Communities and Local Government

Impact Assessment of Amendments to Building Regulations Part J – Combustion Appliances and Fuel Storage Systems

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Department for Communities and Local Government

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Final proposal stage Impact Assessment

Summary: Intervention & Options		
Department / Agency: Communities and Local Government	**Title:** Impact Assessment of Amendments to Building Regulations Part J – Combustion Appliances and Fuel Storage Systems	
Stage: Final proposal	**Version:** Draft 5	**Date:** 26 February 2010
Related Publications: Approved Document J – Combustion appliances and fuel storage systems (2002 edition)		

Available to view or download at:

www.communities.gov.uk/publications/planningandbuilding/partjconsultation

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What is the problem under consideration? Why is government intervention necessary?

Part J of the Building Regulations sets out requirements for, air supply; discharge of products of combustion; protection of buildings and the protection of liquid fuel storage systems. The current Approved Document, which gives guidance on how to satisfy Part J, dates from 2002.

The primary driver for reviewing Part J at this time is a need to take account of changes in air tightness standards for new homes which could have an impact on the safe operation of Combustion Appliances. The Government has also made commitments to review the guidance on Biomass Appliances and the provision of carbon monoxide (CO) alarms.

What are the policy objectives and the intended effects?

To ensure that improvements in air tightness intended to improve standards of energy efficiency do not result in increased health risks from combustion appliances.

To ensure that the guidance given in Approved Document J does not unreasonably discourage the use of Biomass appliances.

To ensure that the guidance given in Approved Document J is robust and appropriate for modern combustion appliances and reflects advances in technology and changes in construction practice.

What policy options have been considered? Please justify any preferred option.

1. Do nothing, status quo;
2. Amend Approved Document J to include clarifications only;
3. Option 2 plus additional requirements for CO alarms and air supply for combustion; and
4. Option 3 plus additional requirement to bund overground oil storage tanks.

Option 3 is the preferred policy option, as options 1 and 2 could result in an increased risk to public health and Option 4 is not cost effective.

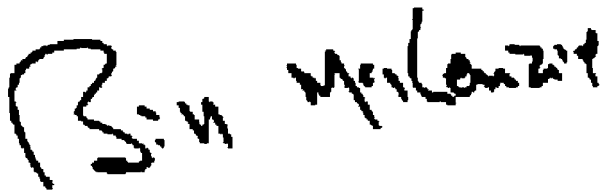
When will the policy be reviewed to establish the actual costs and benefits and the achievement of the desired effects?

The CLG will undertake an evaluation of the revised AD J and review this impact assessment three years after implementation.

Ministerial Sign-off For final proposal/implementation stage Impact Assessments:

I have read the Impact Assessment and I am satisfied that (a) it represents a fair and reasonable view of the expected costs, benefits and impact of the policy, and (b) the benefits justify the costs.

Signed by the responsible Minister:



Lord McKenzie of Luton
Parliamentary Under Secretary of State
Date:

Summary: Analysis & Evidence

Policy Option: 2	Description: **Amend Approved Document J to include clarifications and updates only**

COSTS

ANNUAL COSTS		Description and scale of **key monetised costs** by 'main affected groups'
One-off (Transition)	**Yrs**	This option should be essentially cost-neutral by design, except for minor transition costs for Building Control inspectors and solid fuel appliance installers.
£0.2 million	1	
Average Annual Cost (excluding one-off)		
£0		**Total Cost** (PV) **£0.2 million**

Other **key non-monetised costs** by 'main affected groups'

None identified

BENEFITS

ANNUAL BENEFITS		Description and scale of **key monetised benefits** by 'main affected groups'
One-off	**Yrs**	
£0	1	
Average Annual Benefit (excluding one-off)		
£0		**Total Benefit** (PV) **£0**

Other **key non-monetised benefits** by 'main affected groups'

Removing ambiguity should lead to very minor time savings, whilst reduced confusion in interpreting the guidance should lead to a reduction in the incidence of incorrectly installed appliances, which will have a small impact on the risk of an incident.

Key Assumptions/Sensitivities/Risks Failure to address the potential safety risks for combustion in homes with high standards of air tightness may result in increased risk of CO poisoning resulting in injuries and fatalities.

Price Base Year 2008	**Time Period Years** 10	**Net Benefit Range** (NPV) **£N/A**	**NET BENEFIT** (NPV Best estimate) **£–0.2 million**

What is the geographic coverage of the policy/option?			England & Wales	
On what date will the policy be implemented?			2010	
Which organisation(s) will enforce the policy?			CLG	
What is the total annual cost of enforcement for these organisations?			£ -	
Does enforcement comply with Hampton principles?			Yes	
Will implementation go beyond minimum EU requirements?			No	
What is the value of the proposed offsetting measure per year?			£ -	
What is the value of changes in greenhouse gas emissions?			£ -	
Will the proposal have a significant impact on competition?			No	
Annual cost (£-£) per organisation (excluding one-off)	Micro 0	Small 0	Medium 0	Large 0
Are any of these organisations exempt?	No	No	N/A	N/A

Impact on Admin Burdens Baseline (2005 Prices) (Increase – Decrease)

Increase of £0 Decrease of £0 **Net Impact £0**

Key:	**Annual costs and benefits: Constant Prices**	**(Net) Present Value**

Summary: Analysis & Evidence

Policy Option: 3	Description: **Amend AD J to include clarifications and some additional requirements (including carbon monoxide alarms and ventilation for combustion appliances)**

COSTS

ANNUAL COSTS		Description and scale of **key monetised costs** by 'main affected groups'
One-off (Transition)	**Yrs**	Small transition costs mainly for Building Control inspectors. Some significant ongoing costs, primarily incurred by households.
£0.2 million	1	Breakdown of Total Cost (PV): • CO alarms: £44.8 million • Ventilation: £15.9 million
Average Annual Cost (excluding one-off)		
£7.3 million		**Total Cost** (PV) **£60.6 million**

Other **key non-monetised costs** by 'main affected groups'

Environmental costs of extra CO_2 emissions resulting from the increased electricity generation and the cost of any public awareness marketing exercise for CO alarms.

BENEFITS

ANNUAL BENEFITS		Description and scale of **key monetised benefits** by 'main affected groups'
One-off	**Yrs**	Significant benefits accruing to society resulting from avoided deaths and injuries.
£0	1	Breakdown of Total Benefit (PV): • CO alarms: £135.5 million • Ventilation: £ – (non-monetised)
Average Annual Benefit (excluding one-off)		
£16.3 million		**Total Benefit** (PV) **£135.5 million**

Other **key non-monetised benefits** by 'main affected groups'

High number of deaths and injuries avoided by ensuring adequate ventilation in air-tight new build dwellings.

Key Assumptions/Sensitivities/Risks Please see Evidence Base.

Price Base Year 2008	**Time Period Years** 10	**Net Benefit Range** (NPV) **£16.9 million – £148.2 million**	**NET BENEFIT** (NPV Best estimate) **£74.9 million**

What is the geographic coverage of the policy/option?			England & Wales	
On what date will the policy be implemented?			2010	
Which organisation(s) will enforce the policy?			CLG	
What is the total annual cost of enforcement for these organisations?			£ -	
Does enforcement comply with Hampton principles?			Yes	
Will implementation go beyond minimum EU requirements?			No	
What is the value of the proposed offsetting measure per year?			£ -	
What is the value of changes in greenhouse gas emissions?			£ -	
Will the proposal have a significant impact on competition?			No	
Annual cost (£-£) per organisation (excluding one-off)	Micro 0	Small 0	Medium 0	Large 0
Are any of these organisations exempt?	No	No	N/A	N/A

Impact on Admin Burdens Baseline (2005 Prices) (Increase – Decrease)

Increase of £0 Decrease of £0 **Net Impact £0**

Key:	**Annual costs and benefits: Constant Prices**	**(Net) Present Value**

Summary: Analysis & Evidence

Policy Option: 4	Description: **Policy option 3 plus additional requirement to bund overground oil storage tanks**

COSTS

ANNUAL COSTS		Description and scale of **key monetised costs** by 'main affected groups'
One-off (Transition)	**Yrs**	Small transition costs mainly for Building Control inspectors. Some significant ongoing costs, primarily incurred by households.
£0.2 million	1	Breakdown of Total Cost (PV):
Average Annual Cost (excluding one-off)		• CO alarms: £44.8 million • Ventilation: £15.9 million • Oil tank bunding: £236.3 million
£35.7 million		**Total Cost** (PV) **£296.9 million**

Other **key non-monetised costs** by 'main affected groups'

Environmental costs of extra CO_2 emissions resulting from the increased electricity generation and the cost of any public awareness marketing exercise for CO alarms.

BENEFITS

ANNUAL BENEFITS		Description and scale of **key monetised benefits** by 'main affected groups'
One-off	**Yrs**	Significant benefits accruing to society resulting from avoided deaths, injuries and environmental pollution incidents.
£0	1	Breakdown of Total Benefit (PV):
Average Annual Benefit (excluding one-off)		• CO alarms: £135.5 million • Ventilation: £ – (non-monetised) • Oil tank bunding: £32.7 million
£20.2 million		**Total Benefit** (PV) **£168.3 million**

Other **key non-monetised benefits** by 'main affected groups'

The full avoided cost to environment and potential health implications of water and environmental contamination of domestic oil storage tanks bunding. High number of deaths and injuries avoided by adequate ventilation in air-tight new build dwellings.

Key Assumptions/Sensitivities/Risks Please see Evidence Base.

Price Base Year	**Time Period Years**	**Net Benefit Range** (NPV)	**NET BENEFIT** (NPV Best estimate)
2008	10	**£–256.3 million to £55.1 million**	**£–128.6 million**

What is the geographic coverage of the policy/option?			England & Wales	
On what date will the policy be implemented?			2010	
Which organisation(s) will enforce the policy?			CLG	
What is the total annual cost of enforcement for these organisations?			£ -	
Does enforcement comply with Hampton principles?			Yes	
Will implementation go beyond minimum EU requirements?			No	
What is the value of the proposed offsetting measure per year?			£ -	
What is the value of changes in greenhouse gas emissions?			£ -	
Will the proposal have a significant impact on competition?			No	
Annual cost (£-£) per organisation (excluding one-off)	Micro 0	Small 0	Medium 0	Large 0
Are any of these organisations exempt?	No	No	N/A	N/A

Impact on Admin Burdens Baseline (2005 Prices)		(Increase – Decrease)
Increase of £0	Decrease of £0	**Net Impact £0**

Key:	**Annual costs and benefits: Constant Prices**	**(Net) Present Value**

Evidence Base (for summary sheets)

Introduction

Communities and Local Government (CLG) is responsible for building regulations in England and Wales.

This is the Evidence Base to support the Impact Assessment for the proposed 2010 update of the technical guidance for combustion appliances and liquid fuel storage facilities in Approved Document J (AD J).

Background

Part J of the Building Regulations set out requirements for air supply; discharge of products of combustion; protection of buildings and the protection of liquid fuel storage systems. The current Approved Document, which gives guidance on how to satisfy Part J, dates from 2002.

The primary driver for reviewing Part J at this time is a need to take account of changes in air tightness standards for new homes which could have an impact on the safe operation of combustion appliances. The Government has also made commitments to review the guidance on biomass appliances and the provision of carbon monoxide alarms.

Stakeholder engagement

A Working Party was set up within the Building Regulations Advisory Committee (BRAC) to oversee this review. This Working Party set the agenda for the review, with reference to the regulations in place and likely issues to be addressed in the course of the review.

CLG sought to consult stakeholders at an early stage to be able to fully consider their opinions in the shaping of potential changes to the guidance. GASTEC at CRE Ltd. (GaC) were appointed to conduct the stakeholder consultation. Stakeholders were asked for their views on the operation of the current AD J guidance and also on the areas they felt required attention. The report, entitled *Review of Approved Document J – Backward and Forward Looks*, presents a summary of the views expressed and draws out the main themes.

Broadly, the majority of stakeholders agreed that the existing guidance is working well, the concepts are valid and the method of delivery is understandable. Other than some specific issues, significant changes were not considered necessary and could be viewed as unhelpful.

