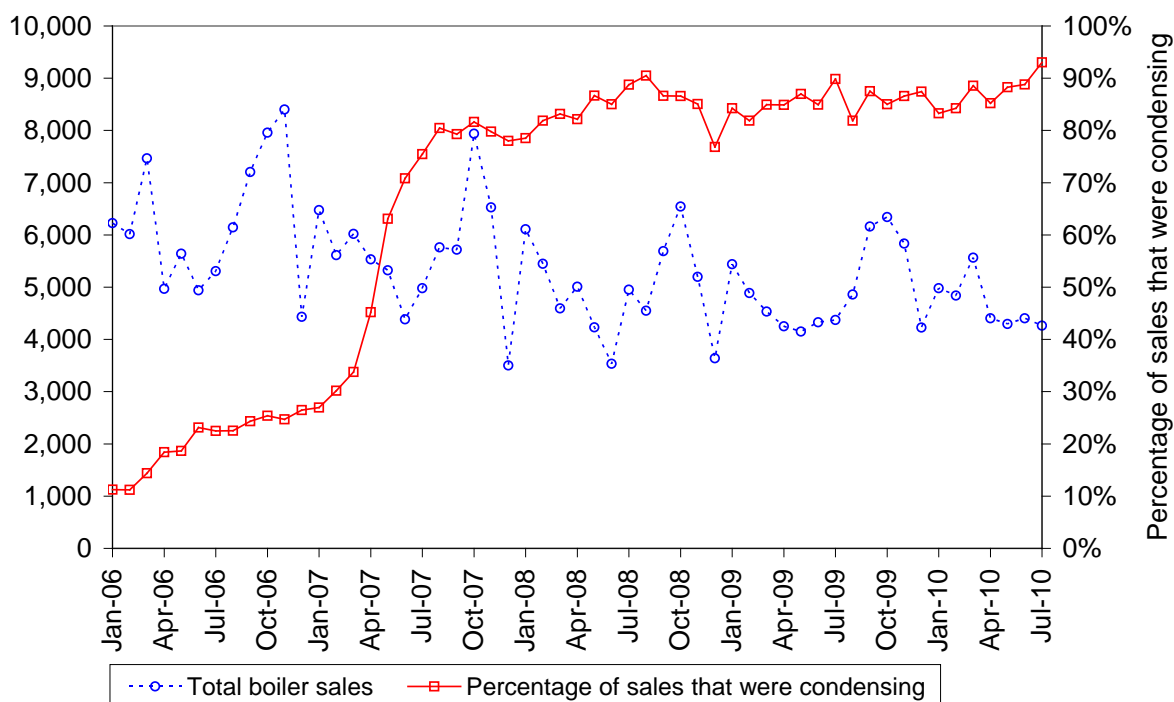
These new boiler energy efficiency standards across the UK had an immediate and significant impact on gas-fired boilers as shown by Graph 1 below.



Graph 1. Monthly sales of gas-fired boilers in UK and % that were condensing (Jan 2001-July 2010)

Graph 1 shows that the proportion of condensing gas-fired boiler sales had been climbing slowly for 5 years from 2001 in anticipation of regulation, but with the introduction of the higher standards in April 2005 in England & Wales there was a step change where the proportion rose from about 40% to 90% in the space of just 2-3 months. **In May 2010 the proportion reached 99%.** This can be regarded as saturation level, as there remain a small number of cases in which non-condensing boilers may still be fitted for technical reasons or because of an unreasonably high cost to adapt the building. As noted above the UK's position is dominated by England & Wales because it has 89% of the population.

Although the increased standards for oil-fired boilers in England & Wales did not come into effect until April 2007, the effect was almost as great as for gas, as shown by Graph 2 below:



Graph 2. Monthly sales of oil-fired boilers in UK and % that were condensing (Jan 2006-Dec 2010)

Graph 2 shows the same general trend as Graph 1, i.e. a slow climb in the proportion of condensing boiler sales in the lead up to the requirement coming into effect (April 2007) and then a dramatic increase subsequently. **In May 2010 the proportion reached 88%.** As shown by the two graphs the level of sales are very different, reflecting the fact that oil-fired boilers only make up some 7% of the domestic boiler market in the UK.

Changes to the Building Regulations (England & Wales) are supported by a Regulatory Impact Assessment (RIA) which set out the impacts (i.e. costs and benefits) of the changes. The RIA supporting the 2006 revision to Part L¹⁶ estimated that the strengthened standards in April 2005 apply to 1.2 million domestic gas-fired boilers replaced each year (this represents nearly 7% of the domestic boiler stock) and would lead to a saving of 0.41 MtC (million tonnes of carbon) per year in 2010. **This can be converted to carbon dioxide giving a saving of 1.51 Mt CO₂ per year in 2010.**

The carbon saving attributable to the more demanding requirements for new-build dwellings from April 2006 was estimated to be 0.09 MtC per year in 2010, although the RIA was not able to separate out the saving attributable to the heating improvements alone. The savings attributable to the more demanding requirements on extensions to dwellings were estimated to be 0.01 MtC per year in 2010.

There are also requirements for boilers in non-domestic buildings. For new buildings boilers must have minimum seasonal efficiencies as calculated by a specified procedure as well as a minimum package of

¹⁶ ODPM. *Regulatory Impact Assessment: Part L and Approved Document F*, 2006.

controls, and there are similar requirements for replacement boilers¹⁷. Carbon savings attributable to the changes in the requirements for new-build and refurbishment of existing buildings are estimated to be 0.14 and 0.26 MtC per year in 2010 respectively, but given the diverse nature of the non-domestic building stock the RIA was unable to separate out the saving attributable to heating improvements alone.

The key point to note from the RIA is that the condensing boiler regulations impact significantly on the domestic boiler stock and produce the largest single carbon saving (45% of the total) of all the amendments to Part L.

3.2.5 The Energy Efficiency Commitment (EEC)

The Energy Efficiency Commitment (EEC)¹⁸ is a previous UK government programme that set targets on energy suppliers to achieve improvements in energy efficiency in customers' homes. Each supplier was set an individual energy saving target based on the number of domestic customers they supplied, with half of the savings to be targeted at 'priority group' households currently defined as those that receive income related benefits or tax credits. EEC applied to Great Britain (GB), i.e. England & Wales and Scotland. Northern Ireland had its Energy Efficiency Levy which is predominately targeted at fuel poor homes and is expected to save 0.4 TWh in 2010⁸.

EEC 2005-2008 (EEC2) followed on from the EEC 2002-2005 (EEC1) and required gas and electricity suppliers to achieve new targets for improvements in domestic household energy efficiency. The Electricity and Gas (Energy Efficiency Obligations) Order 2004 provided the statutory basis for the EEC2, setting out the overall energy efficiency target of 130 TWh to be achieved between 1 April 2005 and 31 March 2008. A third phase of EEC was renamed as the Carbon Emissions Reduction Target (CERT) and came into force in April 2008 for a 3-year period to 2011.

The suppliers attempted to meet their targets by operating a number of schemes, often in conjunction with partners such as local authorities, housing associations or retailers. These schemes were designed to encourage uptake by subsidising or supplying a range of energy efficiency measures including energy efficiency appliances, insulation, condensing gas boilers and low energy lamps. The EEC was administered by Ofgem (Office of Gas and Electricity Markets) whose role is to oversee the suppliers' schemes by approving each scheme that is submitted and monitoring progress. This was in accordance with the Electricity and Gas (Energy Efficiency Obligations) Order 2004.

Energy suppliers have managed a number of schemes within EEC1 and EEC2 which address heating systems and controls. The measures installed must exceed the requirements of Part L of the Building Regulations to ensure that additional carbon savings are achieved (ie, greater than the regulatory minimum). For EEC1 the activity and carbon savings attributable to heating measures in GB are¹⁹:

Band A + B boilers: 279,000 installations producing a saving of 0.35 MtC (lifetime discounted) at a cost of £33.5m

¹⁷ Requirements are set out in the industry produced *Non Domestic Heating, Ventilation and Air Conditioning Guide* which supports Approved Document L2.

¹⁸ For further details on EEC (now CERT) see the Ofgem website at <http://www.ofgem.gov.uk/Sustainability/Environmnt/EnergyEff/Pages/EnergyEff.aspx>

¹⁹ Figures were derived from Ofgem "A review of EEC 2002-05", Report to Defra, August 2005 and Eoin Lees Energy "Evaluation of EEC 2002-05", Report to Defra, February 2006.

