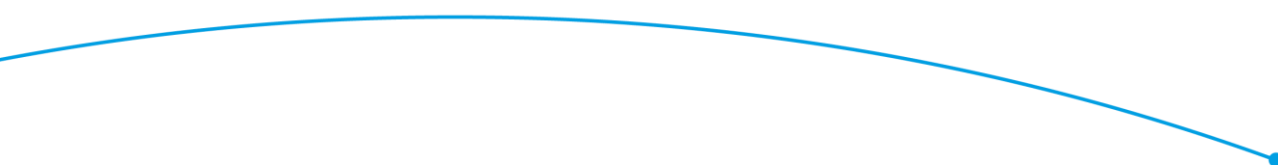




Department for
Business, Energy
& Industrial Strategy

HEAT IN BUILDINGS

The Future of Heat: Non-domestic buildings



November 2016

HEAT IN BUILDINGS

The Future of Heat: Non-domestic buildings

The consultation can be found on the BEIS section of GOV.UK:

<https://www.gov.uk/government/consultations/heat-in-buildings-the-future-of-heat-non-domestic-buildings>

HEAT IN BUILDINGS

© Crown copyright 2016

You may re-use this information (not including logos) free of charge in any format or medium, under the terms of the Open Government Licence.

To view this licence, visit www.nationalarchives.gov.uk/doc/open-government-licence/ or write to the Information Policy Team, The National Archives, Kew, London TW9 4DU, or email: psi@nationalarchives.gsi.gov.uk.

Any enquiries regarding this publication should be sent to us at buildingheat@beis.gov.uk.

Contents

General information	2
Purpose of this call for evidence	2
How to respond	2
Confidentiality and data protection	3
Quality assurance	3
Executive summary	4
A call for evidence: future opportunities	4
Introduction	6
A call for evidence: further opportunities	7
Non-domestic buildings	8
Targeting buildings off the gas grid	13
Innovative solutions	14

General information

Purpose of this call for evidence

This call for evidence provides the means to test what we have learned so far and to seek feedback and views to help us develop and support future policy development. We are seeking views from those in the building industry and decision-makers on the opportunities, and how we can:

- Keep energy bills as low as possible;
- Continue to ensure the UK has a secure and resilient energy system;
- Remain at the leading edge of science, research and innovation; and
- Reduce carbon emissions cost-effectively.

Issued: 16 November 2016

Respond by: 27 January 2017

Enquiries to:

Heat in Buildings
Department for Business, Energy & Industrial Strategy,
1st Floor Area B,
3 Whitehall Place,
London, SW1A 2AW
Tel: 0300 068 4000
Email: buildingheat@beis.gov.uk

Territorial extent:

This comprises a wide call for evidence relating to possible further work across the United Kingdom.

How to respond

Your response will be most useful if it is framed in direct response to the questions posed, though further comments and evidence are also welcome.

Responses submitting in writing or by email to the postal and email addresses above will be accepted.

Additional copies:

You may make copies of this document without seeking permission. An electronic version can be found at <https://www.gov.uk/government/consultations/heat-in-buildings-the-future-of-heat-non-domestic-buildings>

Other versions of the document in Braille, large print or audio-cassette are available on request. This includes a Welsh version. Please contact us under the above details to request alternative versions.

Confidentiality and data protection

Information provided in response to this call for evidence, including personal information, may be subject to publication or disclosure in accordance with the access to information legislation (primarily the Freedom of Information Act 2000, the Data Protection Act 1998 and the Environmental Information Regulations 2004).

If you want information that you provide to be treated as confidential please say so clearly in writing when you send your response to the call for evidence. It would be helpful if you could explain to us why you regard the information you have provided as confidential. If we receive a request for disclosure of the information we will take full account of your explanation, but we cannot give an assurance that confidentiality can be maintained in all circumstances. An automatic confidentiality disclaimer generated by your IT system will not, of itself, be regarded by us as a confidentiality request.

We will summarise all responses and place this summary on the [GOV.UK website](https://www.gov.uk). This summary will include a list of names or organisations that responded but not people's personal names, addresses or other contact details.