Some of the specific issues raised were:

- the risks associated with increased levels of air tightness for open flue combustion appliances
- inconsistent compliance with the provision of chimney notice plates
- problems associated with visible pluming from condensing boilers
- concern about pollution from oil storage tanks.

Changes since Consultation stage Impact Assessment

Based on the responses received from stakeholders in the consultation process, a number of changes have been made since the Consultation stage Impact Assessment. These changes are confined to the bunding requirement for overground domestic oil storage tanks proposal.[1] A summary of the consultation responses is available on the CLG website at www.communities.gov.uk.

Three main changes were made. Firstly, the calculation of the number of new tank sales has been simplified and is now based on OFTEC[2]'s estimate of tank sales, less the status quo bunding sales of 10 per cent. This results in a decrease in the incidence of tanks to be bunded under the requirement from the Consultation stage version. Secondly, the number of oil spillage incidents that may be avoided if the entire domestic oil storage tank stock were to be bunded has been increased, based on the estimate provided in the Environment Agency's response which includes an estimate of unreported incidents. Thirdly, the estimated costs of environmental damage and cleanup of oil spillages have also been changed based on the Environment Agency's consultation response to a more refined percentile-based sliding scale of costs based on the severity of the oil spillage. This has reduced the effective average environmental damage and cleanup cost of oil spillages from that in the Consultation stage version. However, given the magnitude of the total costs of the bunding proposal, the resultant reduction in total benefits had no material impact on the benefit-cost ratio result.

Policy options

Based on the positive stakeholder views of the existing technical guidance, a number of small proposed clarifications, and the possibility of some justified additional requirements, four policy options being considered:

1. Do nothing, status quo
2. Amend AD J to include clarifications only

[1] The 'One-off Cost (Transition)' sections of Option 2 and Option 3, and the carbon monoxide alarm cost-benefit analysis have also been updated to incorporate more recent figures on membership of and installations by members of the competent persons scheme, without any noteworthy change in outcome.

[2] OFTEC – Oil Firing Technical Association.

3. Option 2 plus additional requirements for carbon monoxide alarms and air supply for combustion appliances; and
4. Option 3 plus additional requirement to bund all overground oil storage tanks for domestic heating systems.

Option 3 is the preferred policy option, as Options 1 and 2 could result in increased risks to public health and Option 4 is not cost effective.

Detailed cost-benefit analyses of policy options

Option 1: Do nothing, status quo

Retain the existing AD J technical guidance document with no clarifications or additional requirements.

Overall costs and benefits of Option 1

Total Costs

Nil.

Total Benefits

Nil.

Key assumptions/sensitivities/risks

Failure to address the potential safety risks for combustion in homes with high standards of air tightness may result in increased risk of Carbon Monoxide poisoning resulting in injuries and fatalities.

Net Benefit of Option 1

This option is the status quo with no amendments proposed to the existing AD J, and is therefore cost- and benefit-neutral by definition. However, not taking action to address identified issues with the existing AD J and, more importantly, the strengthening of air permeability targets in another part of the Building Regulations, means that the 'Do nothing' option will have safety implications and risks.

If issues identified with the current AD J are not addressed, then the consequential burden on stakeholders and/or health and safety risk will perpetuate. More significantly, as the review of Part L proposes to strengthen the air permeability targets for new-build dwellings, failure to address the potential safety risks for combustion in homes with high standards of air permeability may result in increased risk of Carbon Monoxide poisoning resulting in injuries and fatalities.

Option 2: Amend AD J to include clarifications only

Retain existing AD J technical guidance, amended to clarify identified issues, and update references to current standards and reflect amendments made to other ADs.

Aside from enforced changes (update of references to current standards and changes to reflect amendments to other ADs), the objective under option 2 is to provide an update of the guidance in AD J by adding clarifications on the existing guidance only, and avoiding any non-negligible additional burden on stakeholders. In fact the burden may be reduced by clarifying ambiguity and reducing confusion.

Failure to address the potential safety risks for combustion in homes with high standards of air tightness may result in increased risk of Carbon Monoxide poisoning resulting in injuries and fatalities.

In Table 1 below, we present the key proposed amendments, their motivation and the expected impact.

Table 1: Amendments to AD J under Option 2

Subject	Motivation for amendment	Proposed amendment	Expected impact
Cut-off point (kW) for application to solid fuel appliances	Changed for consistency with new European standards.	Amendment from: *Rated output up to 50 kW* to: *Rated output up to 45 kW*	No significant impact. Minor amendment with no significant impact on costs or benefits, as the number of appliances rated in the 45kW to 50kW range is expected to be very small.
Definition of 'solid biofuel'	Solid biofuel was previously implicitly included in AD J as a solid fuel but not defined. With the clarification that solid biofuel is to be explicitly included under solid fuels, it must be defined.	Definition of solid biofuel is added for reference: *Solid biofuel is derived from plants and trees. It can include logs, wood chips, wood pellets and other processed plant material.*	No significant impact. Clarification (definition) with no significant impact on costs or benefits.

Table 1: Amendments to AD J under Option 2 *(continued)*			
Subject	**Motivation for amendment**	**Proposed amendment**	**Expected impact**
Solid biofuel as a solid fuel	Solid biofuel was implicitly included in AD J 2002 as a solid fuel but this may not have been readily apparent to some readers.	Clarification in the title of Section 2 that the provisions do include solid biofuel. Amendment from: *Additional provisions for appliances burning solid fuel with a rated output up to 50 kW* to: *Additional provisions for appliances burning solid fuel (including solid biofuel) with a rated output up to 45 kW* [the change from 50kW to 45kW is a separate amendment]	No significant impact. Clarification (making the previously implicit explicit) with no significant impact on costs or benefits.
Issues arising with condensing boilers	Modern domestic boilers are mainly of the condensing type with fanned flues. There are various nuisance issues that can arise, particularly with low level flues producing high velocity plumes in close proximity to adjacent properties. This results in noise and condensate issues.	An advisory paragraph on "Good neighbour issues" in the location of low-level flues has been included.	No impact. This is advisory only. May reduce complaints arising from inconsiderate location of flue outlets.
Flue outlet positions for solid fuel appliances (Diagram 17)	The original Diagram 17 (and Diagram 41) did not consider an adjacent pitched roof.	The requirement on flue positioning in proximity to adjacent building with pitched roofs is clarified (diagram and accompanying text).	No significant impact. Clarification with no significant impact on costs. Some instances of confusion and the resultant incorrect location of flues in respect of and adjacent pitched roof may be avoided, yielding minor benefits.

Overall costs and benefits of Option 2

Total Costs

One-off Cost (Transition)

Besides the small once-off cost of updating the text of the AD and publishing the revised AD J, it is likely that there will be some very minor adjustment costs in terms of familiarisation costs for Building Control Body inspectors and solid fuel appliance installers, as some clarifications relate to solid biofuel appliances. There are not likely to be any additional enforcement costs above the business-as-usual case.

A recent survey of Building Control Bodies undertaken by the CLG indicated that there were approximately 4,000 building inspectors in England and Wales.[3] It has been estimated that familiarisation costs for inspectors are approximately £35 per inspector,[4] yielding a building inspector familiarisation cost of £140,000.

For Competent Person Scheme registered installers, one hour of reading and familiarisation with the revised AD has been allowed per appliance installer, costed at the average hourly wage of a 'skilled construction and building trades' worker of £11.32.[5] The most recent Competent Persons Scheme statistics indicate that there were 1,301 HETAS-registered installers as at September 2009.[6] Therefore, the total registered installer familiarisation costs are estimated at approximately £15,000.

Combining the building inspector and registered installer familiarisation costs gives a total administrative transition cost of **£155,000**.

Average Annual Cost (excluding one-off)

None identified.

Key non-monetised Costs

None identified.

[3] Building Control Alliance (2008) Survey of Building Control Bodies, for Department for Communities and Local Government, www.communities.gov.uk/documents/planningandbuilding/pdf/surveybuildcontrol1.pdf

[4] This has been calculated as one quarter of the familiarisation costs of £140 used for familiarisation costs with AD G in Department for Communities and Local Government (2009) Hot Water Safety – Impact Assessment of a revision to Approved Document G to the Building Regulations 2000 (England and Wales).

[5] Office for National Statistics (2009) Annual Survey of Hours and Earnings (ASHE), Gross hourly wage of 'Skilled construction and building trades' in the UK in 2008.

[6] Department for Communities and Local Government (2007) Competent Persons Scheme: Statistical Information – April 2009 to September 2009, www.communities.gov.uk/planningandbuilding/buildingregulations/competentpersonsschemes/cpsstatsinfo

Total Benefits

One-off Benefit
None identified.

Average Annual Benefit (excluding one-off)
Please see 'key non-monetised benefits' below.

Key non-monetised Benefits
Once implemented, the clarifications (such as the flue outlet position diagram clarification) should remove ambiguity and reduce confusion in the interpretation of the guidance. Removing ambiguity should lead to minor time savings in the inspection process, whilst reduced confusion should lead to a reduction in the incidence of incorrectly installed appliances, which will have a small impact on the risk of an incident.

Key assumptions/sensitivities/risks

Failure to address the potential safety risks for combustion in homes with high standards of air tightness may result in increased risk of Carbon Monoxide poisoning resulting in injuries and fatalities.

Net Cost of Option 2

This option should be essentially cost-neutral by design. Besides very minor adjustment costs, the clarifications should impose no new requirements, nor lead to any significant additional burden on stakeholders. Such costs may be offset, and possibly outweighed, by benefits arising from the reduced incident risk associated with reducing confusion that can result in unsafe installations. Therefore, this option could yield a positive net benefit, but the impact is estimated as a **net cost** of **£0.2 million**.

Option 3: Amend AD J to include clarifications and some additional requirements

As Option 2 (retain existing AD J technical guidance, providing clarifications in the text where required), with additional amendments to include new requirements to update AD J to deal with technical developments and health & safety issues identified since 2006.

Besides elements of the guidance that would benefit from clarification, stakeholders also suggested that AD J would benefit from the incorporation of a small number of additions that were not dealt with appropriately, if at all, in the existing guidance. These additions arise primarily from technical developments (e.g. the growth in use and potential of solid biofuel) and health and safety issues (e.g. risk of carbon monoxide poisoning). Amendments to other ADs also have knock-on implications

that give rise to the need to make additional provisions for combustion appliances in AD J (e.g. ventilation requirements in view of increasing air-permeability standards of modern homes).

Table 2: Amendments to AD J under Option 3

Subject	Motivation for amendment	Proposed amendment	Expected impact
Carbon Monoxide alarms	Solid fuel appliances are responsible for a disproportionate number of carbon monoxide deaths and injuries compared to other combustion appliances. The fitting of CO alarms would potentially save lives and prevent injuries. CO alarms conforming to BS EN 50291:2001 Section 6 with lifetime batteries are reliable, easy to fit and low cost.	Introduction of a new recommendation to fit carbon monoxide (CO) alarms as part of the installation of solid fuel combustion appliances.	Amendment with costs and benefits to be assessed in detail.
Ventilation and air-permeability (Solid fuel appliances)	Buildings are driven to be increasingly airtight by Part L. The existing provisions assumed a level of adventitious (uncontrolled) ventilation that may no longer be valid.	Dedicated ventilation openings are required for all solid fuel appliances in air properties with air permeability <5.0 $m^3/hr/m^2$ at 50 Pa.	Amendment with potential costs and benefits to be assessed.
Ventilation and air-permeability (DFE appliances)	Buildings are driven to be increasingly airtight by Part L. The existing provisions assumed a level of adventitious (uncontrolled) ventilation that may no longer be valid.	Dedicated ventilation openings are required for all DFE appliances in buildings with design air permeability <5.0 $m^3/hr/m^2$.	Amendment with potential costs and benefits to be assessed.
Ventilation and air-permeability (open flue appliances)	Buildings are driven to be increasingly airtight by Part L. The existing provisions assumed a level of adventitious (uncontrolled) ventilation that may no longer be valid.	Dedicated ventilation openings are required for all open flue combustion appliances. The proposal is to require permanent ventilation openings based on the ratios in Diagram 32, starting at 0 kW where the design air permeability is <5.0 $m^3/hr/m^2$.	Amendment with potential costs and benefits to be assessed.