Band A + B boilers and heating controls: 87,500 installations producing a saving of 0.18 MtC (lifetime discounted) at a cost of £16.6m

Heating controls upgrade: 444,000 installations producing a saving of 0.15 MtC (lifetime discounted) at a cost of £24.4m

Fuel switching: 41,000 installations producing a saving of 0.23 MtC (lifetime discounted) at a cost of £90.4m

There is also CHP (Combined Heat and Power) installed in some community heating schemes (615 properties connected) as well as other innovative heating systems such as ground source heat pumps (GSHPs) (200 installations) but by comparison the total carbon savings are very low.

The combined carbon saving from these heating measures is therefore 0.85 MtC (lifetime discounted).

For EEC2²⁰, which was a 3-year programme concluding in March 2008, the heating-related energy savings were nearly 10% of the total savings, and are shown below:

Measure	Number of measures installed (excluding carry-over from EEC1)		Energy savings (GWh)
	Priority Group	Non-priority Group	
All boilers	366,905	1,715,907	7,837
Heating controls installed with replacement boilers	28,205	80,366	135
Heating controls	755,132	1,481,280	210
Fuel switching	47,639	30,371	4,462
Innovative heating	466	2,406	478
CHP/Communal heating (number of properties served by the heating system)	1,894	4,960	1,084
Other heating	2,485	197,301	66
Hot water tank jackets	65,743	93,217	341
Radiator panels (m2)	41,404	16,465	8

EEC2 included a variety of other measures, not shown above, and a small number of micro-generation technologies.

3.2.6 The Carbon Emissions Reduction Target (CERT)

The EEC scheme is now closed and has been replaced by the Carbon Emissions Reduction Target (CERT). CERT 2008 – 2011 follows on from the EEC2 (2005 – 2008). Revised in 2009, the CERT requires gas and electricity suppliers to achieve targets for a reduction in carbon emissions generated by the domestic sector. The programme itself is known as the CERT and the target for carbon emissions reduction as the CER target. Each supplier's individual target is known as its 'carbon obligation'.

The Electricity and Gas (Carbon Emissions Reduction) Order 2008 and its amending order The Electricity and Gas (Carbon Emissions Reduction) (Amendment) Order 2009 (the Order) provides the statutory basis for the CERT. The Order sets out the overall carbon emissions reduction target to be collectively achieved

²⁰ Ofgem "A review of the Energy Efficiency Commitment 2005-2008".

by licensed gas and electricity suppliers between 1 April 2008 and 31 March 2011. The target is 185 million tonnes of carbon dioxide (lifetime).

Suppliers meet their targets by setting up schemes to deliver reductions in carbon emissions. Some of the schemes include measures to improve heating systems; eg, more efficient boilers or heating controls. The proportion from insulation has remained broadly consistent, albeit rising slightly. Carbon savings from heating measures, appliances and microgeneration have all increased proportionally in the second year.

The number of measures installed in the first two years of the scheme, excluding carryover from EEC2, were:

Measure	Number of measures installed
Fuel switching	37,282
Solar water heating (m2)	468
Heat pumps	2,094
Small scale CHP	1
Cavity wall insulation	1,121,317
Professional loft insulation	1,390,230
DIY Loft Insulation (m2)	46,953,917
Solid wall insulation	29,340
CFLs	232,827,748

The latest Ofgem report “A review of the second year of the Carbon Emissions Reduction Target”²¹ is the CERT annual report 2010. It indicates that by the end of the second year of CERT (March 2010) suppliers had delivered sufficient energy saving measures to meet around 80% of the overall target of 185 million lifetime tonnes of carbon dioxide (including carry over from EEC2). By the end of the second year, suppliers had delivered measures resulting in lifetime carbon savings of approximately 149 MtCO₂ or 81 per cent of the overall target. Of this, 37.8 MtCO₂ was carried over from EEC2, 55 MtCO₂ was achieved in the first year of the programme (2008/09), and 56 MtCO₂ was achieved in the second year of the programme (2009/10).

Following a consultation by DECC which ended in March 2010, legislation to restructure and extend the CERT to December 2012 was made in July 2010²². During the extension period, suppliers will be required to achieve a revised overall target. This will incorporate the existing 40 per cent Priority Group target and new targets to focus activity on insulation measures and to ensure the most vulnerable households receive measures.

Based on the number of installations, EEC and CERT, like Part L of the Building Regulations, have had a considerable impact on the heating efficiency of the existing domestic stock. It is not straightforward to combine the carbon savings from these regulatory measures because the EEC figures are expressed in a lifetime discounted format. However, Defra estimates that the total savings from EEC1, EEC2, and CERT in Great Britain will be 1.8 MtC per year in 2010⁸, and if, as noted above, at least 5% of this is attributable to heating measures then the total carbon saving in Great Britain is 0.09 MtC per year in 2010. **This can be converted to carbon dioxide giving a saving of 0.33 Mt CO₂ per year in 2010.**

²¹ <http://www.ofgem.gov.uk/Sustainability/Environment/EnergyEff/Documents1/CERT%20Annual%20report%20second%20year.pdf>

²² <http://www.ofgem.gov.uk/Sustainability/Environment/EnergyEff/Pages/EnergyEff.aspx>

Therefore, combining the heating related savings for the Building Regulations, EEC1, EEC2 and CERT produces an overall saving of 1.84 Mt CO₂ (or 0.50 MtC) per year in 2010.

3.2.7 Community Energy Saving Programme (CESP)

The Community Energy Saving Programme (CESP)²³ was created as part of the government's Home Energy Saving Programme. It requires gas and electricity suppliers and electricity generators to deliver energy saving measures to domestic consumers in specific low income areas of Great Britain. CESP has been designed to promote a 'whole house' approach and to treat as many properties as possible in defined areas.

The Order came into force on 1 September 2009. The CESP obligation period runs from 1 October 2009 to 31 December 2012. It will require certain gas and electricity suppliers and certain electricity generators to meet a carbon emissions reduction target. The Department for Energy and Climate Change (DECC) are responsible for setting the overall CESP target and the policy framework and Ofgem is responsible for administering the programme.

In the Heat and Energy Saving Strategy, the government set out a long-term vision of the continuous delivery of carbon savings from the domestic sector using some form of obligation until at least 2020. Energy efficiency is one of the most cost effective ways of achieving desired reductions in carbon emissions. Reducing energy consumption can also improve productivity and contribute to improved security of supply.

In the first CESP annual report (April 2010)²⁴ covering the operation of the CESP to 31 December 2009 it was too early to report energy savings.

3.3 Grant programmes

3.3.1 Warm Front in England

Warm Front in England²⁵ is a government funded initiative designed to tackle fuel poverty by targeting vulnerable households. The programme provides financial assistance to install insulation, draughtproofing, hot water cylinder thermal jackets, and to repair or replace heating systems. This improves both the thermal comfort of such households and the efficiency of their heating systems.

Warm Front has assisted some two million vulnerable households since its inception in June 2000, saving them an average of more than £300 per year on their energy bills. The programme is responsible for a reduction in carbon dioxide emissions in the average household from 6.6 tonnes per year to 5.2 tonnes per year, equalling total annual savings of 1.4 tonnes of CO₂ per year for those homes improved, each and every year for the next 20 years.

²³ <http://www.ofgem.gov.uk/Sustainability/Environment/EnergyEff/cesp/Pages/cesp.aspx>

²⁴ [http://www.ofgem.gov.uk/Sustainability/Environment/EnergyEff/cesp/Documents1/Ofgems%20report%20on%20the%20first%20quarter%20of%20the%20Community%20Energy%20Saving%20Programme%20\(CESP\)%202009%20-%202012\).pdf](http://www.ofgem.gov.uk/Sustainability/Environment/EnergyEff/cesp/Documents1/Ofgems%20report%20on%20the%20first%20quarter%20of%20the%20Community%20Energy%20Saving%20Programme%20(CESP)%202009%20-%202012).pdf)

²⁵ For further details see <http://www.warmfront.co.uk/>

Warm Front is running trials on low carbon alternative and renewable heating technologies for those households off the mains gas network and who are in, or at risk of, fuel poverty. A solar thermal pilot project was started in 2008, and during 2009 to 2010 another pilot project will be started on air source heat pumps.

In terms of activity the heating measures installed through Warm Front from June 2000 to March 2009 are²⁶:

- gas wall heaters (24,449 installations)
- gas central heating (162,995)
- hot water thermal jackets (153,605)
- replacement boilers (298,911)
- repairs to existing systems (82,038)
- oil central heating (1,988).

