Heat inquiry

Energy and Climate Change Committee

This is an Engineering the Future response to the Energy and Climate Change Committee Heat inquiry

The development of this response has been led by:

- **The Royal Academy of Engineering**

The response has been written with the assistance of and endorsed by:

- The Chartered Institution of Water and Environmental Management
- The Energy Institute
- The Engineering Council
- The Institution of Chemical Engineers
- The Institution of Engineering and Technology
- The Institution of Mechanical Engineers
- The Institution of Structural Engineers

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We provide independent expert advice and promote understanding of the contribution that engineering makes to the economy, society and to the development and delivery of national policy.

Engineering the Future

Summary

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We provide independent expert advice and promote understanding of the contribution that engineering makes to the economy, society and to the development and delivery of national policy. The development of this response was led by the Royal Academy of Engineering with support from The Chartered Institution of Water and Environmental Management, The Energy Institute, The Engineering Council, The Institution of Chemical Engineers, The Institution of Engineering and Technology, The Institution of Mechanical Engineers and The Institution of Structural Engineers.

The key points are:

- Reducing emissions from the heat sector through renewable technologies and demand reduction is vital for the UK's long-term energy strategy. There have been significant changes in government mechanisms in this sector that have led to confusion with industry, financers and consumers. In particular, the Green Deal shows worrying low levels of take-up. This is a major concern given the scale of the challenge in the heat sector.
- Biomass is a vital renewable fuel but GHG emissions and sustainability issues must be carefully considered across the whole life cycle (as should be the case for all renewable technologies). With a large proportion of biomass being imported into the UK there is a major responsibility to ensure the highest standards of sustainability are maintained.
- Heat pumps can provide a low carbon supply of heat but only if installed and operated effectively and as part of an electrical grid with a carbon intensity at least as low as today but preferably much lower in the future.
- District heating is much more common outside of the UK, as within the UK high capital costs are a barrier to its installation. However, recent schemes here and internationally show that it does have advantages to offer for both new build and retrofit.
- Cooling is already a significant source of demand and is likely to increase. It can be dealt with much more effectively if considered as an integrated part of the heating system, particularly through the use of passive cooling techniques.
- Renewable heat technologies are relatively unfamiliar. Improving the relevant engineering skills for installers through training and promoting good engineering practice will be vital to their successful large-scale deployment.

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1. Is the government taking the right approach to reduce heat energy demand?

1.1 While the government's basic principle to reduce heat demand through the Green Deal is sound, it is difficult to give a simple answer to this question given that the sector has many different stakeholders and government schemes have changed considerably in recent times. This has led to confusion among both consumers and industry about what incentives are available and uncertainty as to what the long-term outcomes will be.

1.2 It is unclear whether the new arrangements will prove successful in the long run. When determining success, it is vital that the prospective energy savings arising from Green Deal interventions are, in fact, achieved in practice and this must be continually monitored rather than relying on *a priori* forecasts. Early indications suggest the Green Deal is not performing well.

1.3 It is important to stress that for long-term success and learning effects to be realised, policy stability is needed – helping to reduce risk and uncertainty. Raising and reinforcing the importance of heat to our energy system will help to reduce confusion. There is an opportunity to link this to other areas such as the roll-out of smart meters.

1.4 More generally, it is unfortunate that this consultation excludes certain areas of heat waste. EST's recent report *At Home with Water*[1] highlights the extent to which heat is wasted through water use in households, illustrating how the subject of heat needs to be looked at in totality.

2. What progress is the government making on reducing the demand for heat?

2.1 Government policy has been a major driver of reducing heat demand over the last decade. Since 2004, energy use in households has fallen by 18%, with the vast majority of this reduction being from space and water heating. The key drivers of this reduction have been the improvement of boiler efficiency resulting from the mandatory use of condensing boilers since 2005 and insulation programmes.