Quality assurance

This has been carried out in accordance with the [Government's Consultation Principles](#).

If you have any complaints about the process (as opposed to comments about the issues which are the subject of the call for evidence) please address them to:

BEIS Consultation Co-ordinator
3 Whitehall Place
London SW1A 2AW
Email: enquiries@beis.gov.uk

Executive summary

We are committed to secure, affordable and clean energy as we build an infrastructure fit for the 21st Century. Thanks to Government action and innovation in the sector, we are on track to deliver our next two carbon budgets. We will need action right across the economy: in transport, waste and buildings to meet the fourth and fifth carbon budgets and to make a valuable contribution towards our ambitious targets to reduce emissions of greenhouse gases by 2050.

Today, most buildings in the UK burn fossil fuels for space and water heating. We need to cut bills and emissions in this part of the economy, while ensuring people maintain the same level of comfort in their homes and buildings. One of the best ways to cut bills and carbon is to cut energy use itself. There are technologies which have great potential to help us strike this balance, such as biogas, hydrogen and heat pumps.

Non-domestic buildings account for 12% of greenhouse gas emissions. Policies on heat and energy efficiency will be crucial to meeting the fourth and fifth Carbon Budgets¹. We are looking to unlock carbon and bill savings in areas we know less about, such as non-domestic buildings. We know that there is significant potential for savings from heat, cooling and energy efficiency within the different non-domestic sectors (public, business and commercial) but accessing it has a number of challenges because of the diverse nature of energy usage in those buildings. Our evidence base is not complete and we need to consider and test a number of policies which can deliver the most effective savings. This call for evidence sets us on this path.

A call for evidence: future opportunities

Alongside this call for evidence we are publishing our Building Energy Efficiency Survey (BEES)² research. BEES provides detail on energy use and abatement potential to reduce energy and carbon emissions, as well as barriers and enablers to take up across the whole non-domestic building stock.

This call for evidence provides the means to test what we have learned so far from the BEES research and to seek feedback and views to help us develop and support future

¹ CB4:2023 – 2027, CB5: 2028 - 2032

² Based on an external survey of non-domestic buildings conducted through telephone surveys with more detailed site visits for some buildings.

policy development. We are seeking views from those in the building industry and decision-makers on the opportunities, and how we can:

- Keep energy bills as low as possible;
- Ensure the UK has a secure and resilient energy system;
- Remains at the leading edge of science, research and innovation; and
- Reduce carbon emissions cost-effectively.

Non domestic buildings

Heating costs and emissions from non-domestic buildings will need to fall as part of our overall strategy and to meet our Carbon Budgets. We are seeking views and evidence to help us develop options as part of a long term framework, with the first wave of interventions implemented within this Parliament.

Targeting buildings off the gas grid

The Government will need to consider how to reduce the use of coal and oil in buildings, and how best to promote a transition away from high fossil fuel heating over the coming decades. We need to consider which kind of policy interventions could support this change.

Innovative solutions

The low carbon industry is a growing economy in which big ideas should thrive. Innovative solutions can produce new or improved technologies, novel business models can make currently expensive products pay for themselves and help consumers meet their bills. We need innovative solutions, and in the UK we have an engaged and proactive industrial sector, and an academic community that is at the cutting edge of innovative design. We wish to hear from these and all sectors about new ways of thinking for the future.