Table 2: Amendments to AD J under Option 3 *(continued)*			
Subject	**Motivation for amendment**	**Proposed amendment**	**Expected impact**
Ventilation and air-permeability (flueless appliances)	Buildings are driven to be increasingly airtight by Part L. The existing provisions assumed a level of adventitious (uncontrolled) ventilation that may no longer be valid.	Dedicated ventilation openings are required for all flueless combustion appliances. The proposal is to require permanent ventilation openings based on the ratios in Diagram 33, starting at 0 kW where the design air permeability is <5.0 $m^3/hr/m^2$.	Amendment with potential costs and benefits to be assessed.
Incorporate concealed flue guidance	Modern fanned draught boilers are often suitable for installation on internal walls with a significant length of horizontal flue leading to the external wall. Where the chimney is boxed-in or run through a ceiling void it may be difficult or impossible to inspect for integrity, leakage or corrosion and carry out safety checks (e.g. as required Regulation 26 (9) of the Gas Safety (Installation and Use) Regulations 1998) unless suitable provision is made for access into the void. Although the major use of concealed flues is current for gas appliances similar concerns apply to all fuels.	Addition of guidance on the provision for inspection of concealed flues based on gas industry practice (CORGI (now Gas Safe) Technical Bulletin TB200. Guidance added to section "Provisions which apply generally to combustion installations".	Amendment with potential costs and benefits to be considered.

Table 2: Amendments to AD J under Option 3 *(continued)*

Subject	Motivation for amendment	Proposed amendment	Expected impact
Relaxation of flue requirements for solid biofuel	Solid biofuel appliances produce less ash and soot than coal appliances so flue blockage is less of an issue. The flue need only be sized to produce a satisfactory draught and safe removal of the products of combustion. Full size flues need to be retained for open fires as there is less control over what might be burned.	Addition of new flue diameter requirements (a relaxation of previously applicable solid fuel requirements) for solid biofuel appliances: *Pellet burner or pellet boiler complying with the Clean Air Act:* *Flues of 100 mm to 125 mm diameter will be permitted for solid biofuel boilers if permitted by the appliance manufacturer and supported by calculation.*	Amendment with potential costs and benefits to be considered.
Relaxation of clearance requirements for solid biofuel	Some biofuel products are designed as direct alternatives to oil and gas fired boilers that do not require additional wall protection.	Addition of new clearance requirements (a relaxation of previously applicable solid fuel requirements) for biofuel appliances conforming to BS EN 15270:2007 and similar standards that limit surface temperatures to 85C. Requirement to be as Diagram 39 (i.e. same as gas appliances).	Amendment with potential costs and benefits to be considered.

In the subsequent pages, the impact of each of these amendments is considered in detail.

Carbon Monoxide alarms

Background

Carbon monoxide (CO) is a gas produced by incomplete combustion. It is colourless, odourless and tasteless. The effect of CO on people is to reduce the ability of the blood to carry oxygen. Concentrations less than 100 parts per million can lead to mild poisoning, with symptoms including headaches and dizziness. Coma, collapse and death are the result from COHb (Carboxyhemoglobin) levels of 60-70 per cent in healthy adults.

In a properly functioning appliance the products of combustion, including CO, are discharged through the chimney and diluted in the atmosphere to non-hazardous levels. A build-up of CO in the heated space can occur due to a number of reasons: the appliance being faulty, misused, poorly installed or maintained; the flue being blocked and/or leaky; or inadequate ventilation in the room space.

Though there is no central co-ordinated system for recording incidents, it is estimated that more than 50 people are killed and 200 injured from accidental carbon monoxide poisoning in the UK every year (all fuels and locations).[7] Domestic carbon monoxide alarms could reduce the number of deaths and injuries in homes by providing an audible warning to occupants that the level of the gas is above safe levels, allowing for safe evacuation.

Proposal

It is proposed that AD J is amended to include a new provision that a CO alarm with audible alarm conforming to BS EN 50291:2001, powered by non-removable lifetime batteries, be installed alongside all new installations of any variety of solid fuel combustion appliances.

Why a battery-powered rather than a mains-powered alarm?

Two options were considered for the specification of the CO alarm unit: a hard-wired, mains-powered unit with battery backup; and a standalone, sealed long-life battery-powered unit.

The **hard-wired** option, as required for smoke alarms in new homes built since 1992, has the primary advantage of security of power supply – meaning that continued detection coverage does not rely on battery replacement by the householder. A hard-wired device is also more difficult to deactivate than a regular battery-powered device. Experience with battery-powered smoke alarms has shown that in many cases users have either removed the battery or forgotten to replace it.

[7] NHS Choices, www.nhs.uk/conditions/carbon-monoxide-poisoning/Pages/Introduction.aspx

Hard-wired alarms have their shortcomings too. They are not invulnerable to deactivation, as devices installed on a separate fuse consumer unit can be switched off if the householder is frustrated with nuisance activations. The hard-wired option is also significantly more costly than the battery-powered option, owing primarily to installation costs. The involvement of an additional trade (electrician) to wire the unit in, and to break into the existing circuit in the case of a retrofit to an existing dwelling, leads to installation costs estimated to be in the region of £11.31 for new build (0.5 hours' labour at £12.62 per hour plus materials at £5) and £45.24 for existing properties (2 hours' labour at £12.62 per hour plus materials at £20)[8]. The devices themselves also tend to be more expensive than battery-powered devices.

Electrochemical cell type sensors in CO alarms have a lifetime of approximately 6 years[9], after which time the unit should be replaced, this is not something that can be required by Building Regulations. This is a key distinction from the smoke alarm case, as smoke alarm sensors tend to have a longer lifetime of 10 years or longer. Householders could be discouraged by the replacement cost of a mains powered CO alarm as it requires disconnecting and reconnecting mains supply, and may again require an electrician. Perhaps most importantly, there is the risk that the 'security of power supply' feature may lead householders to believe they are still protected even though the sensor has passed its working life.

On the other hand, **battery-powered** CO alarms conforming to BS EN 50291:2001 with 'sealed for life' batteries are reliable, low-cost and easy to install and equally simple to replace. Sealed long-life battery-powered devices can be as reliable as hard-wired ones for the lifetime of the unit and should be less prone to their batteries being removed for use in other devices.

On the basis of the above reasoning, it was decided that the specification of a battery-powered CO alarm would minimise the cost without reducing the benefits and maximise the benefit-cost ratio of the proposed requirement.

Why limit the requirement to solid fuel appliances only?

The decision to limit the requirement to new installations of solid fuel appliances was based on the findings of an initial pre-impact assessment cost benefit research conducted by GASTEC at CRE (GaC), published separately.[10]

[8] Hourly wage rates for electricians sourced from: Office for National Statistics (2009) Annual Survey of Hours and Earnings (ASHE), Gross hourly wage of 'Skilled metal and electrical trades' in the UK in 2008. Industry sources indicate that the retrofit installation costs could be much higher, in the range £90-£150.

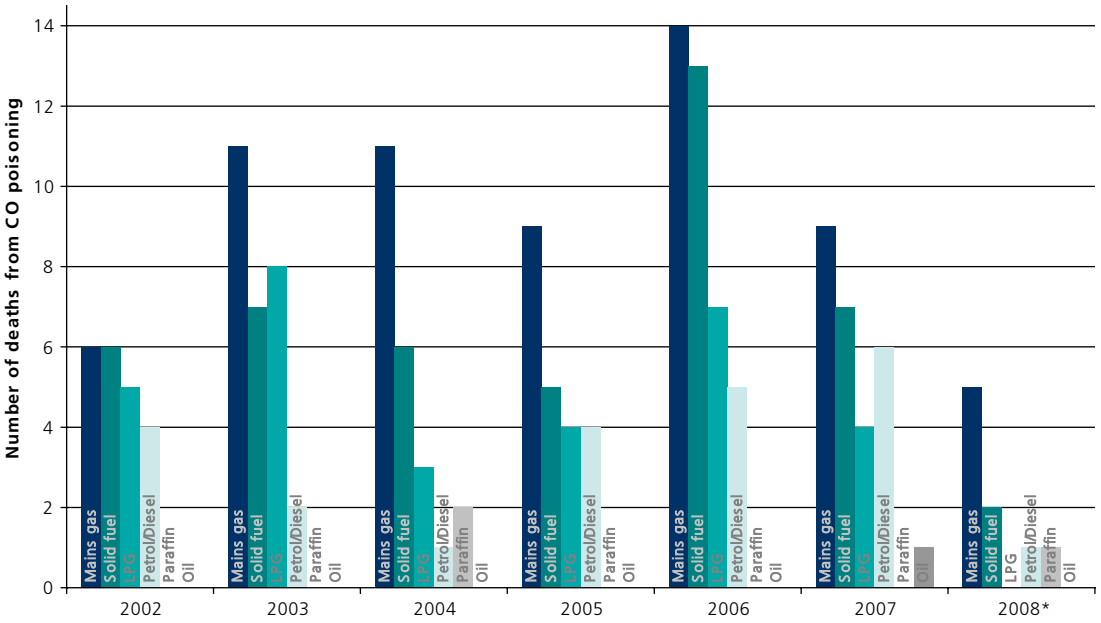
[9] Though replacement of the sensor is possible for some models, the experience of smoke alarm battery replacements suggests that this is unlikely to occur in many instances.

[10] GASTEC at CRE (2009) *Study on the provision of carbon monoxide alarms under the building regulations.*

This study conducted a static cost-benefit analysis of each fuel type, finding that a mandatory CO alarm was only cost-effective for solid fuel appliances.[11] Their recommendation to CLG was that "… a CO alarm be installed with the installation of every new combustion appliance except where gas and LPG appliances conform to the European Gas Appliance Directive or where a pressure jet oil appliance is installed."[12]

The explanation for this result is that **solid fuel appliances** are responsible for a disproportionate number of CO deaths and injuries compared to other combustion appliances. The chart below (Fig 1) shows the number of deaths and injuries resulting from CO poisoning by fuel type in any situation ('unknown' cases are excluded).

Figure 1: Number of deaths from CO poisoning in any situation, 2002-2008*



* 2008 only includes data for January through August.

Source: London Economics' analysis of Carbon Monoxide and Gas Safety Society data.

With the highest number of deaths every year (14 in 2006), it may seem that **mains gas appliances** are the most dangerous of all domestic combustion appliances. However gas is the most popular combustion fuel for homes with approximately 20 million households using gas for domestic heating, cooking and hot water provision[13], whereas approximately 1.25 million homes use solid fuel.[14] Whilst the absolute number of deaths caused by gas is indeed higher than for solid fuels, the number of incidents per household (Fig 2) using solid fuels is much greater than for gas.

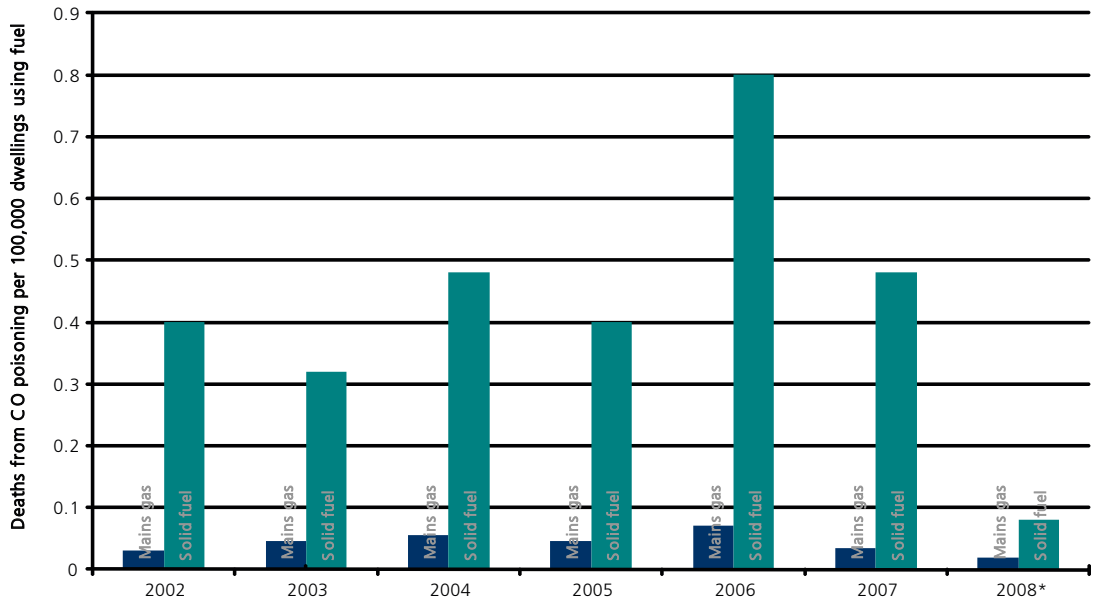
[11] The GaC report also considers the cases of boats and caravans, though these are not included here as they are not covered by The Building Regulations.