3.3.2 HEES (Home Energy Efficiency Scheme) in Wales

HEES²⁷ operates in Wales and 12,656 insulation installations and 5,754 heating installations were completed in 2009/10²⁸. The 2009/10 HEES annual report indicates that these measures saved 19,670 tCO₂/year. In the 08/09 period the CO₂ savings were 22,468.65 tCO₂/year, with 11,277.11 tCO₂/year in the 07/08 period. The scheme is reported to have saved an average of 21,307 tCO₂/year between 2000 and 2006.

3.3.3 Energy Assistance Package in Scotland

In April 2009 the Scottish Government introduced its Energy Assistance Package (EAP), replacing the previous Central Heating Programme. This replaced the earlier Central Heating Programme and Warm Deal schemes which focused on pensioners. It is a holistic package to help maximise incomes, reduce fuel bills and improve the energy efficiency of homes. The EAP is targeted on families and pensioners living in energy inefficient homes and aims to tackle each of the causes of fuel poverty: low incomes, fuel costs, and energy inefficient homes.

The package has four stages. Callers to the EAP helpline are guided to the type of help that is most appropriate to their circumstances. The stages need not be sequential and two or more Stages can run simultaneously.

Stage 1 offers free expert energy advice to anyone who phones 0800 512 012.

Stage 2 offers measures to maximise income and reduce energy bills, with referrals for benefits and tax credit checks by the Department of Work and Pensions (for pensioners) and Citizens Advice Direct (for under 60s) and referrals to the applicant's energy company for checks on eligibility for low cost energy tariffs or cheaper payment methods.

Stage 3 offers referrals to the applicant's electricity provider for cavity wall and virgin loft insulation, funded under the companies' Carbon and Emissions Reduction Target (CERT) obligation.

Stage 4 offers options of grant-funded enhanced energy efficiency measures, including:

²⁶ "The Warm Front scheme annual report 2008/09".

²⁷ For further details see http://www.eaga.com/government_contracts/hees.htm

²⁸ <http://www.heeswales.co.uk/stakeholder-info.htm>

installation of a full central heating system, or boiler or partial system replacement (mains gas, liquid petroleum gas, electric storage, air source heat pump, oil, solid fuel, and introducing micro CHP in 2010-11);

insulation measures (internal and external wall insulation, loft and cavity wall insulation, underfloor insulation, draft-proofing and pipe and HW tank lagging as appropriate);.

cold building temperature alarm, smoke detector and carbon monoxide detector.

Eligibility for the award of grant under Stage 4 is defined by The Home Energy Assistance Scheme (Scotland) Regulations 2009.²⁹ The Regulations have twice been amended in order to extend the benefits of Stage 4 to more households, in December 2009³⁰ and in May 2010³¹.

The grant threshold for Stage four measures is £4,000, with a higher threshold of £6,500 if a specified level of energy efficiency cannot be achieved for the lower amount, or where the installation includes an air source heat pump. 13,000 homes were improved under the budget for 2009-10, including 11,502 homes receiving heating system measures.

The contract for the Stage 4 Managing Agent includes detailed specifications for the selection and installation of all measures provided under Stage 4. These include:

“Boilers must meet the requirements as set out in this document and in addition have a seasonal efficiency as set out in the SEDBUK database of at least 90%, that is a SEDBUK(2005) Band A boiler.

All specified boilers must be listed in the SEDBUK database, meet the criteria set out in this specification, comply with BS EN677 1998, carry the European Approval mark (CE), be registered with the Energy Saving Trust, and be covered by a current and comprehensive Quality Management System covering the manufacturing process, distribution and customer care. Boilers must be installed in accordance with all relevant legislation, regulations, BSI standards, good practice and manufacturers’ written instructions.”

Programme Statistics - February 2010

Summary key performance indicators for the Energy Assistance Package (EAP) as at end of February 2010.

The table below lists the estimated outcomes of help during year to date (excludes legacy Central Heating Programme and Warm Deal).

Outcome	Total	Average (for those helped)
Increase in energy efficiency of homes receiving stage 4 measures (SAP points)	n/a	36
Reduction in carbon dioxide (tonnes CO ₂ over lifetime of measures)	239,042	45

²⁹ http://www.opsi.gov.uk/legislation/scotland/ssi2009/ssi_20090048_en_1

³⁰ http://www.opsi.gov.uk/legislation/scotland/ssi2009/ssi_20090392_en_1

³¹ http://www.opsi.gov.uk/legislation/scotland/ssi2010/ssi_20100110_en_1

Help provided	Feb-10	Year to date (Apr 09 - Feb 10)
Households in contact about the Energy Assistance Package	11,300	54,282
Those taking up offers of help	Feb-10	Year to date (Apr 09 - Feb 10)
Households	11,959	52,506
People	21,107	89,946

The table below lists the type of help delivered during year to date (includes legacy Central Heating Programme and Warm Deal).

Types of help	Feb-10	Year to date (Apr 09 - Feb 10)
Energy saving advice (incidences)	13,604	63,354
Heating system measures	1,215	7,271
Referred for other CERT schemes	496	3,511

3.3.4 Warm Homes in Northern Ireland

Warm Homes is an insulation-based fuel poverty programme operating in Northern Ireland, and Warm Homes Plus focuses on the replacement and repair of boilers and heating systems. These operate in much the same way as Warm Front and HEES. In the 5-year window from April 2002 to March 2007, 11,953 gas-fired boilers and 2,150 oil-fired boilers were installed through Warm Homes. In addition since 2003, the Northern Ireland Housing Executive, which functions as the Regional Housing Authority, has installed 34,255 heating installations the vast majority of which are either gas or oil-fired boilers. All Housing Executive tenants receive advice on their new heating system from both the installation contractor and the Executive's Heatsmart service.

3.3.5 Overall impact of fuel poverty programmes

As indicated by the above numbers of installations, the level of activity in these grant programmes is comparable to that achieved through EEC and CERT. Carbon savings are not provided in the annual reports, although it should be noted that the main focus of these programmes is to address fuel poverty rather than reduce carbon emissions. Defra, however, estimates these to be about 0.4 MtC per year in 2010^{8,32}, but because this figure covers insulation and draughtproofing as well as heating measures it cannot be combined with the carbon savings from the regulatory measures.

3.3.6 Low Carbon Buildings Programme

³² Defra "Synthesis of Climate Change Policy Evaluations", April 2006.

The Low Carbon Buildings Programme (LCBP)³³ is a UK government programme that provided grants for the installation of microgeneration technologies in a range of buildings to include households, community organisations, public, private and the non-profit sectors. It replaced two previous government programmes *Clear Skies* (which covered wind turbines, small hydro, solar thermal hot water, GSHP and biomass) and the Major PV Demonstration Programme (MDP). *Clear Skies* commenced in January 2003 and the MDP in 2002, but both finished in March 2006 when they were replaced by LCBP.

In terms of heating related microgeneration measures as of the end of 2005 there were 78,500 solar thermal installations in the UK (many of which had been installed before 2000), 990 micro CHP units, 550 GSHPs and about 150 biomass-fired boilers³⁴. Carbon savings are not available. Obviously, in comparison to the number of conventional boilers the level of microgeneration is very small but it is a rapidly growing sector.

The LCBP is now closed. However, the Renewable Heat Incentive scheme starting in 2011 will encourage generation of heat from renewable energy sources (solar thermal, biomass, heat pumps) by introducing financial incentives.

3.3.7 Community Energy Programme

The Community Energy Programme (CEP)³⁵, which was launched in 2002 and ran through to March 2007, supported the installation of new community energy/district heating schemes and the refurbishment or expansion of existing schemes across the UK. The government funded schemes were all based on low carbon technologies such as CHP, biomass boilers or incineration of waste.

An evaluation of CEP showed that in the 48 schemes funded in the UK it achieved annual carbon savings of 9,683 Tonnes/year (0.24 MtC lifetime)³⁶. One of the main aims of the Programme was to stimulate the uptake of community energy in the UK, but it has also produced fairly substantial carbon savings as well.

The CEP (now closed for applications) provided £50m to promote community heating through grants to install new schemes and refurbish obsolete infrastructure and equipment, primarily using combined heat and power technology.

3.3.8 Community Sustainable Energy Programme (CSEP)

CSEP is an open grants programme run by BRE as an award partner of the Big Lottery Fund (BIG). BRE carries out research, consultancy, training and testing to help create better buildings and communities.