2.2 However, recent policy changes by the government seem likely to have a less positive influence on reducing demand for heat. The current administration inherited major insulation programmes – the government's own fuel poverty scheme and the energy supplier obligation programmes. The former has since been discontinued (in England) and the latter reduced in scale. These have been replaced by the Green Deal that makes available loans at commercial rates which are tied to the property rather than the individual. The government's own projections indicate that this will be approximately one third as effective as the policies it replaces[2]. Moreover, take-up on the Green Deal has been initially very slow suggesting concern on the part of consumers and possibly problems relating to financing.

2.3 The Renewable Heat Incentive (RHI), which offers financial support for renewable heat technologies, has been operational for non-domestic customers since November 2011 and is expected to be open for domestic customers in spring 2014. Media reports[3] suggest that the total paid out to May 2013 has been less than £12m, which is insignificant compared with the scale of the challenge.

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[1] http://www.energysavingtrust.org.uk/About-us/The-Foundation/At-Home-with-Water

[2] Rosenow, J. and Eyre, N. (2012) The Green Deal and the Energy Company Obligation – will it work? 9th BIEE Academic Conference - European Energy in a Challenging World: The impact of emerging markets. St John's College, Oxford. 19/20 September 2012

[3] http://www.businessgreen.com/bg/news/2271949/government-boosts-rhi-in-attempt-to-warm-up-renewable-heat-market

2.4 Delays in implementation, excessive centralised bureaucracy, changes to the tariffs, the decision to cut payments to mid-size biomass users and the complexity of the scheme as well as the lack of clarity regarding relationships with other schemes, such as the Renewable Heat Premium Payment (RHPP), have contributed to complex arrangements that are poorly understood by many potential beneficiaries and overall it is no surprise that progress has been limited.

2.5 Ultimately, the success of policy will depend on government's ability to design schemes that are attractive to investors and customers alike and that integrate well together, for example the ability to combine Green Deals with RHIs.

2.6 It is also important to note that any success in improving energy efficiency measures runs the risk of 'rebound effects' whereby lower heating costs result in people maintaining higher temperatures in homes for added comfort, thus negating any possible reductions in heating demand. This has been observed in countries with high levels of thermal efficiency in buildings and, even in the UK, average household temperatures have been steadily rising since the wide-scale introduction of central heating[4].

3. Biomass is deemed a key fuel for heat production from both the cost and GHG perspectives. What should be done to ensure methods of calculating biomass GHG balance represent an accurate picture?

3.1 The EU has set a 20% renewable energy target by 2020 with the UK's target set at 15%. Most of the overall 20% EU target will be met from burning biomass; renewable energy plans of Member States envisage 54.5% of renewable energy coming from bioenergy, including biofuels, but with the majority to come from burning wood for heat and electricity.

3.2 The UK government has proposed a CO_2 limit of 240 g/kWh applying to subsidised biomass electricity. It should be noted that this is well above the figures for alternative low carbon generation technologies such as nuclear power and other renewables, even taking into account initial construction emissions. It also does not take into account emissions of pollutants such as soot and volatile organics that can have a detrimental effect on air quality: a problem that is particularly difficult to regulate in the case of single-dwelling biomass heaters. However, it should be remembered that all large-scale plant will have associated environmental impacts such, in the case of nuclear energy, the legacy radioactive waste. Continued innovation in biomass technology is also expected to address many of the environmental impacts over the short to medium term.

3.3 While not wishing to comment on specific biomass standards, we urge that the calculation of GHG emissions should include the complete system, from growing the crop, through its harvesting, transport and processing (although such full life-cycle analysis should not be limited to just biomass). This is becoming particularly important with the increase of international trading in biomass such as shipping wood pellets from North America to supply biomass for co-firing in electricity generating plant in the UK.