Introduction

- 1.1. Non-domestic buildings in the UK account for 17% of our energy consumption and 12% of greenhouse gas emissions. While it is important to improve the energy efficiency of our buildings and reduce the amount of energy used, we know that to make a real difference and meet this commitment, we also need a change in the sources of our heat. Hitting the UK's 2050 carbon reduction target is likely to require eliminating nearly all of emissions from heating buildings and a substantial proportion from heating for industrial processes.
- 1.2. For business consumers energy is often considered a relatively small part of a company or organisation's overheads, and frequently treated as a fixed cost. However, there are significant potential untapped energy savings in this sector.
- 1.3. The UK has a diverse range of building types, heat demands and a dominant natural gas grid. Cutting carbon from heat may require significant change to infrastructure.
- 1.4. Almost 60% of non-domestic heat is currently generated by gas (the majority of which is now imported from overseas).³ In rural areas buildings are more likely to be heated using oil, while electricity is an important heat source for many in those urban areas not connected to the gas network, such as apartment blocks. UK building stock varies widely from solid wall Victorian schools, through mid-twentieth century tower blocks and offices to modern new-build properties; each of these has significantly different thermal characteristics.
- 1.5. The low carbon heat approaches we deploy must accommodate this considerable complexity, but they must also be centred on consumer needs: low costs, low bills, and accessible for all.
- 1.6. Heat supply should not be looked at in isolation, but hand in hand with heat demand. Policies to decarbonise heat must be complementary with policies that drive energy efficiency. The ultimate aim should be for Government to set the framework, and let the markets deliver. This requires setting long-term, transparent signals for the market, giving the confidence to invest and innovate, improving the performance of products and systems and bringing down costs to consumers.
- 1.7. We will continue to work with stakeholders alongside this call for evidence to hone our position.

³ <https://www.gov.uk/government/collections/energy-consumption-in-the-uk>

A call for evidence: further opportunities

- 2.1. We know that further action is needed now to put us on the right path to deliver our ultimate decarbonisation goals. We want the longer term framework to set signals for the market which give them the confidence to invest and innovate, improve product performance and bring costs down for consumers. There is potential to make carbon savings in the non-domestic sector. There is scope to consider what interventions and enablers are needed, including:
 - how innovation can address some of the barriers to take up we've learned about through the Renewable Heat Incentive (RHI) for example, such as reducing costs;
 - how we can harness the interest at a local level for low carbon technologies; and
 - how we support the transition to low carbon technologies in those buildings that currently derive their heat from high carbon fuels such as coal and oil.
- 2.2. While the wider questions around the future decarbonisation of heat are being considered, there are a number of actions we can take now – targeting those buildings off the gas grid remains a sensible approach. Work is underway to reform the RHI to rebalance the scheme and ensure it delivers its objectives in a manner which is affordable and offers value for money.
- 2.3. There are also more innovative solutions that our creative industries and academics can bring into the debate. Innovation can bring forward new products and ways of doing things that not only reduce carbon emissions but reduce the cost of success. We are eager to hear about these innovative solutions in detail, so that we may explore new avenues and opportunities.
- 2.4. We are asking for evidence across non-domestic systems as well as for off gas grid properties to enable us to develop an evidence base with industry and key stakeholders to support robust policy.

Non-domestic buildings

- 2.5. We are currently exploring our approach to reducing energy waste and use as well as decarbonising heating and cooling in non-domestic buildings. Emissions from non-domestic buildings currently make up 12% of UK greenhouse gas emissions,⁴ and will need to fall as part of our overall strategy to meet our Carbon Budgets.
- 2.6. The non-domestic sector includes a wide range of buildings. Buildings which are classed as non-residential cover a variety of uses such as shops, schools, hospitals, offices, community use and industrial buildings. But it does not cover industrial processes and related heat.
- 2.7. The non-domestic sector presents a significant policy challenge due to:
- the diversity of its buildings;
 - building use;
 - heating & cooling requirements;
 - occupancy patterns;
 - ownership;
 - size of organisation; and
 - the impact and barriers these can have on decision making, the design of buildings and their energy use.

Successful interventions will require a whole building approach covering energy efficiency, heat and cooling to maximise potential.

The current policy framework

- 2.8. The current policy framework includes Building Regulations, which set minimum energy efficiency requirements for new buildings and when work is carried out to existing buildings, including heating system upgrades or replacements. Through the Energy Efficiency (Private Rented Property) Regulations 2015, there will be a requirement for non-domestic private rented properties to have a minimum Energy Performance Certificate (EPC) Band E rating from April 2018 (at the point at which a new tenancy is established or a current tenancy is being extended. Under the Regulations, landlords of non-domestic properties will be required to install all measures necessary to improve a property to a Band E where the measures meet a simple seven year payback). As in the domestic rental sector, this requirement will be subject to a limited number of prescribed exemptions. This EPC E requirement will

⁴ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/47613/3702-the-carbon-plan-delivering-our-low-carbon-future.pdf

be extended to all non-domestic private rented properties from 2023 even where no change in tenancy has occurred.

