

INCREASING THE NUMBER OF NEARLY ZERO ENERGY BUILDINGS

UK NATIONAL PLAN

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Introduction

This document sets out the national plan for increasing the number of nearly zero-energy buildings in the UK, as required by Article 9(1) of Directive 2010/31/EU on the Energy Performance of Buildings.

The Directive defines a nearly zero-energy building as *'a building that has a very high energy performance, as determined in accordance with Annex I [of the Directive]. The nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby'*.

UK application of the 'nearly zero energy building' definition

This definition does not mandate the inclusion of a very significant proportion of renewable energy. This is because the word "should" is used as a matter of Community legal practice, to signify an aspiration rather than an obligation.

The UK Government already has a target for all new homes in England to be 'zero carbon' from 2016 and an ambition for all new non-domestic buildings in England to be zero carbon from 2019 (2018 for new public sector buildings). We consider that the approach we are adopting for zero carbon buildings will meet the definition of nearly zero energy buildings for the following reasons:

- although a range of low and zero carbon technologies will count towards meeting our zero carbon standard, we expect that in practice the policy will drive high levels of on-site renewables, for example heat pumps, photovoltaic panels etc;

- similarly, we expect this to encourage the development of heat networks that, in the longer term, could be connected to renewable heat sources even if, in the short to medium term, gas combined heat and power is more prevalent;
- we believe that low carbon technologies which are not classed as renewable still have a significant role to play in the aims of the Directive. Their use will significantly reduce the cost of building to high energy performance standards, while still achieving significant reductions in carbon emissions;
- the building regulation standards for zero carbon buildings will take into account all of the energy uses covered by Annex I. This will be delivered through an energy efficiency standard covering space heating and cooling, with the remaining energy demand for fixed services being covered by the broader carbon emissions standards set in the regulations.

Northern Ireland proposes to apply the same standards as England by 2017 for all new homes and all new non-domestic buildings in England to be zero carbon from 2020.

The Scottish Government share the ambition for zero carbon buildings and work is underway to investigate and discuss the challenges presented by further progressing the zero carbon agenda. At present, the focus is on delivery of revised energy standards within the 2010 Scottish building regulations which reduce CO₂ emissions from new buildings by 30% compared to 2007 Standards. In keeping with the recommendations in the Sullivan Report, *A Low Carbon Building Standards Strategy for Scotland*, the Scottish Government has given a commitment to further reviews of energy standards for 2013 and 2016.

UK Government strategy

Under the Climate Change Act 2008, the UK has committed to legally binding greenhouse gas emission reduction targets of at least 34% by 2020 and at least 80% by 2050. To meet these targets, the emissions footprint of our buildings will need to be almost zero. We will achieve this through a mix of two main changes:

- **Reducing demand for energy in buildings** - by increasing the thermal efficiency of buildings through better insulation; by encouraging consumers to use smarter heating controls and Smart Meters; and by improving the energy efficiency of lighting and appliances, and encouraging more efficient use of hot water. Better demand management can save money, bringing down energy bills, and release resources to support other activity and promote growth.
- **Decarbonising heating and cooling supply** - by supporting the transition from conventional gas and oil boilers to low carbon heating alternatives such as heat pumps and more efficient systems such as heating networks or combined heat and power. A move away from fossil fuels for heating, hot water and appliances can reduce our dependence on imports and associated price volatility, thereby improving the security of our energy supplies.

Learning from history, it has taken around 40 years for cavity wall insulation to reach today's level of market penetration. Achieving the scale of change ahead therefore requires us to start now.

This decade we need to complete the cost effective 'easy wins' in the buildings sector. This means maximising our energy efficiency efforts over the next decade. This will reduce costs and the amount of low carbon heating needed in future years.

We also need to prepare for the future. In the buildings sector, this means acting now to build the supply chain for low carbon heating, cooling, and lighting and appliances to stimulate the innovation and competition that will bring the cost of these technologies down to a level that will make them competitive with fossil fuel-based (or less efficient) alternatives.

We will begin building the market for low carbon heating technologies, such as air- and ground-source heat pumps, so that these can displace expensive, carbon intensive alternatives. At the same time, we will encourage further deployment of heating networks, particularly in urban areas where building-level solutions may face more barriers. And in parallel we will continue to improve the efficiency of our existing gas boilers.

The 2020s will be a key transitional decade in delivering mainstream low carbon heat from heating networks and in buildings, and will see the expansion of low carbon heat at scale into residential areas. Progress in the 2020s will be important in ensuring a smooth and cost effective transition to low carbon heat – 2030 would be the latest opportunity at which to begin roll-out at scale taking into account historical deployment trends.