3.4 The calculations should take account of knock-on effects of biomass production, such as the displacement of local food production to areas previously covered by virgin forests or grasslands, impacts on local climate, the conversion of ancient forest to plantations or construction of transport infrastructure that leads to other increases in GHGs. Even when a biomass scheme uses "waste" agricultural material (such as palm kernel residues), the value ascribed to what was previously classed as a waste material can

[4] http://www.bre.co.uk/filelibrary/pdf/rpts/fact_file_2008.pdf

change the economics of production and lead to an increase in the area under cultivation and hence GHG emissions.

3.5 While some biomass schemes grow, harvest, burn and replant crops over a cycle of a few months, schemes involving trees in temperate latitudes can have replenishment cycles of several decades. This leads to a *carbon debt* – a situation where CO_2 is emitted from burning biofuel many years before an equivalent amount of CO_2 is absorbed from the atmosphere by regrowth of the plant material. GHG accounting methods should take account of carbon debt.

3.6 It should be noted, however, that such full life-cycle emissions calculations can be very complex. This may be manageable for large industrial applications but much more difficult for domestic or even small-scale industrial users. It is therefore important that a relatively simple set of standards are provided for these applications.

4. There are sustainability guidelines for biomass, do these go far enough?

4.1 Since 1 April 2011, biomass electricity generators over 50KW have been required to report against sustainability criteria. From October 2013 generating stations of 1MW capacity and above will be required to meet the criteria in order to receive Renewables Obligation Certificates (ROCs).

4.2 We welcome sustainability guidelines which specify a minimum 60% GHG emission saving for electricity generation using solid biomass or biogas relative to fossil fuel and general restrictions on using materials sourced from land with high biodiversity value or high carbon stock.

4.3 However there are concerns over the sustainability of the use of biomass. Biomass can have a high water demand and also impacts on surface water runoff, erosion and other disruption to local hydrology. There are also biodiversity impacts from promoting mass monoculture. Large-scale biomass production is energy intensive (taking into account fertilisation, pest management, transportation, storage, processing and other raw materials) and may not offer the environmental benefits that have been promoted.

4.4 The Department of Energy and Cliamte Change (DECC) currently estimates that 90% of woody biomass feedstocks will be imported. Whilst it may be possible to incorporate a number of factors directly relating to the production of biomass, it is very difficult to link and assess the relative contribution that changes in policy in one country may have on environmental degradation, land use change and food prices in another. It may not be possible to fully assess the sustainability of biofuels at this time.

4.5 As biomass power stations rely on a finite land resource there are other issues. Since 2009, the price of timber has risen sharply, affecting other wood utilising industries. See also the answer to question 3 on carbon debt.

4.6 The UK is one of the world's largest importers of biomass. Unlike other renewables programmes it therefore offers only limited co-benefits in terms of energy security. It does place a heavy burden of stewardship on the UK to ensure that the overseas sources are sustainably managed.

5. What will the local environmental impact (for example air pollution) be from the use of heat generation in urban areas, for example CHP units?

5.1 In general, the environmental impact will depend on the technology and fuel being used and could potentially be either positive or negative. Often, there will be statutory requirements to limit pollution that could, in fact, set limitations on the development of particular technologies.

5.2 Burning both fossil fuels and biomass emits various substances such as oxides of nitrogen (NOx), volatile organics and particulate matter (PM). The PM is a complex mix of organic and inorganic substances which are responsible for cardiovascular health effects and premature mortality due to both short-term (24-hour) and long-term (annual) exposure. Technologies are available that will reduce NOx emissions from CHP plant but these will have a marginal impact on efficiencies and carbon emissions.

5.3 This is a complex area of regulation with combustion plant being governed by a number of applicable Acts and Directives enforced by various agencies depending on their size. The Biomass and Air Quality Guidelines for Local Authorities[5] published by Environmental Protection UK and endorsed by the Local Authorities Coordinators of Regulatory Services provides some helpful guidance. These combustion plants can have a significant impact on local air quality and the lack of coordinated regulation is a real issue which should be addressed as a priority.