- 2.9. In addition to the regulatory framework, there are a number of industry-led voluntary standards and tools, both in use and being considered for development. For example the use of sustainability assessment methods such as the Building Research Establishment Environmental Assessment Method (BREEAM) to achieve better performing buildings. Additionally, there is an increased interest in environmental and green building certifications such as Leadership in Energy and Environmental Design (LEED) and the National Australian Built Environment Rating System (NABERS). These schemes measure the environmental performance of buildings, monitor the energy efficiency, water usage, waste management and indoor environment quality of a building, and its impact on the environment. We are aware of the use of voluntary Display Energy Certificates and tools such as Building Information Modelling (BIM) and Soft Landings as approaches to manage expectations from design to construction and incorporating post occupancy evaluation to assess the performance of a building.
- 2.10. Alongside this call for evidence we have considered responses to the recent Business Energy Tax review, published in March 2016, and the outcome is now available on Gov.UK⁵.
- 2.11. Our work is also taking into account the roll out of smart meters in the non-domestic sector and the impact of this on consumers in providing access to information and data on energy use. Smart meters will record more detailed consumption data than is currently available, empowering customers to make more informed energy choices. All consumers will be able to directly access their energy data over the Smart Meter Home Area Network (SMHAN) and we will require suppliers to offer them a tool to access that. Consumers will also be able to join any device (paired via the central Data & Communications Company (DCC)) that speaks the right language to the SMHAN to access the data. Where they so choose, this data can be shared with service providers who can offer consumers ongoing advice and information about their energy use and energy saving actions. More broadly, consumers will be able to sign up to services offered by DCC users and so have their data retrieved by DCC (on a schedule or ad-hoc) in return for services e.g. switching advice, in connection with Time of Use tariffs, and others.
- 2.12. The European Energy Performance of Buildings Directive (EPBD) requires that the energy performance requirements in our national building regulations be set with a view to achieving cost optimal levels. Cost optimal is the level of energy performance that results in lowest cost over the lifetime of a building or improvement measure. To demonstrate this, the Department for Communities and Local Government (DCLG) will carry out an assessment on whether our current requirements are 'cost optimal' and report this to the European Commission by June 2017. This assessment will also identify whether there is any need to uplift standards.

⁵ <https://www.gov.uk/government/consultations/consultation-reforming-the-business-energy-efficiency-tax-landscape>

What we know

- 2.13. Our current knowledge of non-domestic sector buildings and their energy requirements is based on limited data and information. We have been gathering evidence to develop an improved understanding of the sector. We would like to test and develop our current understanding and thinking to determine where best to focus any future proposals and the role of Government. This will enable us to move to the next phase of developing proposals, to ensure the consequences of our policies are understood and that they are aligned with industry understanding and practice.
- 2.14. The Building Energy Efficiency Survey (BEES)⁶ provides detail on energy use and abatement potential to reduce energy and carbon emissions, as well as barriers and enablers to take up across the whole non-domestic building stock.
- 2.15. We estimate that there is significant potential from heat, cooling and energy efficiency across different sectors (public, business and commercial). BEES data indicates that today it would be possible to reduce energy consumption by 39% through installing more efficient equipment and improving energy management. Almost half of this total abatement potential came from measures with a private investment payback of three years or less. The estimated bill savings from these measures would be £1.2bn a year.
- 2.16. The potential lies across all types of buildings, with the most cost effective measures being in lighting upgrades, improvements in building energy management and insulation. On an absolute basis, the five largest sectors of offices, retail, industrial, hospitality and health, account for 68% of the total reduction potential.
- 2.17. The largest energy uses included space & water heating, accounting for 46% of all building energy use⁷. A further 7% of energy was used for space cooling. Lighting accounted for 14% of energy. The next largest energy use was for catering at 8%.
- 2.18. BEES divided the buildings into 10 sectors. The largest energy consumers were offices (17%), retail (17%), industrial (16%), hospitality (11%) and health (11%).
- 2.19. The maximum non-traded technical potential in the Carbon Budget 5 period (2027–2032) in existing non-domestic buildings is estimated to be 67MtCO₂e⁸, in addition to current policies. This includes the potential through buildings energy efficiency measures as well as low carbon heating and district heating, energy using products and projections on how the building stock will evolve and what existing policies will deliver.
- 2.20. We have also been engaging with industry stakeholders to better understand practice and approaches for non-domestic buildings and taking into consideration published evidence from academic literature and trade bodies.