Reducing demand for energy in buildings

Reducing our demand for energy is often the cheapest way of cutting emissions, and will also benefit consumers and our economy. In the near term, it will reduce demand for gas and electricity in buildings, helping to bring down emissions. In the medium term, it will save money on bills, releasing spending power to benefit the economy and it will enable smaller and therefore, cheaper, low carbon heating and cooling systems to be installed. In the long term, it will help to reduce the challenge of balancing the electricity grid.

We can achieve a reduction in energy demand either by improving the energy efficiency of building fabric and fixed building services such as lighting and

heating, or by changing the way we behave so that we use energy more intelligently and reduce the amount we need.

As a result of the boiler standards introduced in 2005, savings made from the introduction of domestic condensing boilers up to 2020 are expected to amount to around £2 billion a year for the UK as a whole. Over this period total savings from condensing boilers will amount to £15 billion. In addition, we will also capture the remaining potential in cavity walls and lofts by insulating all cavity walls, where practicable, by 2020 and insulating all lofts, where practicable, by 2020.

Improving the heat efficiency of buildings

Existing buildings

Many energy efficiency measures are inherently cost effective and help people and businesses save money on their bills, but barriers such as upfront costs, disruption and lack of information about how to take up these opportunities can present real problems.

The UK's building stock is one of the oldest in Europe and the Government recognises that, to enable the transition to a decarbonised building sector, standards will need to be raised in every type of building.

The Green Deal is the UK Government's flagship energy efficiency policy, designed to overcome barriers to improving the UK's building stock. Alongside the Green Deal, the new Energy Company Obligation (ECO) will play an important role in supporting the installation of solid wall insulation, and also in providing upfront support for basic heating and insulation measures for low-income and vulnerable households. ECO will integrate with the Green Deal, allowing supplier subsidy and Green Deal Finance to come together into one seamless offer to the consumer.

The Green Deal financial mechanism eliminates the need to pay upfront for energy efficiency measures. A Green Deal advisor will recommend a package of cost-effective measures for the building (based on an Energy Performance Certificate (EPC)). If the measures are installed with Green Deal finance, the building occupier then pays this money back over time as part of their fuel bill. If they leave the building, the responsibility for payments passes to the new occupier. It is a key principle of the Green Deal that the repayment cost of the measures should be covered through savings on lower fuel bills, so that consumers will not see their fuel bills rise, even though they are paying back the cost of the measures .

At a local level, the Green Deal will enable many households and businesses to improve the energy efficiency of their properties so less energy is consumed and less money is wasted.

The key focus of ECO will be on those householders who cannot achieve significant energy savings without an additional or different measure of support. For example, this includes vulnerable and low-income households and those living in harder to treat properties, such as solid walled properties.

New buildings

The Government is committed to successive improvements in new-build energy standards through changes to Part L of the Building Regulations in England and their equivalents within the Devolved Administrations. In October 2010, the new regulations in England and Wales (Northern Ireland October 2012) introduced a 25% improvement on 2006 carbon emissions standards for new buildings, while regulation in Scotland delivered a 30% reduction on their 2007 standards. In England, the current review of the Building Regulations is looking at opportunities for further improvements for 2013 where these can be achieved while meeting our commitments to reduce the regulatory burden on industry, and house builders in particular. The consultation on these proposals closed in April 2012 and the responses are

currently being considered. Any changes would come into effect from October 2013. In Wales, which became responsible for Building Regulations in 2012, current consultation proposals are aimed at delivering a 20% improvement in non-domestic building performance and a 40% improvement in new housing. Further review of energy standards within building regulations is being progressed separately in both Wales, Northern Ireland and Scotland.

Improving the electrical efficiency of lighting and appliances

As well as improving the fabric of our buildings themselves, it will also be important to minimise the energy we use for our lighting and appliances. Energy-using products in our homes and offices, such as white goods, lighting and televisions, contribute around 14% of the UK's CO₂ emissions. By removing the least efficient products from the market and promoting the sales of the most efficient, emissions and energy bills are reduced significantly.

By the end of 2012, minimum EU performance standards and labelling conventions will have been agreed for most domestic and commercial appliances. Looking further ahead, these standards will also cover energy-related products, which may not directly use energy but which contribute to energy consumption, such as double glazing and insulation. The first of these is likely to be regulated from 2014.

By 2020, the measures agreed so far are projected to save the UK 7 MtCO₂e¹ per annum, and the next tranche of measures are expected to save a further 6 MtCO₂e per annum, subject to the stringency and timing of these measures being finalised in Europe.

Changing behaviour to reduce demand

The choices consumers and businesses make about how to use energy can have a huge impact on energy demand and on the costs they face. To help

¹ Metric Tonne Carbon Dioxide Equivalent

homes make the best use of their energy and prevent waste, the Government is mandating Smart Meters to be installed in every home by 2019. Rolling out Smart Meters will enable people to understand their energy use and maximise opportunities for energy saving. The Government is also mandating the provision of in-home displays for domestic customers and ensuring that consumers have the information and advice to make changes that will cut carbon and energy bills (through its consumer engagement strategy).