5.4 The Clean Air Act 1993 requires emissions from chimneys to be smokeless and free of dust and grit and controls the height of chimneys, provided they are located in smoke control areas. It does not explicitly control emissions of PM that are invisible to the naked eye i.e. $PM_{2.5}$ and PM_{10}, nor does it control NOx emissions.

5.5 The Environment Agency regulates combustion plants over 50MW under Environmental permitting regulations. Development of small to medium scale CHP units (less than 20 MW heat input) are regulated by local authorities through the planning system, with impacts assessed against UK air quality standards which are transposed from EU Directives. Further impacts, for example noise and pollution from the often significant levels of vehicle movements required to deliver the biomass fuel, are also assessed at the planning stage. In practice, fuel delivery impacts are often the most controversial aspects of proposed schemes, as in urban areas such deliveries tend to be made at otherwise quiet times to avoid traffic congestion.

5.6 The RHI for domestic and non-domestic sectors specifies air quality for eligible biomass technology. This sets maximum permitted emissions limits of 30 grams per gigajoule (g/GJ) net thermal input for PM and 150 g/GJ for NOx. The Greater London Authority (GLA) are currently consulting on its Draft Sustainable Design and Construction Special Planning Document[6] (part of the GLA's planning policy). This proposes emission standards for combustion plant depending on local air quality that are much lower than the limits set by the RHI. Given that the RHI is publicly funded, there is an argument to say that it should require the most stringent conditions.

[5] http://www.lacors.gov.uk/lacors/upload/22062.pdf
[6] http://www.london.gov.uk/sites/default/files/MAINSD%26C%20SPG%2020130730.pdf

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6. What are the relative merits of using gas to directly provide space heating compared to centralised electricity production plus domestic heat pumps?

6.1 A heat pump operates by using mechanical energy (or work) to move heat from outside a building to the inside. The technology usually involves an electric motor that pumps a fluid through heat exchangers where it is converted from a liquid to a gas and back again taking in heat and then giving it out again – much the same as the technology used in a domestic refrigerator.

6.2 The cold side of domestic heat pumps is usually either, the outside air, drawn over a radiator by a fan, or alternatively a long coil of pipe containing water and antifreeze buried deep in the ground. These are referred to as an *air-source heat pump* (ASHP) or a *ground-source heat pump* (GSHP). How much heat is moved is determined by the *coefficient of performance* (COP) of the heat pump. This is the ratio of the heat output divided by the work that is put in.

6.3 The Energy Saving Trust (EST) carried out a field trial that first reported in September 2010 with an update in May 2013. This was a wide-ranging monitoring exercise of domestic heat pump installations in the UK[7]. It monitored performance of 83 heat pumps installed in UK homes for a period of at least 12 months and covered a variety of house types and applications. The EST trial found installations did not always perform as well as expected. Given this, it is unfortunate that the government has no information on the efficiency of the 7,459 heat pumps installed as part of Carbon Emissions Reduction Target (CERT) or whether the carbon credits associated with the installations were credible.

6.4 The EST study initially measured the average COP as 2.3 for the GSHPs and 2.2 for the ASHPs. The report update found that, following interventions, the overall performance improved slightly to 2.8 for GSHP and 2.5 for ASHP. Although the EST report shows some improvement in efficiencies, they are still well below what has been achieved in other EU countries, but in many cases these higher efficiencies have been achieved in buildings designed for low temperature heating systems (such as with underfloor heating rather than radiators). DECC, in partnership with the EST and BRE, is currently gathering more detailed information on heat pump performance from a larger sample of installations (~700) through RHPP monitoring.

6.5 Early design practices were far from optimum, using simplistic assumptions about “kW/m” of installed ground-loop, rather than properly investigating local thermal conductivities and designing accordingly. Also, interference between adjoining GSHPs was routinely ignored, especially in London, in an effort to meet targets for 10% on-site renewables in buildings. Where proper engineering design is used, COPs well in excess of 3 can regularly be achieved. The EST figures are indicative of what happens during an early-stage boom in a new industry when no-one is overly concerned about long-term performance. Effective use of heat pumps in UK homes is likely to require very major changes to heating systems and their installation.

