Annex 1 – Response Template

1. The Department is seeking comments by Thursday 24 May 2012.

2. DECC will then publish a summary of the comments received on the DECC Website, and continue to work through the issues set out in this document for the remainder of the year, following up specific points with stakeholders and expanding the evidence base. This should then enable the Department to publish a document containing a range of policy proposals for decarbonising heat within 12 months.

3. Please use the table below as a template to respond to the published questions. It will help us to record and take account of your views. Responses should be sent to heatstrategy@decc.gsi.gov.uk
by Thursday **24 May 2012**.

4. Also, please provide evidence for your answers and comments where possible.

PERSONAL DETAILS

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Are you responding as an individual or on behalf of an organisation?

Organisation Name: Chartered Institution of Building Services Engineers

CIBSE is the standard setter and authority on building services engineering in the UK and overseas. It speaks for the profession and supports career development in building services engineering.

How were members' views assembled: By correspondence

Would you like this response to remain confidential? No (Delete as appropriate)

If yes, please state your reasons:

EXECUTIVE SUMMARY: THE HEAT CHALLENGE

Q1: Do you agree with the nature of the challenge described for reducing emissions from heating and cooling across the UK?

Agree

Please explain:

The nature of the challenge as laid out In the consultation document is broadly correct. We welcome DECC's recognition of heat as an important issue that must be addressed if the targets of the Climate Change Act 2008 are to be met. The analysis of the role heat plays in energy demand and carbon emissions seems robust as does the breakdown of sectors, technologies and fuels.

Of greatest concern Is the reliance on decarbonisation of the electricity grid by 2030 to provide low-carbon options for heating and cooling. While we agree that this will be vital to achieve the emissions reduction targets, it is an extremely difficult challenge, made all the more difficult by recent setbacks in the development of CCS and nuclear power. The added load that electrification of heating would require will make this challenge all the more difficult.

CIBSE comment: undue focus on carbon emissions may lead to a failure to emphasise the need for greater efficiency in the use of heat. We need to reduce the emissions from the energy we DO use, but we need to look at ways to use less energy as well. The current emphasis on emissions reduction almost leads us into a 'thermodynamic bypass'. This should be resisted.

Q2: Do you have evidence that we should be taking account of as we develop our view of this challenge?

Your answer:

The Royal Academy of Engineering recently published a report on this subject: Heat: degrees of comfort?

http://www.raeng.org.uk/news/publications/list/reports/RAE_Heat_Booklet.pdf

We would strongly recommend this report to DECC, which goes into more detail on many of these issues raised in this consultation.

Two relevant peer reviewed papers were presented at the 2011 CIBSE Technical Symposium:

Paul Woods (2011)

Huw Blackwell (2011)

http://www.cibse.org/index.cfm?go=page.view&item=2210

and a further paper on the problems of metering heat at the recent 2012 Symposium

Phil Jones (2012)

http://www.cibse.org/index.cfm?go=page.view&item=2374

CIBSE publishes an Applications Manual, CHP in Buildings, which is currently being updated and should be available in Summer 2012.

Q3: Are there other dimensions that we should be factoring in as we pursue our responses to this challenge?

Your answer:

The main aspects of heat are dealt with in the consultation document - demand reduction, domestic and commercial sectors, primary fuels and technologies, and district heating.

What is perhaps less clear is how the proposals relate to other departmental policies. The provision of heat cannot be analysed in isolation. The type of renewable energy best suited to a particular application and how it is used can only be decided in the context of a national energy policy that provides a coherent framework for decision making. At present, this framework does not exist. There is clearly linkage between the Heat Strategy and schemes such as the Feed in tariff and the Renewable Heat Incentive.

It is also impossible to entirely disassociate climate policy from the current economic climate. In difficult economic circumstances, it becomes even more essential for government policy to signal firm, long-standing commitments to emissions targets in order to encourage and promote investment in infrastructure and technology. There is also a need to consider the role of energy efficiency, and in particular the links between the Heat Strategy and the Green deal.