EPCs are required on the sale, rent or construction of a building. Prepared by accredited and suitably qualified energy assessors, EPCs give consumers A to G ratings for a property's energy efficiency and also provide advice on measures that can be carried out to improve its efficiency. The Energy Saving Trust estimates that the average household could save up to £300 a year by making energy saving improvements. EPCs are also required for buildings occupied by a public authority which are larger than 1,000 m² and are frequently visited by the public. These EPCs (known in the UK as Display Energy Certificates (DECs) to distinguish them from EPCs produced in connection with a property transaction) must be displayed in a prominent place so that they can be easily seen by anyone visiting the building. DECs for these buildings must be updated every year. The discipline of having to update a DEC every year and display it to the public may have an impact on behaviour and encourage better energy management.

A revised version of the domestic EPC was launched in April 2012 (and will be launched in Scotland in October 2012). It has been redesigned and made more consumer friendly with clear signposting to the Green Deal and information on which measures qualify for Green Deal finance. The EPC will also be used as a mechanism to disclose the existence of a Green Deal on a particular property.

The Government believes that there may be potential for smarter use of heating controls to help save energy, by giving consumers and businesses greater control and flexibility over the way in which they heat and cool their homes. At a relatively simple level, thermostatic radiator valves allow radiators

to be turned down or off in rooms that are not in use. More sophisticated options, such as remote controls and sensors that respond to building occupancy, offer more possibilities. As these technologies develop, this may enable consumers to reduce the average internal temperature of their buildings – delivering savings of around 10% of energy use on space heating for every 1°C reduction – without experiencing a big change in their levels of thermal comfort.

Decarbonising heating and cooling supply

Achieving a cut in building emissions to virtually zero by 2050 will only be achievable if we decarbonise our supply of heat and cooling as well as reducing demand. It is likely that we will still get most of our heat from natural gas well into the 2020s.

As things stand, we are increasingly dependent on other countries for our oil and gas supplies, and continuing to use these fuels may mean that we are more exposed to global pressures which lead to price spikes and increases. Keeping the price of energy competitive is crucial. For many years, our domestic consumers have benefited from the UK's competitive energy market – from 2008 to the present day, UK gas prices have been among the lowest in Europe.

As we look further ahead, the proportion of heat provided directly by natural gas will fall as we see increased use of low carbon technologies, but this will be a gradual process. Deployment of heat pumps and other low carbon heat technologies, and the construction of district heating systems in urban areas with high heat demand, will replace natural gas as the primary source of heat in this country, a process that has already started and will take many decades to complete. Continuing efforts to deploy highly efficient condensing boilers in homes and businesses remains a priority in the transition.

Building-level technologies

Decarbonisation at the level of individual buildings substitutes current heating systems (such as gas boilers) for low carbon alternatives such as heat pumps or biomass boilers. The portfolio of options available have specific strengths and applications for which they are best suited. There are also technical and practical barriers to these technologies and measures, which will need to be addressed if we are to see large-scale deployment.

All households and businesses will need to play a part in this transformation. The Government aims to create the right conditions for homes and businesses to generate their own heat using low carbon technologies or make use of low carbon heat from a heat network, but there are a number of key obstacles to overcome.

- low carbon heat technologies such as heat pumps and biomass boilers are still expensive relative to conventional boilers, costing in excess of £5,000, and payback periods for this investment are often long. This is by far the biggest barrier to deployment;
- low carbon heat technologies take longer to install compared with a conventional boiler, which offers a particular barrier given that heating systems are often 'distress purchases' – bought only when the old system breaks down;
- the installation of technologies such as ground-source heat pumps requires a specialist skill set, meaning that finding installers with adequate training and skills is a potential barrier to deployment;
- heat pumps in particular can place added strain on the electricity grid. This can partially be managed through the use of storage, such as hot water cylinders to store heat, or batteries to store electricity generated off-peak.

While we do not expect mass market deployment ahead of the 2020s, there are important opportunities now to build a market for low carbon heat in buildings, particularly in commercial buildings and off-gas grid homes. Many public and commercial buildings have already taken up energy efficiency measures, and work to develop low carbon heating in public and commercial buildings will help to build the supply chain for low carbon heat in the UK.

Cooling demand is also expected to rise significantly in these buildings, so increasing the efficiency of air conditioning units and installing low carbon alternatives such as reversible heat pumps will also be important. In the residential sector, 4 million households are not currently heated by mains gas, and many have to rely on expensive, higher carbon forms of heating. Heating oil is still used in around 2 million homes, for example. These households will usually gain more from switching to low carbon heating because their heating bills and carbon emissions are higher than average and they currently suffer the inconvenience of having to have fuel delivered.