6.6 Heat pumps, correctly applied with decent coefficients of performance, will reduce carbon emissions compared to gas fired domestic heating boilers, even at the relatively poor carbon intensities of today’s electricity grids. We would expect grid carbon intensities to improve significantly as coal fired power stations close and more gas fired CCGTs and renewables are connected, assuming new nuclear generation is built in sufficient quantities

[7] *Getting warmer: a field trial of heat pumps,* The Energy Saving Trust
http://www.energysavingtrust.org.uk/Media/node_1422/Getting-warmer-a-field-trial-of-heat-pumps-PDF

to replace old nuclear that closes. The addition of carbon capture and storage would further improve this position. Put in simple numerical terms, the emissions from a gas condensing boiler are:

190 g/kWh (gas)/0.9 (efficiency) = 211 g/kWh

Which compares to well-applied heat pump emissions of:

450 g/kWh (today's grid)/0.93 (electrical distribution losses)/2.8 (heat pump efficiency) = 173 g/kWh.

6.7 However, gas boilers offer an additional benefit in that there is little penalty in installing a relatively high capacity boiler that allows rapid heat-up of the living space and gives users the ability to regulate heating to match their lifestyles. Energy can also be stored far more cheaply in the gas supply network than would be possible by electrical storage and gas boilers thus provide a load-levelling ability that the heat pump option does not have. There are also potential issues of electrical distribution network capacity if the use of heat pumps becomes widespread, which would hasten the need to move to smart grids. This is particularly significant given the variability of heat demand.

6.8 Industry has recognised the problem of low COPs and a new standard MIS3005[8] has been produced setting standards for the application of heat pumps. This requires a minimum COP of 3.5 and, when teamed with low carbon generation, such as nuclear power or renewables, can produce worthwhile saving of CO_2.

6.9 However, this raises the question of when and if a supply of low-carbon electricity will be available. Recent, seemingly *ad-hoc*, government actions to give tax breaks to shale gas producers, to oppose on-shore wind farms and to reduce subsidies to PV panels do not send the message that a low-carbon electricity supply is a priority. This is an example of an issue that has been raised previously with this committee by the engineering profession, to the effect that it is not helpful to consider different energy uses in isolation – there needs to be a far greater level of 'joined-up' policy making that encompasses all aspects of energy supply and use.

7. Why is community heating/CHP not more common in the UK?

7.1 In the UK, district heating was often the designer's first choice in the high density new build housing of the 1960s, often using cheap low-grade oil. But it offered little advantage when cheap North Sea gas became widely available and much of that housing has since been demolished for other reasons. The technology is still widely used in other mixed-use applications like airports and university campuses but to a much lesser degree proportionately than in other countries, particularly in Scandinavian cities. Should the gas network cease to play a role in any decarbonised future heating system then district heating networks can offer certain advantages across a range of technologies including heat pumps, biomass, waste and CHP.

7.2 Installation of district heating schemes is easiest in new developments. However, given that most houses that will exist in 2050 have already been built, the challenges associated with retrofitting district heating schemes into existing communities would need to be overcome. One of the main barriers to district heating are high capital costs in the UK but this is mainly the result of charges under the Street Works Act and, once installed, the

[8] http://www.greenbooklive.com/filelibrary/Microgeneration/MIS_3005_Issue_3_1a_Heat_Pump_Systems_2012_02_20.pdf

operating costs are attractive. The government's new Heat Networks Delivery Unit (HNDU) will assist the early stages of heat network development, where lack of money and lack of knowledge are common barriers.

7.3 Recent district heating schemes in Sweden and Denmark have proved successful, offering additional benefits such as load shifting and added flexibility in the electrical system through varying the power/heat output from CHP units.