[12] GASTEC at CRE (2009), p. Executive Summary.

[13] Gas Safe (2009) *Gas Safety in the Home*, available from: www.gassaferegister.co.uk/advice/gas_safety_in_the_home.aspx

[14] BRAC Part J Working Party advisor, personal communication.

Figure 2: Number of deaths from CO poisoning from mains gas and solid fuel per 100,000 dwellings using the relevant fuel, 2002-2008*



* 2008 only includes data for January through August.

Source: London Economics' analysis of Carbon Monoxide and Gas Safety Society data.

The low incident rate of gas appliances is due in large part to the increased safety specification of modern gas appliances. Since the introduction of the Gas Appliances Directive (GAD – European Council Directive, 90/396/EEC)[15] in 1996, the vast majority of new gas appliances are either room sealed (i.e. products of combustion cannot enter the living space) or already have an on-board safety system monitoring air quality.

Furthermore, evidence from the Gas Appliance Check Project in 2006[16] suggests that older appliances tend to have higher CO emissions, and present a higher risk of causing CO poisoning, than newer ones. Therefore, it is likely that a disproportionately large number of the recorded gas-related incidents are caused by older appliances.

The combination of these factors resulted in the option of requiring new gas appliances to be accompanied by a CO alarm an "extremely low" benefit-cost ratio.[17]

The rationale for not requiring a CO alarm for **oil fired appliances** is that they have an excellent safety record with no deaths attributed in most years. Furthermore, the nature of the pressure jet burners used in modern boilers is such that they are "extremely unlikely to malfunction in such a fashion as to produce excessive quantities of CO without alerting the householder."[18]

[15] The Gas Appliances (Safety) Regulations 1995 (S.I. 1995/1629 – the Regulations) implement the Directive 93/396/EEC as amended by Council Directive 93/68/EEC to include requirements for CE Marking.

[16] Croxford, B. (2006) *Gas Appliance Check Project*, Bartlett School of Graduate Studies, University College London.

[17] GASTEC at CRE (2009), p. Executive Summary.

[18] GASTEC at CRE (2009), p. 13.

Cost-benefit analysis of CO alarms

In this section, we consider the costs and benefits of requiring a mandatory battery-powered CO alarm conforming to BS EN 50291:2001 Section 6 with lifetime batteries, be installed in properties receiving a new installation of any variety of solid fuel combustion appliance.

This analysis draws on initial research on costs and benefits conducted by GaC in the option development stage.[19] However, we refine and expand their static cost-benefit analysis to take the present value of costs and benefits over ten years, as required for impact assessments.

Costs

One-off Cost (Transition)

The initial transition cost of the introduction of the CO alarm requirement is likely to be small, as there are no significant adjustments required. The only immediate impact will be the familiarisation costs for local authority Building Control inspectors, private sector Approved Inspectors and the HETAS-registered solid fuel appliance installers. There are not likely to be any additional enforcement costs above the business-as-usual case.

As explained under Option 2, a recent survey of Building Control Bodies undertaken by the CLG indicated that there were approximately 4,000 building inspectors in England and Wales.[20] It has again been estimated that familiarisation costs for inspectors are approximately £35 per inspector,[21] yielding a building inspector familiarisation cost of £140,000.

For HETAS-registered installers, one hour of reading and familiarisation with the requirement and the specified device has been allowed per appliance installer, costed at the average hourly wage of a 'skilled construction and building trades' worker of £11.32.[22] The most recent Competent Persons Scheme statistics indicate that there were 1,301 HETAS-registered installers as at September 2009.[23] Therefore, the total registered installer familiarisation costs are estimated at approximately £15,000.

[19] GASTEC at CRE (2009) Study on the provision of carbon monoxide alarms under the building regulations.

[20] Building Control Alliance (2008) Survey of Building Control Bodies, for Department for Communities and Local Government, www.communities.gov.uk/documents/planningandbuilding/pdf/surveybuildcontrol1.pdf

[21] This has been calculated as one quarter of the familiarisation costs of £140 used for familiarisation costs with AD G in Department for Communities and Local Government (2009) Hot Water Safety – Impact Assessment of a revision to Approved Document G to the Building Regulations 2000 (England and Wales).

[22] Office for National Statistics (2009) Annual Survey of Hours and Earnings (ASHE), Gros hourly wage of 'Skilled construction and building trades' in the UK in 2008.

[23] Department for Communities and Local Government (2007) Competent Persons Scheme: Statistical Information – April 2009 to September 2009, www.communities.gov.uk/planningandbuilding/buildingregulations/competentpersonsschemes/cpsstatsinfo

As it is not mandatory by law to have a solid fuel appliance installed by a HETAS-registered installer, some public awareness marketing may also need to be undertaken to ensure that non-HETAS registered installers and the general public are aware of the requirement, but this has not been included in the costing.

Combining the building inspector and registered installer familiarisation costs gives a total administrative transition cost of **£155,000**, as in Option 2.

Average annual costs

The main ongoing cost of the amendment is the additional cost of a CO alarm that it imposes on households installing solid fuel appliances. Given the specification of the CO alarm, the calculation of the costs relies on only three key inputs for England and Wales:

- the purchase price of the alarm unit
- the lifetime of the alarm unit; and
- the number of alarm units installed under the requirement annually.

No costs have been included for installation, as the installation of the specified battery-powered unit comprises only the removal of the battery isolation tab and attachment of the device to the ceiling or wall using either screws or 'push-to-attach' double-sided glue pads. The unit does need to be replaced at the end of the unit lifetime. However, as this cannot be required by building regulations, neither the costs nor benefits have been included for replacement alarms.

In regard to the **purchase price of the alarm unit**, two product offerings currently on the market have been identified that conform to BS EN 50291:2001. Although a market share-weighted average price would be desirable, the unweighted average cost of these two alarms (**£23.62**) has been used, as it is not possible to predict the market shares in a 'sealed for life battery' BSEN 50291:2001-only market that could be created by the requirement.

The average **lifetime of the alarm units** identified has been used (**6 years**), with the two models reviewed having lifetimes of six and six and a half years.

The lifetime of the alarm units and the benefit of the coverage provided in this period is an important consideration is determining the value for money of the proposed requirement. It may be claimed that if a CO alarm unit is installed alongside a new solid fuel appliance and if death- and injury-causing appliance faults are more likely outside of the first six years of the life of the appliance when it is ageing (i.e. after the lifetime of the alarm unit), then the benefit of the alarm may be low. However, on the other hand, the experts on the BRAC advisory working party took the view that whilst ageing was an issue, a significant proportion of incidents related to poor

installation and these problems would manifest themselves early in the working life of an appliance. We have adopted the latter position, with CO alarms providing equal benefits of avoided deaths and injuries each year of the unit's life. Nonetheless, the caveat should be noted that no evidence is available on the impact of ageing on the risk of CO poisoning from appliances.

The **number of alarm units installed under the requirement annually** is more difficult to determine and must be estimated. The requirement for a CO alarm to be installed is triggered by the new installation of a solid fuel appliance. We assume that each appliance sold in the ten year period is installed in a different dwelling.

Data on solid fuel appliance sales is poor (and available data sources often give conflicting figures). Nonetheless, we review the range of data sources for solid fuel appliances below, and determine a reasonable estimate for annual sales of solid fuel appliances over the next ten years.[24]

The statistical information available from the CLG in relation to the Competent Persons Scheme indicates that in the period April 2009 to September 2009, HETAS-registered installers installed 21,127 appliances, equivalent to 42,254 for the year.[25] The number of appliances installed by HETAS-registered installers is likely to represent a lower-bound for the annual number of appliance sales, as it is not mandatory to have a solid fuel appliance installed by a registered installer.[26]

HETAS estimate that they install approximately between one in three and one in four solid fuel appliances, and that the market is on a growth curve. Therefore, if HETAS installed 42,254 appliances in 2009, then the total number of solid fuel appliances installed may be estimated at approximately **145,000**.

It is also considered that the market for solid fuel appliances is growing at a fast rate. In the year 2006/07 and 2007/08, the market reported year-on-year growth of 30 per cent. For the impact assessment, we restrict the annual growth to 10 per cent to adjust for an optimism bias, and to account for uncertainty into the medium to long term future.

[24] We also reviewed the Office for National Statistics data on product sales and international trade for its submission to the European Commission's PRODCOM database. The PRA29720 classification related to non-electric domestic appliances, with two product classifications relating to solid fuel appliances. When added, the total UK net supply of solid fuel appliances is calculated as 3,125,744 in 2005, 3,341,358 in 2006 and 8,443,621 in 2007. However, the ONS/PRODCOM data is likely to overestimate the number of appliances significantly owing to the definition of the product categorisations (e.g. grates and braziers are included).

[25] Department for Communities and Local Government (2007) Competent Persons Scheme: Statistical Information – April 2009 to September 2009, www.communities.gov.uk/planningandbuilding/buildingregulations/competentpersonsschemes/cpsstatsinfo

[26] Source: HETAS.

However, not every appliance installed will require a CO alarm to be installed. An estimated 24 per cent of UK dwellings are already equipped with CO alarms, expected to rise to 30 per cent over the next few years in the business-as-usual scenario (presuming no amendment to AD J), of which approximately 40per cent are believed to be of the 'sealed for life battery' variety specified in the proposed requirement.[27] Sold fuel appliance installations in such dwellings will not require a new CO alarm, so the number of alarms required is accordingly lower (by 9.6 per cent in year one rising to 12.0 per cent in year ten) than appliance installations.

The costs of the CO alarm requirement are summarised below:

Initial cost (one-off) of CO alarm requirement	**£0.2 million**
Average annual cost of CO alarm requirement (2008 prices)	**£5.4 million**
PV(Total Cost of CO alarm requirement)	**£44.8 million**

The Present Value (PV) of the cost is taken in order to discount the costs occurring over time to back to base year prices (2008 in this case), to allow comparison of options with costs that occur over time. The same is done with benefits below. A ten year period and a discount rate of 3.5 per cent (as recommended in HM Treasury's *Green Book*) have been used.

Additional costs not monetised

- The environmental costs of extra CO_2 emissions resulting from the increased electricity generation required for alarm unit and battery production.

Benefits

Initial benefit (once-off)

No initial one-off benefit has been identified.

Average annual benefits

It is hoped that the mandatory installation of CO alarms will reduce the level of deaths and injuries (both minor and serious) due to accidental CO poisonings from solid fuel appliances in England and Wales.

It is important to note, as reflected in the methodology, that the benefits realised will relate to those dwellings that installed a CO alarm under the requirement only, and not all dwellings. The estimation of expected benefits draws on five input figures:

- the likely long-term number of deaths and injuries (minor and serious) due to accidental poisoning by CO arising from solid fuel combustion appliances in a domestic setting

[27] Estimates provided by the Council for Gas Detection and Environmental Monitoring (CoGDEM). The 24% figure is supported by surveys conducted on behalf of the Carbon Monoxide Consumer Awareness Alliance (COCAA).

- the expected effectiveness of CO alarms in preventing death or injury in a dwelling
- the values of avoiding death and injury (minor and serious)
- the cumulative total number of alarm units installed under the requirement in each year; and
- the number of dwellings using a solid fuel appliance in the dwelling stock.

The likely long-term number of deaths and injuries (minor and serious) due to accidental poisoning by CO arising from solid fuel combustion appliances in a domestic setting in England and Wales has been estimated as the expected long-term rate of such incidents, based on a review of available data sources.