The Community Sustainable Energy Programme will provide £8 million to community-based organisations for the installation of microgeneration technologies, such as solar panels or biomass boilers and energy efficiency measures including loft and cavity wall insulation. It will also provide £1 million for project development grants that will help community organisations decide if they could benefit from a microgeneration and energy efficiency installation.

³³ For further details see <http://www.lowcarbonbuildings.org.uk/home/>

³⁴ "Potential for microgeneration: Study and analysis", Report prepared for DTI, November 2005. The figures in the report are for the UK and so have been scaled to England & Wales using a population multiplier.

³⁵ For further details see <http://www.energysavingtrust.org.uk/housingbuildings/funding/community/> and <http://www.defra.gov.uk/foodfarm/growing/crops/industrial/energy/energy2.htm>

³⁶ BRE "Community Energy Programme: Evaluation of carbon savings", Report prepared for EST, August 2007.

The programme aims to achieve a reduction in CO₂ emissions from lower energy bills. Capital grants are awarded on a competitive basis at quarterly Selection Panel meetings and Project Development grants on a first-come first-served basis until all funds are spent. The programme was launched in April 2008 to provide funding for three years, continuing until October 2010.

3.4 Financial instruments

3.4.1 Enhanced Capital Allowances (ECA) and Energy Technology List (ETL)

The Enhanced Capital Allowance (ECA) scheme³⁷ is a UK government initiative that provides businesses with enhanced tax relief for investments that meet published energy-saving criteria. 100% tax relief on the cost of equipment is available in the year of purchase. There are currently 14,400 energy saving products in 57 technology categories that comprise the ECA scheme which are on the Energy Technology Product List (ETPL) which is managed by the Carbon Trust³⁸. Heating related technologies on the list include boilers, CHP, heat pumps, pipe insulation and solar thermal systems. However, there is no recent data on carbon savings specifically attributable to the ECA and ETL.

3.4.2 Loans

The Carbon Trust provides interest-free loans to help small and medium sized enterprises to buy energy saving equipment. In 2006/07 the Trust offered 482 loans worth over £18m which will deliver annual savings of around 14 kTonnes of carbon³⁸. The scheme has nearly doubled in size from 2005/06, and it is estimated that the fund will save 0.1 MtC per year in 2010 in the UK⁸. However, it is not possible to identify which savings relate to heating systems. However, it is not possible to identify which savings relate to heating systems.

The Trust also funds an independent company, Salix, which has committed funds to 49 local authorities, 8 higher education establishments and 4 NHS Trusts and has initiated 251 projects during 2006/07 generating annual carbon savings of 1.3 kTonnes³⁸. Again, it is not possible to identify which savings relating to heating systems. Again, it is not possible to identify which savings relating to heating systems.

In Scotland, 94 loans have been committed worth £2.9 million that will save 47 ktCO₂ and £6.5 million in energy bills over their lifetime.

The £4 million Scottish Higher and Further education revolving fund (specifically granted by Scottish Government) resulted in further projects being installed in 2009/10 that will save 21ktCO₂ and reduce energy bills by £4.5 million over their lifetime. This brings the cumulative total for this revolving loan fund to reduce emissions by 51 ktCO₂ and energy bills by £9.5 million over their lifetime, which with the initial capital fund remaining intact looks set to increase its impact over future years.

3.4.3 Reduced VAT

A reduced rate of VAT at 5% (rather than 17.5%) is charged on certain energy saving materials provided they are professionally installed in a residential or charitable property. The materials include controls for hot water and central heating, solar panels, ground-source and air-source heat pumps, micro-CHP and wood-fired boilers. In addition, grant-funded contractor installations of factory-insulated hot water tanks, domestic

³⁷ For further details see <http://www.eca.gov.uk/etl>

³⁸ Carbon Trust Annual Report 2008/09.

CHP units and heating systems that use renewable energy also benefit from the reduced rate. This measure is designed to support the aforementioned policies on heating systems so no specific carbon saving has been attributed to it.

3.5 Guidance and promotion

3.5.1 Energy Saving Trust

The Energy Saving Trust (EST)³⁹ is a non-profit organisation, funded both by UK government and the private sector. It is one of the UK's leading organisations set up to address the effects of climate change and has offices in England, Scotland, Northern Ireland and Wales. Its aim is to cut emissions of carbon dioxide by promoting the sustainable and efficient use of energy and it works primarily in the domestic sector providing advice and guidance to both householders and housing professionals, but it also operates in the transport sector and on community based projects. In particular, EST has promoted the installation of condensing boilers and the better use of heating controls to householders to improve energy efficiency, and has prepared technical guidance on boilers and heating controls for housing professionals which links into the Part L requirements discussed above.

EST annual reports summarise carbon savings at overall programme/audience level. The report for 2005/06 indicates annual savings of 0.33 MtC, and the report for 2008/09⁴⁰ indicates annual savings of 0.29 MtC in 07/08 and 0.25 MtC in 08/09. The figures are annual across all sectors excluding transport. 66% in 07/08 and 72% in 08/09 of these savings were attributable to individual households. However, they do not distinguish separate activity streams to enable the heating contribution to be identified.

3.5.2 Carbon Trust

The Carbon Trust⁴¹ is an independent company funded by UK government whose role is to help the UK move towards a low carbon economy by helping business and the public sector reduce carbon emissions now and capture the commercial opportunities of low carbon technologies. The Carbon Trust manages the Energy Technology List and provides loans but it also provides carbon management services to the public sector, on-site energy surveys, design advice, general advice etc.

As with the EST, the Carbon Trust annual reports only summarise carbon savings at overall programme/audience level and does not distinguish separate activity streams to enable the heating contribution to be identified.

The Carbon Trust has helped SMEs (small and medium enterprises) to achieve £45m energy savings and 300,000 tonnes carbon reduction in 2007-2008. £20.5m interest-free loans were given to SMEs for buying low-carbon equipment in 2007-2008.

³⁹ For further details see the EST website at <http://www.energysavingtrust.org.uk/>

⁴⁰ <http://www.energysavingtrust.org.uk/Media/Corporate-Media/Publications/Annual-review-2008-09>

⁴¹ For further details see the Carbon Trust website at <http://www.carbontrust.co.uk/default.ct>

The Carbon Trust has realised £1 billion total energy savings for UK businesses and plans to save them £1m every day over the next three years. 17m tonnes total carbon reduction is attributable to the Carbon Trust since its inception⁴².

3.6 Overall impact of “alternative solutions”

As described above there is a wide range of measures introduced in the UK since 2003 which are specifically designed to improve the efficiency of heating systems. The key ones are the regulatory measures (e.g. Part L and EEC/CERT) which can be considered as “alternative solutions” in respect of demonstrating broad equivalence. The higher energy efficiency standards in Part L alone will produce savings of 0.41 MtC per year in 2010 and have already had the effect that nearly all new and replacement domestic boilers are condensing. EEC/CERT is estimated to produce heating related savings of 0.09 MtC per year in 2010.

Between them these measures will produce savings of 1.84 Mt CO₂ (0.50 MtC) per year in 2010 in the UK.

Warm Front, HEES and the Energy Assistance Package together have also had a substantial impact given the levels of activity are comparable to that seen in EEC and CERT. They will produce carbon savings of 0.4 MtC per year in 2010 although this figure includes insulation and draughtproofing as well as heating-related measures so it cannot be added to the 0.5 MtC figure.

The other policies and measures support and extend the aforementioned regulatory requirements with regard to improving heating system efficiency. However, for the reasons outlined, it is not possible to assign a unique carbon saving to them for the purposes of demonstrating Article 8 equivalence. Therefore, the saving figure given here is an under-estimate.

⁴² <http://www.carbontrust.co.uk/publications/pages/publicationdetail.aspx?id=PFL331>

4 Implementing Option (B): Information and advice programmes

4.1 Introduction

Section 3 described the measures taken to improve heating system efficiencies which can be regarded as “alternative solutions” under the provisions of Article 8. As shown they have had a significant impact and provide a firm basis on which to develop the information and advice programmes which are the other strand to the implementation process for Option (b) in the UK.

4.2 England & Wales

The process of implementing Option (b) in England & Wales originally stemmed from an Article 8 Consultation Group formed by Defra with industry in 2003 to study options and make recommendations. The group produced a report recommending Option (b) in preference to Option (a), having established that inspection is more onerous and that costs were generally not commensurate with the likely benefits. An initial Regulatory Impact Assessment (RIA) was also prepared, and this was subsequently revised for CLG as part of the RIA prepared to support the implementation of Articles 7 to 10 of the EPBD⁴³.