7.4 Ideally, communal heating schemes would serve both new and old housing as well as non-residential buildings which have 'baseload' day time heat demands. In most successful community heating schemes of any size in mainland Europe, the local authority has played an important role. In the UK, schemes in Sheffield and Nottingham both relied on local authority leadership and the same has been true in Malmö and Västerås in Sweden as well as projects in France and Germany. Present government policy has caused many local authorities (particularly in northern metropolitan areas) to shed all but essential functions and it is difficult to see how they could take the initiative in new community heating schemes. Several Continental community heating schemes are combined with waste disposal. For example, the Issy-les Moulineaux site in western Paris, opened in 2008, can treat 460,000 tonnes of residual waste a year, alongside a recycling facility for 50,000 tonnes. The energy from waste plant burns over 30 tonnes of waste an hour, and produces 52 MW of electrical power. The "waste" heat is used to provide district heating for buildings including the Musée D'Orsay[9]. Unfortunately, with protests against local incinerator construction commonplace, it is difficult to see this type of facility in the UK outside of industrial parks although it is encouraging to note that a number of schemes do look likely to go ahead.

7.5 New initiatives are also being taken forward in many towns and cities across the UK, as the full environmental potential of heat networks becomes more widely recognised. In London, for example, developments are being driven by the implementation of the London Plan. District heating networks are fuel flexible. This means not only that a range of low carbon fossil fuel, renewable, and surplus energy sources can be integrated, but also that heat networks can migrate towards lower carbon operation.

7.6 Mention should be made of new CHP schemes based around fuel cells. These are now beginning to appear in major sites including the TfL building and the Regent Street Energy Centre. Fuel cell systems are at the core of the New World Trade Center in New York.

8. What are the lock-in, costs and GHG savings from the promotion of different forms of domestic heating solution?

[Not answered]

9. Should the government take any further any specific actions in relation to cooling?

9.1 The recent hot weather has reminded us that temperatures in Britain can become unpleasantly hot and humid, particularly in cities which suffer from urban heat island (UHI) effects and climate change is likely to result in greater variability and more frequent hot periods. Most significantly there is mortality associated with UHI overheating. In the hot summer of 2003, more than 900 deaths were directly attributable to overheating in the UK

[9] Information from http://www.letsrecycle.com/news/latest-news/waste-management/largest-french-waste-incinerator-unveiled-in-paris

and more than 20,000 attributable deaths occurred in Europe. It is therefore advisable to consider cooling when specifying any thermal management system. In almost all cases, a well-designed cooling system, integrated with the building structure and heating system will be more efficient than a succession of schemes added as afterthoughts to residential or office buildings.

9.2 The need for cooling and the efficiency with which cooling is currently delivered to buildings has been generally ignored by government and in public debate. The requirement for air conditioning inspections under the Energy Performance in Buildings Directive is largely ignored by the public sector. There has also been little consideration of the impact of high insulation standards on summertime performance. For example, a small modern flat with west facing glazing left locked up during the day can easily reach 40C because of a lack of external shading.

9.3 New London flats are often sold with air conditioning, no doubt reflecting buyers' expectations, but with no regulatory control on efficiency that would be imposed on a heating system. Air conditioning design can itself create a heating problem. Much of the US high energy consumption is associated with using electric resistive heating to warm up air leaving dehumidifiers. Packaged air conditioners are substantially less efficient than systems, and while some can be reversed in winter to act as a heat pump, the efficiency performance is poor.

9.4 In many office buildings, air conditioning is required to ensure a comfortable working environment. However, even in hotter climates, in residential buildings and many commercial and public buildings, it should be possible to ensure comfort without this additional cost and energy use. Effective passive cooling techniques have been known for hundreds of years in climates warmer than foreseen in the UK. Key principles include improved insulation (but not internal to the walls), improved shading (to reduce solar gain), higher thermal mass (to use night-time cooling) and better ventilation[10]. These need to become part of standard designs in refurbishment and new build, and where appropriate should be incorporated into building regulations.