Data is collected by a number of bodies but such sources are likely to only give a partial view of the full picture. GaC were tasked with examining and reconciling the various data sources, so we mirror their findings.

- The NHS indicate that in the UK, more than 50 people die from accidental carbon monoxide poisoning every year, and 200 people are seriously injured.[28] No breakdown of these numbers by fuel type or location is possible.
- The Office for National Statistics publishes data on the number of deaths occurring due to the toxic effect of CO. In 2007, there were 251 deaths due to CO poisoning in all buildings in England and Wales, 79 of which were unintentional, and 35 of which occurred due to exposure to gases and vapours in the home, from all fuel types.[29] Again, no breakdown of these numbers by fuel type is possible.
- The Carbon Monoxide and Gas Safety Society publish data on deaths caused by accidental CO poisoning, compiled from news items and coroners' reports. Of the 28 deaths from CO in buildings in 2007, 6 deaths occurred from accidental CO poisoning from a solid fuel appliance in a house, flat or bungalow.
- Data published by the Solid Fuel Association shows that in 2006-07, there were 8 incidents arising from CO from solid fuel appliances leading to 4 deaths and 8 injuries. Historical data shows that the number of deaths has stabilised in the 4-8 range since 2001/02, from a high of 20 deaths in 1997/98. The average rate of deaths per year since 2001/02 is 5.5 deaths.

[28] NHS Choices, www.nhs.uk/conditions/carbon-monoxide-poisoning/Pages/Introduction.aspx

[29] Office for National Statistics (2008) Mortality Statistics: Deaths Registered in 2007, Review of the National Statistician on Deaths in England and Wales, 2007. Also, a private communication to GaC from the ONS.

Of the available sources reviewed, the ONS data is believed to be the most comprehensive, but does not allow a breakdown of deaths by fuel type. The Solid Fuel Association estimates are the lowest, but are believed to focus on incident investigations where faulty appliance and installations are at fault, rather than accidents. The CO-Gas Safety Society is the only source of accidental deaths by fuel type, but is not comprehensive in its coverage. It has therefore been decided to use the CO-Gas Safety Society (28 deaths) domestic solid fuel death rate of 6 deaths in 2007, grossed up to match the ONS aggregate death rate (35 deaths), which provides and estimate of 7.5 deaths for year one, rounded *down* to **7 deaths** to follow a conservative approach to ensure that the death-avoidance benefit is not overstated. However, the number of households using solid fuel (including solid biofuel) is forecast to increase over the ten year period. Therefore the number of deaths expected (without the requirement) in each year increases proportionately in line with increasing solid fuel use, adjusted down to account for the expected increase in CO alarm coverage, to give the **likely long-term death rate**. It is these deaths that the installation of CO alarms is hoped to reduce.

The **likely long-term minor and serious injury rates** have been estimated in the ratio of 15 injuries to each death. This ratio is based on the Health Service Executive's Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) death and injury figures from 2003/04 to 2007/08,[30] with the average value of the ratio of injuries to deaths over this five-year period used. Though related to gas-related incidents in the workplace, the RIDDOR is a reliable data source that gives an indication of the relationship between the level of deaths and injuries from CO poisoning incidents. Furthermore, as few victims tend to survive serious CO poisoning, it has been assumed that 20 per cent of injuries are serious and the remaining 80 per cent of these injuries are minor.

The **values of avoiding death and injury (minor and serious)** are estimated using the Department for Transport (DfT) valuation of the prevention of road accident casualties. For the purpose of cost-benefit analysis, the DfT has estimated the value to society of the benefits that would be obtained by preventing death and injury (both minor and serious) from road accidents. The values include cost of lost output due to injury or death, the healthcare costs (ambulance and hospital treatment) and the human costs (e.g. pain, grief and suffering), based on willingness-to-pay.

[30] Health and Safety Executive, Table GS1: Incidents relating to the supply and use of flammable gas (a) 2003/04 – 2007/08p, www.hse.gov.uk/statistics/tables/gs1.htm

The most recent valuation figures available from DfT are valued at June 2007 prices,[31] so these have been uprated to June 2008 prices (reference price year of the impact assessment) using the uprating factor as specified by the DfT in *Department Highways Economics Note No. 1:*[32] This gives the following prices:

- Value of a life £1,723,657
- Value of a serious injury £193,677
- Value of a minor injury £14,932

The **expected effectiveness of CO alarms in preventing death or injury in a dwelling** is taken to be 75 per cent for the cost benefit analysis, as a conservative value based on expert opinion as no evidence is available. This rate is the proportion of the likely long term incidents (death and injury) rates that would be expected to be avoided by the presence of a CO alarm. Whilst factory quality and safety testing of alarm units should ensure a very low fault rate of the unit itself,[33] a rate of 75 per cent is used rather than 100 per cent to reflect other factors that may lead to incidents occurring, including incorrect location of the alarm in the home and potential non-alarm for incidents arising distant from the location of a working alarm (e.g. leaking flues, fume re-entry from same or adjacent dwelling).

The **number of dwellings using a solid fuel appliance in the dwelling stock** is important as it is this population that the likely long-term number of deaths and injuries from CO poisoning incidents from solid fuels, absent the new requirement, is spread over. It is necessary to calculate the risk of death and injury *per dwelling using solid fuel*. However, it is difficult to estimate for a number of reasons.

Firstly, most houses built prior to the modern era were built with fireplaces as standard, but many are no longer functional for solid fuel use, having been 'bricked-up', fallen into disuse, or changed for gas or decorative fuel effect (DFE) fire use. Secondly, at the same time, anecdotal evidence indicates that "many people are now deciding to return to 'traditional values' and opening up their fireplaces."[34] Thirdly, as with annual sales, the data in relation to the number of solid fuel appliances in the existing dwelling stock is very limited. Most available data is based on surveys focusing on primary usage for central heating, rather than on the capacity for use. However, it is the capacity for use that is relevant for safety purposes – a disused flue is more likely to become blocked and pose a greater risk if the associated appliance is used only intermittently.

[31] Department for Transport (2008) Valuation of road accidents and casualties: 2007, available at: www.dft.gov.uk/excel/173025/221412/221549/227755/2856721/article2costdatatables.xls

[32] Department for Transport (2007) Highways Economics Note No. 1: 2005 Valuation of the Benefits of. Prevention of Road Accidents and Casualties, www.dft.gov.uk/pgr/roadsafety/ea/pdfeconnote105.pdf

[33] Supported by manufacturer studies of post-retail reliability, as cited by CoGDEM.

[34] AMA Research Ltd. (2009) *Domestic Heating Market – UK 2009-2013 800,000 in the UK*, p.28.

The following data sources have been identified for solid fuel appliance usage in the dwelling stock:

- The BRE's Domestic Energy Fact File 2008[35] (based on the GfK House Audit) estimates that in 2006, 211,000 dwellings had solid fuel central heating, 142,000 of non-centrally heated homes had a solid fuel fire and a further 76,000 had a solid fuel stove, suggesting that in total 430,000 homes in Great Britain used solid fuel as the 'main form of heating' (adjusted to 389,728 in England and Wales).
- Private research by AMA Research estimates that 800,000 homes in the UK have solid fuel heating systems installed as of 2009.[36]

Given the difficulty in relying on the limited data that there is available, we draw on informed opinion of industry experts[37]. The number of chimneys visible across England and Wales indicates that there is clearly a very large number of solid fuel burning appliances in the existing dwelling stock, particularly open fires, with an overall population of up to 7 or 8 million. However, only a small proportion are actually used and, historically, the incidence of CO poisoning from open fires is very low. Discussions with industry indicate that approximately 1.25 million installed appliances existed in 2009, but that only approximately 1 million of these are used either regularly or intermittently, but sufficiently, often to be considered 'in use'.

In order to predict the appliance stock forwards, we assume a 20 year life cycle for the existing stock of appliances. Therefore, on average, every year one in 20 of the appliances existing in the previous year will be removed from the stock. Whether it is to be either replaced with another solid fuel appliance, an appliance using a different fuel, or simply not replaced does not matter. However, this reduced stock is replenished each year by the level of annual sales of new solid fuel appliances, adjusted to take into account that a portion of dwellings will be equipped with CO alarms even in the absence of this policy.

Additional benefits not monetised

- None identified.

[35] BRE (2009) *Domestic Energy Fact File 2008*, based on the GfK Home Audit, www.bre.co.uk/filelibrary/rpts/eng_fact_file/Fact_File_2008.pdf, "Table 21 Main form of heating – centrally heated dwellings (1,000s) – GB figures" and "Table 22 Main form of heating – non centrally heated dwellings (1,000s) – GB figures".

[36] AMA Research Ltd. (2009) *Domestic Heating Market – UK 2009-2013 800,000 in the UK*.

[37] Including HETAS and industry research specialists.

The benefits of the CO alarm requirement are summarised below:

Initial benefit (once-off) of CO alarm requirement	**£0**
Average annual benefit of CO alarm requirement (2008 prices	**£16.3 million**
PV(Total Benefit of CO alarm requirement)	**£135.5 million**

As with total costs, the present value of the total benefits of the CO alarm requirement is taken. Comparison of the present value of the total costs (£44.8 million) with the present value of the total benefits (£135.5 million) shows that the benefit-cost ratio is positive, with a net benefit (NPV) of £90.8 million. The introduction of the CO alarm requirement for new installations of solid fuel appliances is therefore supported by a positive benefit-cost ratio.

Key sensitivities of the analysis

The result of the model is particularly sensitive to the following:

- the total number of dwellings with a solid fuel combustion appliance that may be used, however infrequently
- the status quo expected number of deaths and injuries (to be avoided); and
- effectiveness of CO alarms at avoiding death and/or injury.

A sensitivity analysis has been carried out on the key assumptions of the number of deaths (low: 5 and high: 9) and injuries (constant ratio to deaths) expected, and the effectiveness of CO alarms at avoiding those deaths and injuries (low: 60 and 90 per cent). In the low case, the net benefit (NPV) is calculated at £32.8 million, and at £164.1 million in the high case. Even in the low case, the benefit-cost ratio of the requirement is strongly positive (1.73:1).

Ventilation for non-room-sealed combustion appliances re: air-permeability requirement

Background

Requirement J1 of the Building Regulations states that "Combustion appliances shall be so installed that there is an adequate supply of air to them for combustion, to prevent overheating and for the efficient working of any flue".

Changes in energy efficiency provisions are resulting in increasingly high standards of air tightness in new homes. The current guidance on air supply in ADJ is based on assumptions about adventitious (uncontrolled) ventilation from cracks and leaks in the building fabric. In modern, more air tight homes additional ventilation may be necessary to ensure that combustion appliances can continue to function safely. This issue only affects those appliances, such as open fires, that draw oxygen for combustion from the room they are situated in.

Likely impact

The proposed amendment would impact only on modern homes built with high standards of air tightness and where an open flue or flue-less appliance is installed. The amendment would impact on a proportion of new homes at the time of build and also any subsequent installation of relevant appliances during the life of such homes.

The potential benefits are unclear at this stage. However, failure to address the potential increased risks to health and safety could result in death and injury.

An estimate of the costs of this proposal has been made based on the following factors

- the number of new build modern homes built per annum
- the number of solid fuel, DFE and flueless appliances to be installed in such homes both at the time of construction and where such appliances are installed at a later date
- the unit cost of a through-wall ventilation kit
- the installation cost of the through-wall ventilation kit both at the time of construction and as a retrofit.

For the basis of calculating total cost figures for this assessment, an 'indicative' **number of new build modern homes built per annum** of 150,000 dwellings has been used, where there are no major economies of scale or fixed costs issues so build rates do not affect costs and benefits proportionately.

It is estimated that there were 459,000 decorative gas fuel effect (DFE) fires and 1,250,000 solid fuel appliances installed in the UK dwelling stock in 2008.[38] The number of flueless appliances is not known. Further, annual sales of such appliances in the new build sector are unknown, though the new build sector is estimated to account for 9 per cent of the market for domestic central heating products.[39]

In the absence of data on the **number of solid fuel, DFE and flueless appliances to be installed in such new build modern homes**, we adopt the assumption that 10 per cent of new dwellings are fitted with relevant appliances and that 5 per cent of modern homes will have relevant appliances fitted in each year. This is considered to be a conservative assumption resulting in higher costs than may occur in practice.