Specifically, Articles 7, 9 and 10 of the EPBD are implemented in England & Wales through the Energy Performance of Buildings (Certificates and Inspections) (England & Wales) Regulations 2007 (the “Energy Performance Regulations”) SI 2007:991 as amended by SI 2007: 1669 which came into force over the period 19 April 2007 to 1 October 2008. Because England & Wales has adopted Option (b), these regulations make no direct provision for Article 8.

However, Energy Performance Certificates (EPCs) are accompanied by a section advising home owners on the most effective energy efficiency measures they could introduce. Out of the 11 low cost improvement measures that might be recommended 7 are heating related, and out of the 7 further measures 3 are heating related. A research report⁴⁴ into the potential impact and take-up of energy efficiency improvements recommended in Energy Performance Certificates for private homes sold in England and Wales shows that 63% of EPCs recommended boiler replacement (57% having boilers in efficiency band F or G), 34% of EPCs recommended improvements to heating controls, and 42% recommended that solar water heating is considered as a “further measure” (not low cost). In this respect EPCs are providing heating system advice that contributes to the implementation of Article 8.

The “alternative solutions” have been operating since 2003 and as well as building regulation changes and EEC/CERT also include national information and advice initiatives managed by EST and the Carbon Trust related to boilers and heating systems. These include direct guidance and publications and have been developed to produce enhanced information and advice.

⁴³ *Regulatory Impact Assessment, Energy Performance of Buildings Directive Articles 7-10, The Energy Performance of Buildings (Certificates and Inspections) (England and Wales) Regulations 2007*, March 2007. It can be found on the CLG website at: <http://www.communities.gov.uk/index.asp?id=1509172>

⁴⁴ *Energy Performance Certificates: Seizing the opportunity* by The National Energy Foundation, December 2009.

In England & Wales, information and advice programmes are in place to promote the energy efficiency of boilers and heating systems as part of its wider communication activities on the EPBD⁴⁵.

To build upon this, CLG convened a number of stakeholder forums to canvass their views and steer EPBD implementation, and the Article 8 (boiler stakeholder) forum has its membership drawn from the aforementioned organisations EST, Carbon Trust, HETAS, Gas Safe Register, Oftec and ICOM, as well as:

HVCA (Heating and Ventilating Contractors Association),
CIBSE (Chartered Institution of Building Services Engineers),
IDHEE (Institute of Domestic Heating and Environmental Engineers), and,
HHIC (Heating and Hotwater Industry Council).

In accordance with the requirements of Option (b), a new strengthened programme that encourages heating and boiler installers to provide basic energy advice to users of heating and hot water systems about the energy efficiency of their systems has been introduced with effect from 2008. The advice given is in the form of checklists and recommendations which have been developed in conjunction with key members of the heating and hot water manufacturing and installation industries. The checklists have been designed to be simple and quick to complete, and the intention is that they are left with customers. The advice is included in existing service and maintenance visits (the nature of which are described in section 2.2 above) and now forms part of industry recommended good practice guidelines.

There are different HM Government checklists for businesses and homeowners. The checklist for businesses provides a record of the main appliances in the system. As the efficiency of appliances varies considerably depending on age and how they are maintained, a simple set of questions about the system controls and boilers gives an indication of whether further expert advice on the heating and hot water systems improvement would be beneficial.

Homeowners are provided with a simple checklist which includes a rating for the boiler based on SEDBUK and the Boiler Efficiency Database (see paragraph 0). The reverse of the checklist provides the homeowner with estimated annual savings for boiler replacement and other home improvements. As these figures are different for gas, oil and solid fuel installations, different versions of the checklists are provided. To help complete the rating section a one page guide allows householders to rate the boiler A-G based on information from the Boiler Efficiency Database. As an example, a copy of the householder checklist for gas-fired boilers is given in Appendix B.

Copies of the checklists and advice are available on the CLG website and there is also a customisable version available⁴⁶.

4.3 Scotland

The Scottish Government: Building Standards Division (BSD) engaged with the EST to produce a domestic guidance leaflet⁴⁷ which provides advice on boiler replacement, associated heating system modifications,

⁴⁵ For further details see the CLG website at:

<http://www.communities.gov.uk/planningandbuilding/theenvironment/energyperformance/boilers/>

⁴⁶ See:

<http://www.communities.gov.uk/planningandbuilding/theenvironment/energyperformance/boilers/energyefficiencyadvice/>

⁴⁷ Leaflet can be found on the SBSA website at <http://www.sbsa.gov.uk/pdfs/Annex%20D%20boiler%20advice.pdf>

boiler efficiency and appropriate sizing. The leaflet also provides the homeowner with other sources of help and advice such as grant schemes etc. which are described above.

The BSD arranged for the EST to issue advice leaflets with Energy Advice packs requested by people interested in improving the energy efficiency of their homes. The Scottish Government has produced leaflets to be issued to all applicants for building warrants for alterations, extensions and conversions. By targeting building owners at a point where building works are being planned, they will be more likely to take the opportunity to act on the advice provided on boiler efficiency.

The guidance leaflet has been made available electronically on the BSD website⁴⁸ and also on a number of local authority websites. The leaflet is attracting on average 200 'hits' per calendar month on the BSD website alone.

In addition to the advice leaflet issued by the BSD, a large number of local authorities in their role under the Home Energy Conservation Act (HECA) have mounted a number of campaigns to offer a free home energy check, advice and grants. 'Changeworks' are working with local authorities in the South East of Scotland to deliver such a scheme. Homeowners are being offered a free home energy check together with a tailored report explaining the energy efficient measures which can be taken and grants available for these works. Again, a number of local authorities (some in partnership with other organisations) have offered grant funding towards the costs of replacement boiler upgrades.

In the social housing sector, the boiler guidance leaflets were issued to all local authorities and social landlords in Scotland to assist them in achieving the energy efficient heating aspect of the requirement of the decent homes standard, the Scottish Housing Quality Standard (SHQS). The Minister for Communities announced the SHQS on 4 February 2004, and implementation of these standards was rolled out throughout Scotland to meet the SHQS deadline of 2015.

The investment in the social rented sector on efficient heating measures (central heating/boilers) totals £95 million for the period 2004-2006/07 with the projected minimum expenditure for this measure being £235m for the period until 2015.

The Energy Saving Factsheet on Boiler Advice⁴⁹ produced by the Carbon Trust has been adopted by BSD and issued within the non-domestic sector. This document contains advice on boiler selection, installation, inspection and maintenance.

As with the strategy for domestic advice, the BSD has worked with a number of partner organisations to deliver advice in this area. The boiler advice factsheet produced by the Carbon Trust was issued to some of the organisations who have responsibility in Scotland for key services such as the Scottish Prison Service, National Health Service, Local Authorities in relation to schools, sports facilities and libraries. A number of these organisations have reported that they are currently working with the Carbon Trust in relation to the design and efficiency of new and refurbished buildings.

Hosting of boiler advice leaflets on the Scottish Government building standards website (Scottish Building Standards Agency & Building Standards Division):

⁴⁸ <http://www.scotland.gov.uk/Topics/Built-Environment/Building/Building-standards/publications/gl2>

⁴⁹ Leaflet can be found on the Carbon Trust website at
<http://www.carbontrust.co.uk/publications/publicationdetail.htm?productid=GIL121&metaNoCache=1>

The figures below refer to the number of 'hits' during the period 1 January 2007 – 27 September 2010 for the Scottish domestic boiler advice leaflet. The non-domestic equivalent was originally hosted on the Carbon Trust site, with a link from the Scottish website, though it is not possible to give the number of times it was accessed or downloaded prior to 1 January 2010.

Number of hits	Year			
	2007	2008	2009	2010
Month				
Jan	215	191	144	106
Feb	246	162	122	
Mar	231	159	94	
Apr	200	182	110	
May	195	125	111	
Jun	152	195	90	
Jul	165	155	155	
Aug	168	137	99	
Sep	147	133	107	
Oct	161	156	112	
Nov	170	173	101	
Dec	97	104	73	
Total	2147	1872	1318	

In February 2010, the building standards web pages reverted to a site within the Scottish Government website. The following are statistics from that period (including a short co-existence period from 1 January 2010).