9.5 It should also be noted that groundwater cooling is fortuitously available from under-used aquifers below many UK cities. This technology is still in its infancy but there are large-scale trials[11] that suggest further investigation is warranted.

10. Why does the RHI not seem to promote heat pumps successfully?

10.1 There have been past difficulties in assessing heat pump performance and the factors which affect it. However the latest EST report has provided DECC with the means to be much clearer about the types of properties where heat pumps will be successful. Heat pumps work best in well insulated properties – key to their large-scale roll out is therefore to achieve improved insulation efficiency at the same time. The opportunity to combine RHIs with the Green Deal should be promoted, to the benefit of both schemes – an example of a joined-up approach.

10.2 There are factors other than the level of insulation which affect heat pump performance, but these are not yet well understood – hence RHPP monitoring. These include: occupants 'taking comfort' (eg, by running heat pumps for longer periods than the

[10] http://www.arcc-cn.org.uk/themes/overheating/practical-guidance/
[11] See, for example http://eprints.gla.ac.uk/82767/ (full text available on request)

heating systems that they replace); the relative contribution of boosts (immersion heaters), heating systems and operating temperatures; and quality of installation.

10.3 In older properties where space heat in transmitted by hot water flow to standard radiators, retrofitting of a heat pump to replace a gas boiler is not feasible, as water temperatures are tens of degrees lower with heat pumps. This implies an additional investment in new low temperature radiators. The result is that the overall system investment required for heat pump installation is unattractive, with very long payback times.

10.4 The level that tariffs are set at will also be crucial in order to attract installers but this is true across all the supported technologies.

10.5 More generally, the inclusion of heat pumps within the scope of 'renewables' was a relatively late development of the RHI. As explained above, heat pumps are simply the most efficient way of using electrical power to provide heating and are not, as such, 'renewable'. As noted in the answer to question 6, without a sufficiently low-carbon electricity supply they may not even offer the lowest carbon solution.

10.6 The Carbon Emissions Reduction Target (CERT) scheme seems to have been relatively more straightforward and successful, although true additionality in CERT is hard to judge. It must be presumed that later developments will drop the onerous heat metering requirement, and by greater use of local authority knowledge (as elsewhere) reduce the bureaucratic overhead.

11. How successful will the RHI be when rolled out to households?

11.1 A concern must lie with DECC's reluctance to have effective accreditation systems that draw on experience of effective best-practice. Compared with easily controllable high temperature gas, renewable heat systems are noticeably harder to engineer properly and safely. Skill and knowledge of the pre-natural gas era have long been lost. Home owners are in no position to judge the quality of installation and there is a justified barrier of caution that needs to be overcome.

11.2 Unless care is taken, the government could create a situation where new, renewable technologies are installed badly, still earn subsidies, but the users are dissatisfied and inhibit greater take-up through negative word-of-mouth. Increasing the development of the relevant engineering skills through training, maintaining standards and promoting good engineering practice in vital to the success of relatively unfamiliar renewable heat technologies.

12. Thermal storage is a potential useful method of balancing electricity/energy demand both diurnally and annually. What is government policy doing to promote thermal storage, and should it do more/different?

12.1 We agree that thermal storage is a potentially useful method of balancing energy demands. However it is not, as far as we are aware, widely used at present. One possible solution would be to tighten building regulations for heat storage insulation on domestic hot water tanks to industrial standards in the expectation that the tank will in the future provide more than just hot water service requirements. Additionally, increased volume capacity for hot water tanks might be stipulated in building regulations, perhaps sufficient to support diurnal heat storage from solar-thermal installations of typical domestic capacity.

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12.2 The issue of large-scale storage, whether thermal or electrical, is of vital importance to the UK’s future energy system. A full exploration of the topic is beyond the scope of this current consultation and is, perhaps, worthy of a separate inquiry by this committee.