The **unit cost of a through-wall ventilation kit** has been estimated based on a review of the price of ventilator builder supplies. The average price of suitable units used has been calculated at £11.41.

[38] AMA Research Ltd. (2009) Domestic Heating Market – UK 2009-2013 800,000 in the UK.

[39] AMA Research Ltd. (2009) Domestic Heating Market – UK 2009-2013 800,000 in the UK.

The **installation cost of the through-wall ventilation kit** has been estimated as the labour costs for fitting. It is estimated, informed by BSRIA, that a through-wall installation kit is likely to take a maximum of one hour for fitting in a new build development and 3 hours to retrofit in an existing home. The average hourly wage for 'Skilled construction and building trades' is estimated to be £11.32 in 2008, taken from the ONS's Annual Survey of Hours and Earnings (ASHE).[40]

The total, installed cost of the ventilator is therefore estimated at £22.73 for new homes and £45.37 for retrofit, yielding:

Initial cost (once-off) of ventilators requirement	**£0**
Average annual cost of ventilators requirement (2008 prices)	**£1.9 million**
PV(Total Cost of ventilators requirement)	**£15.9 million**

Benefits

The potential benefits in terms of deaths and injuries avoided have not been calculated, however avoiding an average of only 1 death per annum would render the proposal cost effective.

Initial benefit (once-off) of ventilators requirement	**£0**
Average annual benefit of ventilators requirement (2008 prices)	**n/a**
PV(Total Benefit of ventilators requirement)	**n/a**

Additional benefits not monetised

- The benefit of avoiding the likely high number of deaths and injuries that would occur if adequate ventilation requirements are not specified for air-tight new build dwellings.

Incorporation of concealed flue guidance

Background

The proportion of modern apartment blocks built has increased rapidly over the last six to seven years, with flats representing 48 per cent of house-building completions in 2007/08.[41] For flats in such blocks, external wall space is very limited (especially for internal single-aspect flats) and it is preferred to free-up as much space as possible for windows. Accordingly, there has been pressure to locate the boiler somewhere where it does not occupy valuable external wall space.

[40] ONS Annual Survey of Hours and Earnings (ASHE) 2008: Hourly wage for "Skilled construction and building trades".

[41] CLG and AMA Research Ltd.

A popular solution to this issue was presented by the development of fanned draught boilers. Modern fanned draft boilers are suitable for operation with significant length of horizontal flue running through the ceiling void. However, whilst fanned draft boilers can safely operate in these circumstances (as designed and tested for), it can be difficult or impossible to inspect the flue for integrity, leakage or corrosion and carry out safety checks (as required by Regulation 26 (9) of the Gas Safety (Installation and Use) Regulations 1998) unless suitable provision is made for access into the void.

Gas industry practice, first published in CORGI Technical Bulletin 200[42] includes specific mention of the need to install means of access to the flue at strategic locations to allow for visual inspection. However, the Health and Safety Executive (HSE) have discovered[43] in some cases where such means of access have not been provided. In these cases there is a risk that the flue may leak poisonous carbon monoxide (CO) gas into the dwelling or adjoining dwellings if the flue has not been installed properly or has fallen into disrepair without anyone noticing. It is this problem that the amendment aims to address to avoid the risk of CO poisoning.

It is proposed that AD J is amended to include guidance on the provision for inspection of concealed flues based CORGI Technical Bulletin 200 on to section "Provisions which apply generally to combustion installations".

Likely impact

The impact of the addition of this guidance is considered unlikely to lead to any significant new burden, cost or benefit. Given that the guidance was already in operation for gas appliance installations since the CORGI Technical Bulletin was first published in 2007, the only potential impact arises from the fact that the proposed amendment would apply to solid fuel and oil fired appliances. However, although no data exists, it is considered unlikely that there would be a significant incidence of long flues for solid fuel or oil appliances.

Relaxation of flue requirements for solid biofuel appliances

Background

Consistent with the removal of 'unnecessary measures' for biomass (defined as 'solid biofuel' in the proposed revisions to AD J), as per Biomass Task Force report Recommendation 22,[44] it is proposed that AD J is amended to allow greater flexibility in the specification of flue diameter for solid biofuel appliances.

[42] CORGI Technical Bulletin 200 (2007) *Room-sealed fanned draught systems concealed within voids*.

[43] HSE (2008) Safety Alert: Gas boilers – flues in voids, www.hse.gov.uk/gas/domestic/alert21008.htm

[44] Biomass Task Force (2005) Biomass Task Force: report to Government, www.defra.gov.uk/farm/crops/industrial/energy/biomass-taskforce/pdf/btf-finalreport.pdf, "Recommendation 22: Building Regulations, Part J does not recognise that biomass systems are not radiant heat devices. The regulations require unnecessary measures – extending flues, fitting heat pads for heaters to stand on. Building regulations should be updated to take full account of the specifications of biomass systems." (p.44).

Some modern solid biofuel appliances produce less ash and soot than other solid fuel appliances and the probability of the flue becoming blocked is less than with less sophisticated appliances. It is proposed to allow the current minimum of 125mm to be reduced to 100mm if permitted by the appliance manufacturer and supported by calculation.

Likely impact

Calculation methods for the sizing of flues can be very time consuming and in some costs involved in calculating the flue diameter may be greater than the costs saved from using a smaller diameter flue.

However, as the installer is free to choose between employing the existing guidance (status quo) and the relaxed requirement (if he/she has the capability of doing the necessary calculation), then, assuming the installer is rational and will choose the least costly option (in terms of effort and financial cost), the impact of the amendment may be considered to be cost-neutral as a lower bound, and may give a positive net-benefit.

For the purposes of aggregating the costs and benefits of this revision of AD J, the benefit is assumed to equal the costs (nil).

Relaxation of clearance requirements for solid biofuel appliances

Background

This amendment is also consistent with the removal of 'unnecessary measures' for solid biofuel appliances, as per Biomass Task Force report Recommendation 22.[45] Specifically, the Government Task Force on Biomass highlight the measures of "extending flues, fitting heat pads for heaters to stand on" in AD J as unnecessary, and that "Part J does not recognise that biomass systems are not radiant heat devices".[46] The proposed addition of relaxed requirements specifically relating to solid biofuel should ensure that these unnecessary measures are removed.

Some modern biofuel appliances are designed such that they do not require a hearth or additional wall protection to prevent accidental ignition of adjacent materials. However, the existing AD J treats all solid fuel in the same way. It is proposed that the AD J is amended such that, whilst still treating solid biofuel broadly as a solid fuel, it provides greater flexibility in the guidance where measures necessary for conventional solid fuel appliances are unnecessary for the more sophisticated biofuel appliances.

[45] Biomass Task Force (2005) Biomass Task Force: report to Government, www.defra.gov.uk/farm/crops/industrial/energy/biomass-taskforce/pdf/btf-finalreport.pdf, "Recommendation 22: Building Regulations, Part J does not recognise that biomass systems are not radiant heat devices. The regulations require unnecessary measures – extending flues, fitting heat pads for heaters to stand on. Building regulations should be updated to take full account of the specifications of biomass systems." (p.44).

[46] Biomass Task Force (2005) Biomass Task Force: report to Government, (p.44).

The proposed amendment includes the addition of new clearance requirements that represent a relaxation of previously applicable solid fuel requirements for solid biofuel appliances conforming to BS EN 15270:2007 and similar standards that limit surface temperatures to 85°C.

Likely impact

The impact of the increased flexibility offered by this proposal is considered to give rise to no additional cost and has the potential to provide benefits in terms of reduced costs (e.g. unnecessary hearths) and home design flexibility. It is also intended to reduce the perceived barriers to the use of solid biofuel appliances which are regarded as being beneficial in terms of their Carbon emissions.

For the purposes of aggregating the costs and benefits of this revision of AD J, as the up-side of the potential cost savings and flexibility benefits are not monetised, the benefit is assumed to equal the costs (nil).

Overall costs and benefits of Option 3

Total Costs

Initial cost (one-off) of Option 3	**£0.2 million**
Average annual cost of Option 3 (2008 prices)	**£7.3 million**
PV(Total Cost of Option 3)	**£60.6 million**

This PV Cost of £60.6 million can be broken down into the £44.8 million PV Cost for CO alarms and the PV Cost of £15.9 million for ventilation for non-room-sealed combustion appliances.

Key non-monetised costs

- the environmental costs of extra CO_2 emissions resulting from the increased electricity generation required for alarm unit and battery production
- the cost of any public awareness marketing exercise undertaken to promote the proposed CO alarm requirement.

Total Benefits

Initial benefit (once-off) of Option 3	**£0**
Average annual benefit of Option 3 (2008 prices)	**£16.3 million**
PV(Total Benefit of Option 3)	**£135.5 million**

This PV Benefit of £135.5 million relates directly to the £135.5 million (PV) benefit of the CO alarm requirement, as the benefits for ventilation for non-room-sealed combustion appliances are non-monetised.

Key non-monetised benefits

- The benefit of avoiding the likely high number of deaths and injuries that would occur if adequate ventilation requirements are not specified for air-tight new build dwellings.

Key assumptions/sensitivities/risks

The key assumptions and sensitivities are discussed under the cost-benefit discussion of each proposed amendment.

Net Benefit of Option 3

Based on the full range of costs and benefits assessed for Option 3, the benefit-cost ratio is therefore estimated at **2.3:1**. The complete set of proposed amendments of option 3 is therefore supported by cost-benefit analysis evidence.

PV(Total Cost of Option 3)	**£60.6 million**
PV(Total Benefit of Option 3)	**£135.5 million**
PV(Net Benefit of Option 3)	**£74.9 million**

The results of the sensitivity analysis on the CO alarm assumptions (discussed above) feed into the Net Benefit Range of Option 3 (£16.9 million to £148.2 million), as presented on the summary sheet. The Low estimate is derived from a Net Present Benefit of £32.8 million for CO alarms from the sensitivity analysis on page 30 minus the £15.9 million Net Present Cost of ventilation. Similarly, the High estimate is derived from a Net Present Benefit of £164.1 million for CO alarms from the sensitivity analysis on page 30 minus the £15.9 million Net Present Cost of ventilation.

Option 4: Option 3 plus oil storage tank bunding requirement

As Option 3 (retain existing AD J technical guidance, providing clarifications in the text where required and some additional requirements, including carbon monoxide alarms and ventilation for combustion appliances), with an additional amendment to require that domestic oil storage tanks be bunded.

Table 3: Additional amendment to AD J under Option 4			
Subject	**Motivation for amendment**	**Proposed amendment**	**Expected impact**
Bunding for oil (and blends) storage tanks	The environmental consequences of oil spills are very serious. A review of the Oil Storage Regulations on behalf of the Environment Agency (Oakdene Hollins, 2008) suggested that 9 per cent of spillage incidents reported to EA National Incident Reporting Scheme were related to domestic oil storage. There is now a wide range of range of low cost integrally bunded prefabricated tanks available to domestic consumers.	All outside fuel storage should be provided with secondary containment, either as an integrally bunded prefabricated tank or with a separate bund in accordance with PPG2. *Integrally bunded oil tanks that comply with the following standards will meet this requirement:* *i. OFS T100 Oil Firing Equipment Standard – Polyethylene Oil Storage Tanks for Distillate Fuels (2008)* *ii. OFS T100 Oil Firing Equipment Standard – Steel Oil Storage Tanks and Tank Bunds for use with Distillate Fuels, Lubrication Oils and Waste Oils (2008) will meet this requirement.*	Amendment with costs and benefits to be assessed in detail.

Bunding for overground oil storage tanks

Background

The environmental consequences of inland oil spills are serious and can be long-term, primarily relating to water pollution and damage to wildlife (species and habitats). Given that oil is used widely in Great Britain, with an estimated 927,000 dwellings using it as the main form of heating,[47] the potential for spillage and other accidental releases from domestic oil storage is considerable.

According to The Environment Agency (EA), there were 111 serious (category 1 and 2) pollution incidents caused by oil in England and Wales 2007,[48] representing 12 per cent of all sources of pollution. A number of these incidents are caused by spills from domestic oil storage tanks which fall under the control of Part J of The Building Regulations. In order to reduce domestic incidents, strengthening the protection required for domestic oil storage tanks in AD J is therefore being considered.