Domestic boiler advice leaflet
 1 Jan - 31 March 2010 1,025 hits
 1 April - 21 Sept 10 1,504 hits

Non-domestic boiler advice leaflet
 1 Jan - 1 March 2010 54 hits

4.4 Northern Ireland

Provisions similar to England and Wales are in operation in Northern Ireland.

Advice to the non-domestic sector on boilers in Northern Ireland mainly comes from the activities of the Northern Ireland office of the Carbon Trust (CT). CT give best practice and impartial advice to the non-domestic sector in Northern Ireland. A summary of their activities since 2006 is given below:

1. Specialist site surveys to Northern Ireland businesses. Key survey findings (implemented solutions & identified opportunities) since 2006 include:

	Implemented Annual CO2 Savings	Implemented Annual Finance Savings £	Implemented Initial Cost	Implemented Lifetime CO2 Savings
	Annual Savings CO2	Annual Savings Pounds	Initial Cost	Lifetime Savings CO2
Biomass boiler	8,994	5,958	312,279	135,984
Boilers - other	3,787	102,040	196,012	43,167
Boilers: Condensing boilers	7,133	1,923,182	1,277,267	102,999
Grand Total	19,913	2,031,180	1,785,558	282,150
Biomass boiler	237,301	10,525,202	50,046,416	3,587,989
Boilers - other	4,171	401,404	1,100,762	47,548
Boilers Condensing boilers	10,868	2,187,109	2,121,849	156,937
Boilers Shell and tube	101	12,840	10,000	1,540
Grand Total	252,441	13,126,555	53,279,027	3,794,015

2. Training events. Since 2008/09:

2009-02-04 HVAC Workshop, Dunadry Hotel – 58 delegates

2009-10-07 Heat Recovery Workshop, Concourse Building – 38 delegates

2010-08-05 Energy Suppliers advice workshop, Concourse Building – 19 delegates

2010-09-14 Flue-gas optimisation, Concourse Building – 16 delegates registered to date

3. Publications: Advice on heating-related topics is freely available from the Carbon Trust and includes:

How to implement boiler sequence control (CTL022)

Product Application Checklist: Boilers: Hot Water Boilers up to (and including) 400kW (ECA703)

Product Application Checklist: Boilers: Hot Water Boilers over 400kW (ECA707)

Product Application Checklist: Boilers - Condensing Economisers (ECA719)

Energy efficient boilers and heat distribution systems, choosing the best for your site (GPG381)

Product Application Checklist: Boiler Equipment: Optimising controllers (ECA743)

Product Application Checklist: Boiler Equipment: Sequence controls (ECA746)

Product Application Checklist: Boilers: Condensate Pumping Equipment (ECA713)

Product Application Checklist: Boilers - Flue Gas Economisers (ECA720)

Product Application Checklist: Boiler Equipment: Steam Boilers (ECA740)

How to implement HVAC heat recovery (CTL030)

Product Application Checklist: Boiler Equipment: Burners with controls (ECA741)

Product Application Checklist: Boiler Equipment: Combustion trim controls (ECA742)

Product Application Checklist: Boiler Equipment: Retrofit burner control systems (ECA745)
Product Application Checklist: Boiler Equipment: Localised rapid steam generators (ECA749)
Product Application Checklist: Boilers: Automatic Boiler Blowdown Control Equipment (ECA717)
Product Application Checklist: Boiler Equipment: Gas fired condensing water heaters (ECA744)
Product Application Checklist: Boilers: Heat Recovery from Condensate and Boiler Blowdown (ECA706)
Best Practice NI: HVAC guide to be published October 2010-09-07

4. On-line guidance: This is also available at website⁵⁰.

In relation to domestic boiler advice, the Energy Savings Trust (EST) still provides up to date advice and information on boilers. The Northern Ireland EST advice centre provides guidance to householders who call the freephone number, based on the EST domestic boiler factsheets. These were produced in conjunction with the Energy Efficiency Partnership for Homes and therefore have been approved by industry.

From 1 January 2009 to 7 September 2010 2,100 queries were logged where the main advice sought regarded heating boilers/systems/controls. In addition, there were many more queries where boiler information will have been a secondary topic or where boiler upgrades were recommended as part of responding to a Consumer during an 'advice' call.

Cost and carbon saving information is also provided, advising consumers that replacing a G-rated boiler with a new A-rated condensing boiler and a full set of heating controls would save the consumer around £225 and up to 1500 kg/CO₂ per year.

Through the 'Home Energy Check' reports, bespoke boiler information to 9,100 Northern Ireland households was provided.

Moreover, it may be worth noting that the fact sheets are used solely by advisors for them to provide quality advice to householders. This advice is monitored on a monthly basis and every advisor is scored on the quality, relevance and accuracy of the advice they provide to householders. The NI ESTac consistently scores in the top 5 of a network of 16 centres in England, Wales and NI on this monitoring.

⁵⁰

<http://www.carbontrust.co.uk/cut-carbon-reduce-costs/products-services/technology-advice/Pages/boiler-heat-distribution.aspx>

5 Demonstrating Broad Equivalence

The EPBD does not define the methodology that Member States should use to demonstrate that the overall impact of adopting Option (b) is broadly equivalent to that arising from the provisions set out in Option (a). The first Article 8 Equivalence report produced by the UK Government showed the total carbon saved by the two options in 2010, and this second report shows the total carbon estimated to be saved in 2012. This carbon saving is the most important of a series of proposed Key Performance Indicators (KPIs) to measure impacts, another of which is concerned with the cost-effectiveness of the two options. The Directive itself refers to the need to consider the cost-effectiveness of energy efficiency measures and activities in a number of places, and Recital 19 refers specifically to the cost-effectiveness of replacing heating plant. Box 1 below lists the KPIs that were considered for demonstrating broad equivalence.

Box 1. KPIs to use to demonstrate broad equivalence between Options (a) and (b)
No. boilers inspected or subject to advice
No. boilers adjusted
No. boilers replaced early
Total cost
Total carbon saved in 2012
Total cash benefit
Net Present Value, NPV (i.e. the difference between the total cost and the discounted cash benefits)
Cost per tonne of carbon saved

The total carbon saved in 2010 by the “alternative solutions” has been derived in Section 2.3. Although this is not used in the equivalence argument it is useful for context and to show the significance of the saving.

In demonstrating equivalence, there is a need to first determine the carbon that will be saved by the information and advice programmes (as described in Section 4). This is Stage (III) of the equivalence process.

The next step is to estimate the likely carbon saving that would arise from an inspection procedure that meets the requirements of Option (a) – which is Stage (IV).

Then finally in Stage (V), the carbon saved by the information and advice programmes (Stage III) are compared to that likely to arise from the inspection procedure (Stage IV).

To achieve this we have made series of assumptions as to how such an inspection procedure might operate in the UK. These assumptions are:

The inspection regime would build upon the existing service market as described in Section 2.2, and would focus solely on those boilers captured under the provisions of Option (a) – the number of boilers captured by this is shown in Table 1.

A boiler inspection would include:

- o Identification of the boiler manufacturer, model, type and age

- An estimate of the efficiency at time of installation, using a simple process
- Examination of available records to establish when the boiler was last serviced.

A heating system inspection would be triggered when a boiler was >15 years old and would include:

- Assess boiler efficiency
 - Assess boiler size relative to heat demand of the building
 - Identify heating service
 - Identify circulation method
 - Identify the hot water system and examine storage vessel, if fitted
 - Identify controls, with reference to the minimum set
 - Identify number of zones, and how controlled
 - Report on boiler interlock, if feasible.
- Advice would focus on the scope for worthwhile improvement in energy performance, by reference to what could be obtained from new products to current best practice standards. It would also advise on the need to improve or augment controls, and, where practical, consider the case for replacement of a boiler oversized by reference to the heating demands of the building. In the case of larger systems, advice may recommend measurement and testing by specialist staff.
 - A competency framework would need to be introduced for personnel undertaking boiler and heating system inspections, covering a much wider range of staff than currently. Competent persons' schemes include training, qualification, supervision and quality control arrangements to assure minimum skill levels and provide uniformity of service to customers. Large parts of the current competent persons schemes' deal with safety matters, whereas the skills required for boiler and whole system inspections have to deal with identification of energy-critical components, assessment of their condition and scope for improvement. A number of new competent person schemes would need to be introduced for:
 - Boiler maintenance staff
 - Heating system estimators
 - Heating engineers and consultants.

Enforcement would require a national scheme for registration of boiler owners, holding names, addresses and records of inspections undertaken.