⁶ Based on an external survey of non-domestic buildings conducted through telephone surveys with more detailed site visits for some buildings.

⁷ Building energy use excludes industrial process use within non-domestic buildings.

⁸ This is based on internal analysis that fed into the impact assessment on setting the level of CB5: http://www.legislation.gov.uk/ukia/2016/152/pdfs/ukia_20160152_en.pdf

Call for Evidence Question

- | | |
|----|---|
| 1. | What are your views on how we can maximise the potential to reduce energy consumption and reduce carbon emissions, including through decarbonising the heating supply in non-domestic buildings? Consider in your answer what existing statutory or voluntary standards are most effective and why. |
|----|---|
-

Future considerations

2.21. From our research and engagement, we have identified some key messages about decarbonising heat and cooling in non-domestic buildings and how to reduce or minimise building energy use. We are considering how we use our current knowledge to develop our future policy proposals for non-domestic buildings for the short term and those with a long term focus. We are keen for your feedback on whether there are other issues that we should be considering, and what role Government should take in either leading or supporting industry.

2.22. Two key areas for options are emerging for further consideration:

- Energy management
- Energy use

Energy management

2.23. As identified in BEES there is the potential to reduce energy consumption through improving energy management and controls. We will consider what more could be done to reduce energy requirements, whether that is through better understanding of energy use, how energy use is monitored or more efficient products. We will explore and consider behavioural and regulatory elements to understand the current requirements and how energy use is monitored and managed, including:

- Heating and energy management controls and systems, including the role of energy managers.
- Better understanding of the importance of monitoring, reporting and control of energy use and how this can be supported through more effective use of energy management systems, sub-metering and more meaningful ways of reporting and targeting energy use.

Energy use

2.24. BEES provides a stronger evidence base on the variety of energy uses within non-domestic buildings and opportunities for energy consumption to be reduced through more efficient materials and equipment. We will consider the challenge of how energy is used and what it is used for, and whether or not more is required to tighten the trajectory for minimum performance standards, including the current measures

used to assess building performance. Other feedback to date has identified the following issues and questions:

- We know there is a performance gap between predicted and actual building performance and are seeking to understand how the current requirements or measures contribute to this gap and how the current metrics used to assess buildings work and their wider impact on building performance standards.
- What are the planning, design and performance standards which could help to reduce the performance gap and build in post building monitoring and evaluation?
- What is the technology potential and what measures could be used to reduce energy use and decarbonise heat and cooling in buildings? In addition to low carbon options, this may, for example, consider the technical potential for heating and cooling such as natural ventilation and waste heat recovery.
- Can there be cost effective improvements to building regulations standards over time to reflect innovation opportunities?
- Could buildings that have high levels of energy efficiency be associated with a lower risk profile (in relation to regulatory risk and energy price volatility)?
- How to encourage investment to decarbonise electricity supply, gas and heat supply so that the carbon cost of doing business and providing services is reduced through changes to infrastructure.

2.25. We are interested in understanding more about current heat and cooling requirements and energy sources as well as the practical considerations which affect decisions on the choice of technology or technologies. We are particularly keen to understand how the heating and cooling requirements are determined by the size and use of building, its location and access to heat networks or fuel source. We are interested in what drives technical choices and the types of systems which are installed. Examples or case studies on meeting the different standards and approaches would be welcome.