[47] Number of dwellings relates to 2006. BRE (2009) Domestic Energy Fact File 2008, based on the GfK Home Audit, www.bre.co.uk/filelibrary/rpts/eng_fact_file/Fact_File_2008.pdf

[48] The Environment Agency (2008) DATA: Serious (category 1 and 2) pollution incidents by pollutant type in England and Wales 2007, www.environment-agency.gov.uk/research/library/data/88377.aspx

The risk of an oil spill can be reduced by the use of bunding. A bund is a method of secondary containment comprising an outer wall or tank designed to catch and store escaped oil in the event of leakage or spillage. There are two options to achieve a bunded tank. One option, increasing in popularity since 2000,[49] is an 'integrally bunded' tank, which is essentially a 'tank within a tank'. The alternative option is a separate bund built around the base of a single-skinned tank, designed to catch any oil that may leak or spill from the tank above.

Since 2002, AD J has provided that secondary containment of oil storage tanks be provided where there is "a significant risk of oil pollution"[50]. Oakdene Hollins determined that between 2002 (529 incidents) and 2006 (383 incidents), the incident rate reduced by 27 per cent, with the positive trend likely to be explained by the implementation of the Building Regulations (J5 and J6) after April 2002.

On the other hand, anecdotal evidence from installers suggests that the risk assessment approach is not being followed consistently, with the consequence that the risk of pollution is not being reduced.[51] Whilst the risk-assessment approach may make sense in terms of targeting high-risk tanks only, it may not be effective if compliance is low.

It has been proposed that AD J should be changed such that all overground fuel storage tanks should be provided with secondary containment, either as an integrally bunded prefabricated tank or with a separate bund in accordance with PPG02.[52]

Changes since Consultation stage Impact Assessment

Based on the responses received from stakeholders in the consultation process, the following changes have been made since the Consultation stage Impact Assessment:

- The calculation of the number of new tanks required to be bunded has been simplified to use OFTEC's estimate of tank sales (Great Britain sales total reduced pro rata to England and Wales based on the number of households), less the status quo bunding sales of 10%. This results in the incidence of tanks to be bunded under the requirement reducing to 62,000 in the base year, from 72,000 (Consultation stage). This change caused a reduction in the total costs of the proposal to £236.3 million, from £263.9 million (Consultation stage).

[49] Source: The Environmental Agency, personal communication.

[50] Office of the Deputy Prime Minister (2002) *The Building Regulations 2000: Combustion appliances and fuel storage systems – Approved Document J*, p.55 para 5.8.

[51] The Environment Agency, personal communication.

[52] Environment Agency (2004) Pollution Prevention Guidelines – Above Ground Oil Storage Tanks: PPG02, publications.environment-agency.gov.uk/pdf/PMHO0204BHTN-e-e.pdf

- The number of oil spillage incidents that may be avoided if the entire domestic oil storage tank stock were to be bunded has been increased to 642, from 550 (Consultation stage), based on the Environment Agency's estimated number of reported and unreported incidents. The main reason for this increase is the inclusion of unreported incidents. This change had an upward effect on the total benefits of the proposal, though the total benefits ultimately decreased (see below).
- The estimated costs of environmental damage and cleanup of oil spillages have also been changed based on the Environment Agency's consultation response to a percentile-based sliding scale from £5,000 up to £50,000 per incident. This has resulted in a lower effective average environmental damage and cleanup cost of oil spillages than the Consultation stage version (£7,500, down from £20,000). This change caused a decrease in the total benefits of the proposal to £32.7 million, from 85.5 million (Consultation stage), though this is immaterial to the benefit-cost ration result given the magnitude of the total costs of the proposal (£236.3 million).

Cost-benefit analysis of bunding for overground oil storage tanks

Costs

One-off Cost (Transition)

In terms of the implementation of the new requirement, it is likely that there would be some very minor Building Control familiarisation costs, and possibly some adjustment costs for tank manufacturers.

The familiarisation for building inspectors would be negligible, as the amendment simply removes the risk-based assessment of whether or not to require a particular oil storage tank to be bunded. There are no new standards or specifications to be learned. In fact, the amendment to make bunding a blanket requirement is likely to represent a slight simplification of the control of oil tanks for inspectors.

There is a potential adjustment cost for manufacturers selling into the England and Wales market. OFTEC's Equipment Directory[53] indicates that a large majority of manufacturers currently produce both single-skinned and integrally bunded tanks, so the impact would involve switching all resources to produce the latter. The cost of this 'switching' of production may be more significant for a smaller manufacturer, especially for those not already producing integrally bunded tanks, but the extent of such costs is unclear.

For these reasons, no one-off costs of transition have been included.

[53] Available at: www.oftec.org/equipment_directory.asp

Average annual costs

The ongoing cost of the requirement relates to the additional cost that it imposes on households in having to either buy a new integrally-bunded oil tank over a single-skinned tank, or the cost of installing a separate bund around a single-skinned tank. In both cases, the cost is incurred in the year of installation of the tank or bund, multiplied by the number of bunded tanks installed in that year.

The total cost of this amendment per annum therefore depends on three key inputs:

- the number of tanks that will be bunded under the requirement (integrally-bunded tanks or separate bunds) per annum
- the additional cost of bunding
- the average lifetime of integrally-bunded tanks/separate bunding.

The proposed requirement will not be retrospective but will apply to the purchase of a new oil storage tank for domestic use. The **number of tanks that will be bunded under the requirement per annum** can therefore be estimated directly from annual sales of oil tanks with a capacity of 3,500 litres or less.

OFTEC estimate that 80,000 tanks were sold in Great Britain in 2007, equivalent to 72,480 in England and Wales if reduced on a pro rata basis using the dwelling stock.

Reflecting the fact that a proportion of the new tanks sold would have been required to be bunded under the existing risk-based approach, it is necessary to adjust this sales figure down to account for the business-as-usual scenario. To estimate the necessary adjustment, we consider the proportion of the existing stock of domestic oil storage tanks that are bunded.

Though very little information is known on the proportion of the existing stock of tanks that is bunded, a research report in 2005 reported that the number of bunded tanks was "very few".[54] Some industry sources have indicated that up to 25 per cent of existing tanks may be bunded, but this is likely to relate to newer tanks, with older tanks likely to be replaced under the requirement. However, based on opinion obtained from the EA, supported by additional evidence,[55] we estimate that approximately 10 per cent of domestic oil storage tanks are bunded. Thus, we adopt a conservative approach by using an adjustment factor of **–10 per cent**, yielding ***N*** = **61,970** tanks to be bunded under the requirement in the base year.

[54] Oakdene Hollins (2005) *An analysis of Inland Oil and Fuel Incidents in England and Wales*, p.30.

[55] Also supported by: J. Griffiths (Reading, East) (Lab) (2005) *Installation of Oil Fired Heating*, Parliamentary Business: Bound Volume Hansard – Westminster Hall, 18 Jan 2005: Column 228WH, www.publications.parliament.uk/pa/cm200405/cmhansrd/vo050118/halltext/50118h03.htm

We have also considered how this number may change over the coming ten years. Additional information provided by OFTEC show an average annual decrease over the 3 years 2006-2008 of approximately 10 per cent, so this rate of negative annual growth (–10 per cent) has been assumed to continue in the annual sales of appliances over the ten years. This is believed to reflect the likely reality of falling oil use, driven by environmental and energy efficiency policies and targets.

Having calculated the number of tanks to be bunded per annum, we now return to examine the mode of bunding in order to estimate the **additional cost of bunding**.

Based on a comparative analysis of the two options in terms of cost, technical aspects and long-term sustainability, we do not believe that households will opt for the separate bund option. In the case of an existing single-skinned tank, the additional cost of labour and materials to construct a brick bund to the specifications of PPG2 would be significant, without extending the life of the tank. In the case of a new tank, the cost of installing a new integrally bunded tank is likely to be cheaper than buying an un-bunded tank and building a separate brick bund. From a practical perspective, rainwater must be emptied from a separate bund if exposed to the elements and requires filtering if any oil has leaked or spilled into the bund.

We therefore assume that **100 per cent** of new tanks are installed with the **integrally-bunded tank option**. In this case, the additional cost will be the price difference between an integrally-bunded tank and a single-skinned tank (where both are a standard specification). This conclusion was also reached by Defra in the Regulatory Impact Assessment for the Control of Pollution (Oil Storage) (England) Regulations, 2001.[56] It is furthermore supported by the experience of the EA, who say that whilst separate bunding is commonplace for commercial and industrial tanks, it is very rare to find it in a domestic context.

To estimate the **additional cost of an integrally bunded tank**, we conducted a price survey of oil tanks using a major online oil tank vendor. For two leading manufacturers, we have compared the price of their single-skinned and integrally-bunded standard or basic oil tanks for a range of tank sizes within the AD J threshold of 3,500 litres. All prices examined included delivery charges. The results are summarised in the following table. Reflective of the fact that the vast majority of domestic tanks are less than 2,000 litres, we have used the average additional cost of tanks with a capacity between 1,000 and 1,800 litres, equal to **£544**.

Installation costs may be ignored as in every case, a tank of some description would be required to be installed, with the cost of installing a single-skinned and an integrally bunded tank assumed to be approximately equal.

[56] Defra (2001) Guidance Note for the Control of Pollution (Oil Storage) (England) Regulations 2001, www.defra.gov.uk/environment/water/quality/oilstore/pdf/oil_store.pdf

Table 4: Estimates of the additional cost of an integrally bunded oil tank compared to a single-skinned tank (£, including VAT)	
Tank capacity (litres)	**Additional cost (£ per tank)**
1,000	£527
1,100	£393
1,200	£622
1,400	£514
1,800	£664
2,500	£724
3,500	£1,050
Average (1,000 litres – 1,800 litres)	**£544**

Source: http://www.tankdepot.co.uk, accessed 3 June 2009.

The additional cost of the integrally-bunded tank (Ca) is incurred in the year of installation. Assuming average lifetime of a new integrally-bunded tank to be 15 years, the issue of replacement does not arise in the timeframe of the impact assessment. Therefore, to calculate the annual cost of the amendment, the number of tanks installed under the requirement per annum (N) is multiplied by the additional cost (Ca). An average of these total annual costs is taken over the ten years of the impact assessment.

The costs of the mandatory oil tank bunding requirement are summarised below:

Initial cost (once-off) of oil tank bunding requirement	**£0**
Average annual cost of oil tank bunding requirement (2008 prices)	**£28.4 million**
PV(Total Cost of oil tank bunding requirement)	**£236.3 million**

Additional costs not monetised

None identified.

Benefits

Initial benefit (once-off)

No initial one-off benefit has been identified.

Average annual benefits

Pollution events such as oil spills can harm the environment by killing aquatic life, and can threaten human health. There are other impacts, such as disruptions to water abstraction, which supplies water for a variety of purposes throughout the economy. However, data and information on the benefits is limited.

The estimation of the benefits of the blanket requirement for all new domestic oil tanks to be bunded is based on the following information:

- number of domestic oil spillages per annum expected to be avoided per annum
- avoided costs of domestic oil spillages, including:
  - avoided environmental costs of oil pollution from domestic oil spillages
  - the cost of clean-up of domestic oil spill
  - the replacement cost of oil tank
  - the replacement cost of lost oil
  - the avoided costs to environmental agency of responding to each incident reported.

The **number of domestic oil spillages per annum expected to be avoided** has been estimated at **642 incidents, including unreported incidents**, on the basis of an estimate provided by the Environmental Agency (EA), which maintains a database of reported incidents known as the National Incident Recording System (NIRS).

However, the proposed amendment will not be retrospective and will not apply to all tanks, and so we must only account for the benefit accruing to those integrally bunded tanks that are installed under the revised guidance from 2010 onwards. The proportion of the tank stock that is bunded annually under the provisions of the amended requirement is calculated using two figures calculated for the cost estimation earlier, namely:

- the total number of tanks that will be bunded under the requirement annually; and
- the number of existing oil tanks in the dwelling stock in England and Wales, but adjusted to report only non-bunded tanks (Si = 756,163 in 2008).