The boiler stock model referred to in paragraph 0 was used to derive values for each of the KPIs in Box 1 together with guidance prepared by Defra for undertaking greenhouse gas policy evaluation and appraisal in UK government departments under the auspices of the inter-departmental analysts group (IAG)⁵¹. In order to compare the two options and to run the boiler stock model a number of assumptions were required as follows:

Both **Option (a) and (b)** would build upon the existing boiler service activity as described above. Where there are existing service visits the additional cost of undertaking an inspection (Option (a)) or providing advice (Option (b)) is minimal, but where a specific visit is required then the cost rises to reflect this. The

⁵¹ Defra/IAG "Greenhouse Gas Policy Evaluation and Appraisal in Government Departments", April 2006. Defra believes the UK's approach for estimating energy savings is broadly consistent with the guidance developed by the Commission's Evaluation and Monitoring for the EU Directive on Energy End-Use Efficiency and Energy Services (EMEEES) project.

checklists described in section 4 were designed to be simple so as to minimise costs for providing advice. All costs were obtained through discussion with industry.

For both **Option (a) and (b)** there is a cost to industry to provide the necessary training to undertake inspection and advice provision. For **Option (a)** there is also the cost of setting up a national enforcement scheme.

For **Option (a)** where solid and oil-fired boilers <100kW require 'regular' inspection it has been assumed that this would be every 5 years, which is consistent with the inspection periods for boilers >100kW. The Directive does not require gas-fired boilers <100kW to be inspected. There is a cost to identify those boilers subject to the provisions of Option (a) but which currently do not have a service visit.

For **Option (b)** it has been assumed that all boilers (including those <20kW) are targeted. It has been assumed that a small proportion of householders and businesses currently without a service visit will request an advice visit as a result of the information and advice programme.

For both **Option (a) and (b)** benefits (in terms of fuel cash savings) arise from adjustments that return a boiler to its original efficiency and early replacement of old and inefficient boilers. It was assumed that boiler adjustments were only realised in boilers not already subject to service visits and different figures were used for gas, oil and solid fuel boilers based on industry guidance. For early replacement of boilers it was assumed that boilers would be replaced 5 years earlier than they otherwise might, and in the case of domestic boilers the savings were reduced to allow for improvements in thermal comfort. The cost of replacing a boiler early was also included in the analysis. Only a very small percentage (0.5-1%) of householders and businesses were assumed to take this action because of the cost and disruption this would entail.

Option (a) would be implemented in 2009 following the implementation timetable for the EPBD described in paragraph 0.

The additional measures under **Option (b)** are counted in the overall equivalence argument from 2006 onwards.

The boiler model was then used to calculate all of the KPIs from Box 1 on the basis of the above assumptions. In particular, the carbon saving KPI was calculated for each option in terms of Mtonnes of carbon saved in 2012 to ensure consistency with the carbon saving figure already derived. Table 2 summarises the results of this analysis.

	Option (a)			Option (b)		
	Domestic	Non-domestic	Total	Domestic	Non-domestic	Total
CO ₂ saving in 2012 (MtCO ₂):	0.01	0.10	0.12	0.27	0.06	0.33
Cost per tonne CO ₂ saved:	£476	£123	£161	£176	£30	£147
Carbon saving in 2012 (MtC):	0.004	0.03	0.03	0.07	0.02	0.09

Table 2. Summary of costs and benefits of implementing Option (a) inspection regime compared with the Option (b) information and advice programme in the UK

6 Conclusions

The key result from Table 2 above is that the Option (b) information and advice programme will save more carbon compared with implementing Option (a) in the UK. Specifically, this is 0.33 Mt CO₂ (0.09 MtC) in 2012 compared with 0.12 Mt CO₂ (0.03 MtC) for Option (a). All alternatives examined were cost-ineffective (i.e. NPV<0) but the overall cost per tonne of carbon for the two options are comparable.

The difference arises because of the respective boiler populations captured by the two options. Option (a), as shown in Table 1, is targeted at a relatively small proportion of boilers (specifically it is 11.5% of all boilers), but Option (b) addresses all boilers in the UK. Option (a) produces greater savings in the non-domestic sector compared to Option (b) because inspection would be a regulatory requirement and the action on boilers taken would be larger than that produced by the latter option since this is dependent on response to the advice programme. However, the difference in carbon savings in this sector (0.04 MtCO₂, i.e. 0.10-0.06) is not that significant because: (i) Option (b) addresses gas-fired boilers <100kW whereas Option (a) only addresses these boilers when they are >15 years old, and (ii) a relatively high proportion of non-domestic boilers is already subject to service visits.

In the domestic sector, Option (b) produces far more savings than Option (a) because it addresses gas-fired boilers <20kW which make-up up nearly half of all boilers in the UK. Therefore, although action is dependent on the uptake of the advice programme, the population of boilers where action is taken is far larger than the small number of boilers targeted by Option (a). The large savings produced by Option (b) in the domestic sector more than off-set the slightly lower savings produced by this option in the non-domestic sector making Option (b) the preferred approach overall.

Sensitivity analysis shows that the rate at which householders and boiler owners replace their boilers early following an Option (a) inspection would have to more than triple before it achieved the same carbon savings as that achieved through Option (b).

As discussed above, the information and advice programmes for the UK as summarised in section 4 builds upon the measures – i.e. the “alternative solutions” - taken to improve heating systems since 2003. It should be noted that the annual carbon savings produced by the “alternative solutions” in 2010 at 1.84 MtCO₂ are significantly greater than that produced by either Option (a) or (b). The “alternative solutions” consist of building regulation requirements to install condensing boilers in new dwellings and in existing ones where boilers are replaced, and the promotion of condensing boilers through EEC. As shown in Graphs 1 and 2 this has had a dramatic impact on the gas and oil-fired boiler markets. Together these two measures are more effective than either boiler inspection or an advice programme.

Nevertheless, they provide a firm basis on which to develop the information and advice programmes and, as has been shown, this programme will produce more carbon savings than an Option (a) inspection regime in the UK.

In conclusion it is asserted that with regard to implementation of Article 8 of the EPBD in the UK Option (b) is better than broadly equivalent to Option (a).

7 Future Plans

CLG is to make the energy efficiency requirements for buildings in England & Wales more demanding in the future. As has been shown in this equivalence report building regulations are a very effective vehicle to generate carbon savings, particularly when they are applied to existing buildings subject to building work. In respect of new dwellings, CLG has published a document⁵² which sets out what the energy performance requirements are likely to be. The proposed target carbon emissions (TER) required in 2010, 2013 and 2016 represent significant improvements with respect to the 2006 requirements, with the 2016 standard representing zero carbon. Revised building regulations in England & Wales from October 2010 raise the minimum allowable efficiency of new and replacement domestic boilers from SEDBUK 86% to 90% (band B to band A).

Compliant construction forms in 2010 will typically involve high efficiency condensing boilers (SEDBUK Band A) and the 2013 compliant construction forms will additionally offer the option of adopting lower carbon technologies such as heat pumps and micro-CHP. There are no proposals yet for the requirements for the replacement of boilers and heating systems in existing dwellings but these too are likely to be more demanding.

In Scotland, as indicated in paragraph 0, the 2007 revision to energy standards delivers further carbon dioxide savings in the region of 23-25% when compared to previous standards. Consideration is now being given to the next revision. Scottish Ministers appointed an Expert Panel to advise on a Low Carbon Buildings Standards Strategy for Scotland. Scottish Ministers were looking to the Panel to recommend challenging but realistic targets and to industry to develop skills and technologies to deliver improvements to buildings. The intention is to improve the construction of new buildings in Scotland, including housing, to meet the rigorous energy performance levels imposed in Scandinavia thereby significantly reducing energy use.

The report of the Panel, the Sullivan Report, was published in late 2007 recommending:

- significant percentage improvements in stages to reduce carbon dioxide emissions from buildings;
- a route map towards the goal of zero-carbon buildings;
- a wide range of energy efficiency and performance measures specific to buildings; and
- how measures to promote the use of low carbon equipment including microgeneration should progress in tandem with staged reductions of carbon dioxide emissions.

The measures adopted from the report will be progressed to include further requirements to improve boiler efficiencies.

CLG has produced a UK national annex to EN 15378 *Heating systems in buildings - Inspection of boilers and heating systems*, which is the CEN standard designed to assist Member States to implement Option (a). This annex is closely modelled on the boiler checklists and guidance produced by CLG and industry to

⁵² CLG. *Building Regulations: Energy efficiency requirements for new dwellings: A forward look at what standards may be in 2010 and 2013*, July 2007. Report can be found on the CLG website at:

provide advice on boilers and heating systems. As the checklists form part of industry recommended good practice guidelines, existing service visits partly meet the inspection requirements of Option (a).