Call for Evidence Questions

2.	Do you agree that these are the key considerations for heat and cooling in non-domestic buildings? What drives decisions about heat sources and cooling systems in non-domestic buildings? For example how do building characteristics, use and location impact on the decisions about the technology or technologies which are used?
3.	Should there be a further tightening of building performance standards? If so, what level should the standards be set at and over what timeframe should they be

	introduced so that they are manageable?
4.	Please provide any further information to support your answers to questions 2-3. In answering please note any current or planned work being driven by industry that may have a bearing. Examples or case studies on meeting the different standards and approaches would be welcome.

Targeting buildings off the gas grid

2.26. In 2013 non-domestic buildings were responsible for 4 MtCO₂e, associated with the use of oil and solid fuels for heating and cooking⁹. However, we are aware that many of these buildings are industrial buildings, and therefore the fuel use for heating may be linked with process activity. We would welcome your feedback and knowledge on the extent to which fuel use in such buildings is linked to both process heat and heat required for heating.

2.27. The current policy to support these buildings to decarbonise their heat supply is the Renewable Heat Incentive (RHI). Its purpose is to promote the use of renewable heat and is targeted at, but not limited to, buildings off the gas grid. Those without mains gas have the most potential to save on fuel bills and decrease carbon emissions by switching to low carbon heating technologies. Funding for the RHI has been agreed out to 2021. We want to develop the policy framework for the following period to encourage a transition away from high fossil fuel heating while moving away from subsidy and mitigating the risk of unintended effects. We would welcome views on which policy levers should be explored and how we should time the transition.

2.28. While the UK has some of the oldest building stock in Europe, many buildings have the potential to be upgraded cost-effectively with insulation or other measures to improve their thermal efficiency which will reduce their heating and cooling bills – and associated carbon emissions. We know that there may be particular challenges for some types of buildings that will remain difficult to heat cost-effectively. They will be thermally inefficient and their heating and cooling choice may be affected by other factors, such as:

- Off gas grid, so no gas option for heating (or grid connection cost may be prohibitive) or potential for a district heating network

⁹ This is based on adjusting energy consumption end use from ECUK 2016 by conversion factors. See ECUK 2016 Table 1.04: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/541168/ECUK_Tables_2016.xlsx

- Off national grid so cannot use electric heating and cooling (e.g. on an island or distance/upgrade costs are too high)
- Cost of installing energy efficiency measures necessary to make low temperature heating viable (eg through heat pumps) is significantly more than the reduction in energy costs over the lifetime

Call for Evidence Question

- | | |
|----|---|
| 5. | What action should Government take to reduce the use of coal and oil in buildings? Over what period of time should the transition occur? Which levers should be deployed to support buildings that are harder to heat? Is there a fuel use connection in off gas grid non-domestic buildings between heat required for processes and for heating? |
|----|---|
-

Innovative solutions

2.29. We remain committed to meeting our carbon emissions targets. The Climate Change Act requires UK emissions to reduce by 2050 to at least 80% below 1990 levels. Success will depend on an openness in Government and in the market to new ideas: new technologies and ways of doing things that bring down costs and carbon emissions. The low carbon industry is a growing economy in which big ideas should thrive. Innovative solutions can produce new or improved technologies and novel business models can make currently expensive products pay for themselves and help consumers meet their bills. We want to create economic opportunities for British-based businesses to sell low carbon economy products and services and British investors to make good investments.

2.30. We need innovative solutions, and in the UK we have an engaged and proactive industrial sector, and an academic community that is at the cutting edge of innovative design. We wish to hear from these and all sectors about new ways of thinking for the future.

Call for Evidence Question

- | | |
|----|---|
| 6. | What other innovative solutions or opportunities exist that may have a tangible impact on emissions from heat in buildings, either in the next two Carbon Budgets or out to 2050? Please provide any supporting evidence. |
|----|---|
-