The establishment of estimates of the avoided environmental costs of oil pollution from domestic oil spillages is significantly complicated, due to the clear scientific basis required to link the benefits with the intervention and a lack of financial information on a range of environmental benefits. It has not been possible at this stage to monetise the environmental benefits, though it is likely that the following are included:

- avoided costs in terms of reduced biodiversity of species and habitats if made extinct or destroyed by pollution; and
- avoided clean-up cost of contaminated water supply (open water, rivers, water table, etc.) from an unidentified domestic source.

Nonetheless, it is important for the purposes of the impact assessment to include an estimate of avoided environmental costs of oil pollution, even with a large caveat.

We have employed estimates of the range of avoided costs of an oil spillage provided by the Environment Agency in its consultation response, presented in the table below. The breakdown of the average costs of oil spills by percentile (ordered according to the severity of the oil spill) reflects the fact that more serious incidents are less common but more costly and vice versa for less serious spillages.

Percentile (percentage) of all oil spills	Average cost
1st percentile (1%)	£50,000
2nd-6th percentile (5%)	£20,000
7th-31st percentile (25%)	£10,000
32nd-100th percentile (69%)	£5,000

Additional benefits not monetised

- Potential wider avoided costs to environment and potential health implications of water and environmental contamination of the amendment, as explained in the text above.
- The benefit to tank manufacturers of selling a higher-specification tank as standard, likely to lead to a higher mark-up, but this could be eroded by the increased competition in the regulatory specification tank market.
- Another, potentially significant benefit that has not been monetised is the avoidance of non-reported relatively minor spillages due to over filling that may cause local environmental consequences but won't result in tank replacement or insurance claims.

The benefits of the mandatory oil tank bunding requirement are summarised below:

Initial benefit (once-off) of oil tank bunding requirement	**£0**
Average annual benefit of oil tank bunding requirement (2008 prices)	**£3.9 million**
PV(Total Benefit of oil tank bunding requirement)	**£32.7 million**

In comparing the benefits and costs, it is very clear that the benefits (£32.7m) are outweighed by the costs (£236.3m). This is likely to be due in part to the fact that environmental benefits may not have been fully costed, and that all high-risk domestic oil storage tanks are already covered by the existing guidance.

Key sensitivities of the analysis

The result of the model is particularly sensitive to the following:

- the value of environmental benefits
- the number of incidents expected to be avoided by the amended requirement
- the assumption that all new tanks are installed as the integrally-bunded tank option
- the sales of new integrally bunded tanks per annum; and
- the proportion of existing tanks that is already bunded.

A sensitivity analysis has been carried out on the key assumptions: the proportion of existing stock believed to be bunded/required in business-as-usual (low: 5 per cent and high: 20 per cent), annual sales of oil tanks in England and Wales (low: 80,000 and high: 60,000), the additional cost of an integrally bunded tank (low: 600 and high: 393), the number of domestic oil spillages per annum expected to be avoided per annum if all tanks were bunded (low: 600 and high: 700) and the avoided costs to the environment per spill (low: £4,500-£45,000 and high: £5,500-£55,000). In choosing the upper bound for these values, it is noted that spills at locations with a high risk of serious pollution should already be covered by the existing risk-based bunding requirement of AD J. In the low case, the net cost (NPV) is calculated at –£273.2 million, with the high case also generating a substantial net cost (NPV) of –£93.1 million.

Overall costs and benefits of Option 4

As Option 4 includes and adds to the amendments of Option 3, the following total costs and benefits include those from Option 3 (detailed earlier) as well as those for the oil storage tank bunding requirement.

Total Costs

Initial cost (once-off) of Option 4	**£0.2 million**
Average annual cost of Option 4 (2008 prices)	**£35.7 million**
PV(Total Cost of Option 4)	**£296.9 million**

Key non-monetised costs

- As Option 3: The environmental costs of extra CO_2 emissions resulting from the increased electricity generation required for alarm unit and battery production.
- As Option 3: The cost of any public awareness marketing exercise undertaken to promote the proposed CO alarm requirement.

Total Benefits

Initial benefit (once-off) of Option 4	**£0**
Average annual benefit of Option 4 (2008 prices)	**£20.2 million**
PV(Total Benefit of Option 4)	**£168.3 million**

Key non-monetised benefits

- The full avoided cost to environment and potential health implications of water and environmental contamination of domestic oil storage tanks bunding.
- The benefit to tank manufacturers of selling a higher-specification oil tank as standard, likely to lead to a higher mark-up, but this could be eroded by the increased competition in the regulatory specification tank market.
- As Option 3: The benefit of avoiding the likely high number of deaths and injuries that would occur if adequate ventilation requirements are not specified for air-tight new build dwellings.

Key assumptions/sensitivities/risks

The key assumptions and sensitivities are discussed under the cost-benefit discussion of each proposed amendment.

Net Cost of Option 4

Based on the full range of costs and benefits assessed for Option 4, the benefit-cost ratio is therefore estimated at **0.5:1**. The complete set of proposed amendments including the oil storage tank bunding requirement is therefore not supported by cost-benefit analysis evidence.

PV(Total Cost of Option 4)	**£296.9 million**
PV(Total Benefit of Option 4)	**£168.3 million**
PV(Net Cost of Option 4)	**–£128.6 million**

The results of the combined sensitivity analyses of the CO alarm and oil tank bunding assumptions (discussed above in the relevant sections) give the Net Benefit Range of Option 4 (–£256.3 million to £55.1 million), as presented on the summary sheet for Option 4. It should be noted that the positive net benefit of the high case is due to an increased net benefit of the CO alarm requirement, as the oil tank bunding requirement contributes a net cost in the high case.

Preferred policy option

On the basis of the cost-benefit analysis findings presented above, Option 3 is the preferred policy option to be taken forward and because policy option 4 is not cost effective.

To improve compliance with the risk-based assessment, it is proposed that the current guidance regarding the risk-based assessment will be tidied up to include reference to the Environment Agency's mapping of high-risk environmental damage areas. All new oil storage tanks in these areas will be required to be bunded without recourse to the risk-based assessment. In practice, these high-risk areas should already be targeted by a correct application of the current risk-based assessment. Therefore, whilst it is hoped that this amendment will increase the compliance rate, it is not believed that it will lead to any significant additional regulatory impact.

Monitoring and evaluation

CLG is also developing a more comprehensive programme of evaluation of all parts of the Building Regulations, including levels of compliance. This will provide evidence to underpin the development of any further changes – either to the Regulations and guidance themselves as part of the periodic review programme, or other actions such as targeted communications, further training, and changes to the building control system.

Specific Impact Tests: Checklist

Use the table below to demonstrate how broadly you have considered the potential impacts of your policy options.

Ensure that the results of any tests that impact on the cost-benefit analysis are contained within the main evidence base; other results may be annexed.

Type of testing undertaken	Results in Evidence Base?	Results annexed?
Competition Assessment	No	Yes
Small Firms Impact Test	No	Yes
Legal Aid	No	No
Sustainable Development	No	Yes
Carbon Assessment	No	Yes
Other Environment	No	Yes
Health Impact Assessment	No	Yes
Race Equality	No	No
Disability Equality	No	No
Gender Equality	No	No
Human Rights	No	No
Rural Proofing	No	No

Annexes

We have looked at the specific impact test checklist below and consider that the amendments to Building Regulations Part J have no impact on legal aid; race equality; disability equality; gender equality; human rights; or rural proofing.

The findings of those specific impact tests carried out are discussed below. In all cases, the test results do not feed into the costs and benefits.

Legal aid

The proposals would have no impact on Legal Aid.

Equalities assessments

There is a statutory duty to consider the impact of a policy on race, disabilities and gender equality. The assessment involves a screening process followed by a thorough assessment if impacts are identified which have or might have a negative impact on certain target equality groups and is of high or medium impact; is not intentional; or is illegal or possibly illegal.

The policy would affect all parties the same regardless of race, gender and disability. We consider whether there might be indirect impacts on BME groups due to the distribution in the housing mix as discussed below.

Overall equality impacts

The proposed policy will not have a negative impact on any racial or gender groups.

The proposed policy would have the same effect on all parties regardless of disabilities.

There would not be any impact on human rights.

Rural proofing

Rural proofing involves a commitment by the Government to ensure its domestic policies take account of specific rural circumstances and needs (Rural White Paper 2000). As a result policy makers should:

- consider whether their policy is likely to have a different impact in rural areas from elsewhere, because of the particular characteristics of rural areas
- make a proper assessment of these impacts if they are likely to be significant
- adjust the policy, where appropriate, with solutions to meet rural needs and circumstances.[57]

[57] DEFRA rural proofing – policy makers' checklist.

The policy would not apply differently to rural and urban areas. However, it may impact differently on the two groups due to the higher proportion of rural households that are not connected to the gas network and therefore do not have access to gas as a less carbon intensive and cheaper source of fuel.

Impact of the Proposal

Given the fact that many rural properties are off the gas grid and rely on oil fired heating any proposal for bunding of oil tanks would impact more on rural areas than urban areas.

Health Impact Assessment

A number of the proposed amendments are likely to lead to a positive impact on public health and welfare, with knock-on savings for public health costs. Firstly, the CO alarm requirement for solid fuel appliances should lead to lives and injuries being saved by avoiding CO poisoning in the home. These benefits have been fully monetised in the figures used in the CO alarm cost-benefit analysis above. Secondly, the new requirement for dedicated ventilation provisions be installed for new combustion appliances in new build dwellings is a necessary amendment to ensure that large numbers of instances of injuries and deaths are avoided from CO poisoning in increasingly air-tight new build dwellings. These benefits have not been monetised, but are highly likely to be very significant. Thirdly, the requirement that all domestic oil storage tanks be bunded should lead to a reduction in the instances of contamination of drinking water by oil. No amendments are likely to lead to a negative impact on public health.

Competition Assessment

There may be some impacts on the operation of competition as a result of some of the proposed amendments, though the extents of the impacts are not clear at this stage. Here we outline the potential impacts foreseen.

The specification of the particular CO monoxide alarm required under the revised AD J may impact on the market for CO monoxide alarms. For example, the introduction of the proposed amendments would result in a significant increase in the demand for battery operated devices and a fall in demand for mains-powered devices. Only a small number of units, and therefore manufacturers, were identified as producing a device conforming to BS EN 50291:2001 Section 6 with lifetime batteries. Therefore, the requirement could potentially limit the number or range of suppliers and limit the ability of suppliers to compete, at least in the short-term. In addition, the specification may also restrict the potential for innovation in CO alarm technology.

It is also possible that the domestic oil tank bunding requirement may impact on the market for oil tanks less than 3,500 litres, with sales of single-skinned tanks likely to fall significantly. This could limit the number or range of suppliers in the short-term, although it has been established that the majority of tank manufacturers currently produce integrally bunded tanks.

The removal of unnecessary measures for solid biofuel appliances is likely to give a competitive boost to solid biofuel appliances, at the expense of other, mainly solid fuel, possibly limiting the ability of suppliers to compete.

Small Firms Impact Test

It is not believed that any of the amendments is likely to lead to significantly disproportionate costs for firms of different size. There may be some initial distributional effect of the proposals towards large firms as they tend to have more resources to effect change, for example to increase production of integrally bunded oil tanks against single-skinned ones. If this, or other impacts dependant on firm size, is considered significant by stakeholders, then the impact of the requirements may need to be investigated in more detail.

Sustainable Development

It is believed that the removal of 'unnecessary measures' for solid biofuel appliances, including the relaxation of flue diameter requirements from the previously applicable solid fuel requirements and the re-specification of wall clearance and hearth requirements, should promote the uptake and use of solid biofuel, a renewable energy source, to meet domestic primary energy demand needs. No amendments are considered to restrict sustainable development.

Carbon Assessment

There is not likely to be a significant carbon impact of the proposed amendments to AD J. Whilst some extra carbon emissions may result from increased production of CO alarms, batteries and integrally bunded tanks, this has not been possible to estimate but is not considered to be significant.

Other Environment

The proposed requirement that all domestic oil storage tanks are bunded from 2010 has potential environmental benefits. The likely environmental impact of this amendment, and the limitations of monetisation of the benefits that has been possible, is discussed in the cost-benefit analysis above. However, the proposal is not considered to be cost effective.

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