CLG will review the impact of the boiler information and advice programme as part of its market surveys of the implementation of Home Information Packs (HIPs) and Article 7 Energy Performance Certificates (EPCs). When results become available they will be integrated into a later edition of the Article 8 equivalence report.

8 References

- (1) The Domestic Central Heating Market in Great Britain, Peter Crampton, Simon Whittome, Market Intelligence Centre, BSRIA, MR3/92, June 1992 (and source data/analysis).
- (2) European Space and Water Heating. Domestic Boilers, United Kingdom, BSRIA Report 14847/6. April 2000 (and source data/analysis).
- (3) DTI Digest of UK Energy Statistics.
- (4) Non-Domestic Building Energy Fact File, CH Pout, S A Moss, P J Davidson, BRE Report BR339, January 1998.
- (5) Commercial and Industrial Floorspace Statistics, England and Wales, 1990-1994, DOE, HMSO, London.
- (6) DTI Construction Statistics Annual 2003.
- (7) The UK Market for Commercial Boilers, Peter Crampton, Simon Whittome, BSRIA, MR 6/95, April 1995 (and source data/analysis).
- (8) Rules of Thumb, Guidelines for assessing building services, ed. Martin Boushear, BSRIA Technical Note, TN15/2001.

Appendix A – Boiler stock model

Overview

It is not practical or cost effective to carry out a comprehensive and statistically significant survey to establish the size and age structure of the boiler population in England & Wales. Even if such a survey were to be undertaken, information on the age of boilers would be likely to be incomplete or unreliable.

Values for the establishment (installed base) have been estimated and assumptions (based on observed behaviour) about rates of replacement used to reconcile these with historical sales figures. Projections for the establishment and boiler sales together with assumptions about the future pattern of replacement have been used to produce the figures presented.

In the case of gas and oil fired domestic boilers in residential premises a large part of this work has already been carried out as part of Defra's Market Transformation Programme (MTP)⁵³. The Boiler Energy Model contains detailed projections of the future stock of boilers by year of installation. This is based on reconciliation of overall establishment (boiler stock) figures from surveys with Trade Association data on boiler sales.

For other sectors, establishment estimates have been made using rules of thumb applied to floorspace/number of buildings statistics. Historical and projected boiler sales figures from 1991 to 2010 have been used (with adjustments to allow for replacement within 15 years) to predict numbers of boilers (and installations with at least one boiler) over 15 years old.

Detailed notes

Boiler stock figures for gas and oil fired boilers (under 44kW output), installed in dwellings are taken from the detailed analysis contained in the Boiler Energy Model produced as part of the Market Transformation Programme. This analysis also provides a projected age structure (breakdown of stock by year of installation). Further reference to source data on historical boiler sales by output has allowed gas and oil boilers in dwellings to be split between those above and below 20kW output (Note that a high proportion of recently installed gas fired boilers are combis with higher outputs). (Refs: 1,2)

Projected establishment figures for residential solid fuel boilers are based on survey data (House Condition Surveys, GfK Home Audit etc.) adjusted in line with observed/projected consumption of coal in the domestic sector. (Refs: 1,2,3)

Projected establishment figures for boilers installed in non-residential buildings are derived from a detailed analysis of floorspace by building use and size. BRE estimates of floorspace by sector in 1999 and 2000 have been used as a base and to relate rates of construction activity to changes in floorspace. Detailed analysis of commercial/service sector premises by size and penetration of central heating systems has

⁵³ For details see: <http://www.mtprog.com/>

been used to predict the floorspace heated by boiler systems. A rule of thumb relating boiler capacity to floor space (120W/m^2) has been used. This factor has been reduced for floorspace added (to 110W/m^2 for that added 1994 – 2006 and to 100W/m^2 for that added 2006 onward) and a factor applied for sanitary hot water needs (based on energy use analysis by sector).

Figures are derived for total boiler capacity by sector and energy use patterns/projections are applied to produce a further breakdown by fuel. Observations/assumptions about the relationship between installations by size and boiler capacity and number of boilers by rated output have been used to produce numbers of boilers.

Division of boilers by size produces values for: small non-domestic buildings – mainly single boiler installations with boilers of rated outputs less than 20kW or 20 to 44kW and “Normal” non-domestic buildings with boilers of rated outputs greater than 44kW (many installations have more than one boiler). Part of this analysis produces values for the number of installations with boiler capacity over 100 kW. (Refs: 3 - 8).

Estimates of numbers of boilers installed in large dwellings or to heat groups of dwellings are based on the assumption that these represent 5% of boilers with rated outputs of 44 to 100 kW and 0.5% of boilers with rated outputs over 100 kW. Estimates of numbers of installations with boilers over 15 years old are based on the assumption that the average installation consists of 1.1 boilers (i.e. there is limited standby capacity in residential applications).

Historical and projected sales of residential solid fuel boilers have been used (together with assumptions about replacement patterns) to arrive at estimates for remaining boilers that are at least 15 years old. (Refs: 1,2).


The age structure relationship for residential applications, derived from the Boiler Energy Model has been applied to boilers installed in small non-domestic buildings.

Historical and projected sales of commercial boilers (rated outputs over 44kW) have been used (together with assumptions about replacement patterns) to arrive at estimates for remaining boilers that are at least 15 years old. (Ref: 7 and discussions with manufacturers etc.)

Replacement patterns for boilers 44 – 100 kW (in the first 15 years) are derived from patterns for boilers of similar type (but lower output) used in the Boiler Energy Model. Boilers with rated outputs greater than 100 kW, have been assumed to be less likely to be replaced when under 15 years old. An exponential factor has been applied to the values for the remaining percentage of boilers by year of installation (the value used is 0.5, i.e. the square root).

This analysis includes the relationship between numbers of boilers and numbers of installations. In considering installations with boiler capacity greater than 100kW, an adjustment has been made to allow for the fact that not all of the boilers in a particular installation will be replaced together. The “equivalent installations” represented by boilers replaced at less than 15 years old has therefore been reduced by half.

Appendix B – Household checklist for gas-fired boilers


HM Government

Gas fired Home Heating Installations – energy efficiency checklist

This energy assessment is not a service or safety check. You should ensure your heating system is regularly maintained and inspected by a competent heating engineer to ensure its safety and efficiency.

This is part of an initiative to help homeowners cut their fuel bills and reduce their carbon emissions.

Section 1 – Installation information	
Customer Name	
Installation Address	
Customer Address (if different)	
Date of assessment	

Section 2 – Stored Hot Water Systems (if applicable)		
Are the water pipes connected to the cylinder insulated?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Does the hot water cylinder have spray foam insulation or a jacket with a thickness greater than 75mm?	Yes <input type="checkbox"/>	No <input type="checkbox"/>

Section 3 – Heating Controls	
Does the system incorporate time control?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Does the system have thermostatic radiator valves (TRV)?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Does the system have room thermostat(s) and boiler interlock ¹ ?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Does the hot water cylinder have a thermostat and boiler interlock ¹ ?	Yes <input type="checkbox"/> No <input type="checkbox"/>

¹ Boiler Interlock ensures the boiler and pump shuts down when heating and/or hot water are at the required temperature

Section 4 – Boiler			
Manufacturer		Approximate Age	
Model name/number			
The Energy Efficiency of your boiler			
<input type="checkbox"/> High efficiency (A-C rating) <input type="checkbox"/> D rated <input type="checkbox"/> E rated <input type="checkbox"/> F rated <input type="checkbox"/> High G rated <input type="checkbox"/> Low G rated			

Section 5 – Energy Efficiency Assessment
<p><i>A brief inspection of your heating system has been carried out in accordance with recommended industry good practice. Depending upon the outcome of this inspection there may be an opportunity for you to improve the energy efficiency of the system, thereby reducing emissions to the environment and at the same time reducing your fuel bills.</i></p> <p>In any of the following cases you are strongly advised to obtain a more thorough examination of your boiler and complete heating system by a competent heating engineer.</p> <ul style="list-style-type: none"> If any of the answers in Sections 2 and 3 are 'No', If the boiler is rated D or below If the boiler is more than 15 years old or if a complete examination of the design and condition of your heating system has not been carried out in the last 15 years.
Name of service engineer
Signature of service engineer