The Government is therefore committed to providing financial support for low carbon heat consistent with the UK's 2020 renewables target. The Renewable Heat Incentive (RHI) is the first financial support mechanism of its kind in the world to increase the deployment of renewable heat. Communities, charities, and public and private sector organisations can apply to receive a payment for generating heat using eligible low carbon heat technologies.

Under the current phase of the RHI, the Government expects to deliver:

- an additional 56.5 TWh² of low carbon heat by 2020 (of which, 30.5 TWh will be delivered to buildings – up to 112,000 low carbon heat installations), saving 43 MtCO₂e overall (of which over half is from buildings) over the period 2011–20; and

² Terawatt hours

- 11% of our heat coming from new and diversified renewable sources, as part of an overall ambition to achieve 12% by 2020.

The quality of installations and the supply chain to support low carbon heat need to be first class to ensure consumer confidence. The Government is requiring all RHI installations (up to and including 45 kWh) be installed by an accredited Microgeneration Certification Scheme³ installer.

The Government expects to introduce support for the domestic sector under the next phase of the scheme. In the interim, the Government has launched the Renewable Heat Premium Payment (RHPP). The RHPP provides a single payment to households that install low carbon heat and also includes competitions for social landlords and community groups. A crucial part of the RHPP is then monitoring a significant number of installations made under the scheme. This information will inform the Government's longer-term approach to support for low carbon heat.

Network-level technologies

At network level, substituting natural gas with sustainable biomethane in the grid is, at first glance, the least disruptive option. Decarbonising our heat and hot water supply without having to change our heating systems, and while using a gas grid that is already built, initially appears like an attractive option.

However, injecting biomethane into the gas grid presents a number of challenges. Biomass is likely to be needed for sectors that are hard to electrify, such as freight and some industrial processes. In addition, there are doubts over the scale of sustainable global biomass supply. It would, therefore, be high risk to assume that large-scale biomethane injection into the grid is a viable option. The gasification process or anaerobic digestion of UK-sourced waste(s) or biomass could only meet a small proportion of UK demand, with gas consumption in buildings currently running at close to 500

³ <http://www.microgenerationcertification.org/>

TWh a year. Relying on imports would leave the UK exposed to international bioenergy prices that may rise substantially.

Heat networks, where heat is generated remotely and supplied to buildings, offer a more promising option. Up to half the heat demand in England, and much of it in other parts of the UK, is found in areas that potentially have heat loads dense enough to make heat networks a viable means of delivering heating direct to homes and businesses. Combined in the medium and long term with low carbon heat sources, this offers a valuable alternative to building-level heating as a means of decarbonising the UK's heat supply.

Heating networks have the advantage of convenience and flexibility, and would allow for the cost effective deployment of transitional heat sources. For example, in the nearer term, it may make most sense for heat networks to be supplied by combined heat and power plants fuelled by natural gas but, in the long run, this may be supplanted by heat from nuclear or carbon capture and storage power plants, energy from waste plants or from dedicated large-scale heat generation through heat pumps or biomass boilers large enough to supply whole cities. This approach allows for a portfolio of heating sources to be deployed which best suit local contexts.

Heat networks require significant deployment of new infrastructure and therefore face a number of barriers, notably the cost of installing the pipes, as well as questions of regulation, ownership and charging structures. Practicalities of geography can also restrict the deployment of heating networks. The Government will therefore explore the potential to remove barriers in these areas.

Intermediate targets

Within the UK, intermediate targets for improving the energy performance of new buildings by 2015 are addressed by a programmed review of energy standards within building regulations (see *'Improving the heat efficiency of*

buildings - new buildings' section). We will consider the need for setting further intermediate targets in due course. This work will be guided by assessment of building performance delivered by standards against a functional definition of what constitutes a 'nearly zero energy' new building.

Indicator of a building's primary energy use

This information is now incorporated in the UK National Calculation Methodologies. It can be found on the domestic Energy Performance Certificate (EPC) in use in England, Wales and Northern Ireland, and will be included in the EPC used in Scotland from October 2012. The EPC shows a dwelling's current primary energy use per square metre of floor area. We will ensure that this information is taken into account when looking at increasing the number of nearly zero energy buildings.

Conclusion

By 2050 we will have transformed our buildings and the way in which we generate energy. Heating and powering buildings produced 45% of the UK's carbon emissions in 2010. Those emissions are a result of burning fossil fuels to heat buildings, and generating the electricity that powers our lighting and appliances. Buildings will need to be much better insulated and make use of Smart Meters and heating controls, and more efficient lighting and appliances, to reduce their demand for energy. At the same time, we will move away from the use of fossil fuels for heating and hot water and towards low carbon alternatives such as heat pumps or heating networks. By 2050, emissions from heating and powering our buildings will be virtually zero.