Heat technologies need to be compared on a like-for-like basis. The paper by Woods (Q2) provides a methodology based on Equivalent Heat Efficiency which is a way of comparing alternative heat technologies that gives a more balanced comparison.

Q4: Do you have evidence about the role that different technologies or approaches might play in our response to the challenge, or the key barriers that we will have to address?

Your answer:

Please refer to the report and papers noted in answer to Q2.

District heating is often regarded as a future stranded asset as the grid decarbonises.

However, district heating can provide low carbon heat in the short term, whilst low carbon generating capacity is still being deployed. District heating has a key part to play in providing heat through to 2050,particularly to high heat density scenarios (e.g. city centres). Most of our 2050 housing has already been built and DH is a cost effective and low carbon way to deal with hard to insulate existing homes. Once gas fired plant comes to the end of its life then other lower carbon technologies can be connected to the infrastructure to provide heat. Also, the future role of CHP-DH with heat storage in acting as peak lopping (spinning reserve) for the grid should not be ignored. The heat strategy does recognise this role in the medium term but could reflect an even longer term role.

CHAPTER 1: MANAGING HEAT DEMAND IN BUILDINGS

Q5: Do you agree with the barriers and opportunities set out in relation to managing demand for heat in buildings?

Agree

Please explain:

Managing heat demand is the most important, cost-effective way to reduce emissions from heat and costs to customers. It is also correct that the majority of homes in 2050 have already been built, making retrofitting more important than new-build (although high standards of thermal efficiency in new-builds must also be maintained). However, taking the proportion of homes requiring retrofit from research carried out before the 2008 financial crisis means that the number of new homes is probably over-estimated, so retrofit will be even more important than the consultation suggests.

We recognise the situation described in §1.17 and §1.18 and support the principles behind the policy:

“The UK has some of the oldest and least thermally-efficient building stock in Europe. Taking action now to improve our buildings will reduce bills and cut emissions this decade, and help the mass roll out of low carbon heating technologies in the next. … The fabric quality of our existing buildings can be improved through retrofit measures or installed during the construction of buildings, as specified in building regulations.”

However we are less optimistic than the consultation document on the extent to which building fabric can be improved at a cost home-owners will pay. Insulating a spacious roof void is relatively straightforward but insulating a Victorian house with dormer windows and a scullery extension at the back is much more difficult.

Solid wall insulation is said to cost from £6,000 to £11,000 to install and can save around £334 per year (see §1.37), assuming a 2% discount rate, a loan at the low end of this scale would take 20 years to payback. Even assuming a 0.5% discount rate, an £11,000 loan is not recouped for 40 years.

Homeowners, who may be increasingly insecure about their job prospects and finances in the current economic climate are unlikely to sign up to this sort of deal without a large subsidy. This will make the success of the proposed Green Deal vitally important and, given the scheme Is yet to be tested, adds a serious degree of uncertainty to achieving the aspirations in the consultation document.

The standard of installation of demand reduction measures is also extremely important; targets set assuming a certain theoretical level of performance can easily be missed when the actual, real-life performance fails to meet expectations. Experience has shown that predicted reductions in energy within the home may not materialise, as shown by UCL's research into the Warm Front programme[1]. Design, installation, commissioning, ergonomics and feedback all play a part and could be improved upon in many cases.

Technically the report is very persuasive but little is said about the scale of the retrofit issue. For example, is the supply chain in place to satisfy demand if it materialises? A great deal is expected of the Green Deal and behavioural change. Based on UK experience over four decades of energy efficiency and carbon saving campaigns, it seems quite likely that neither will deliver without more compulsion, however unattractive this may be to government. However, the introduction of the enabling mechanism for the minimum energy standards in the Energy Act is already galvanising action in the property sector.

1. Hong, SH and Gilbertson, J and Oreszczyn, T and Green, C and Ridley, I and Warm Front Study Grp, (2009) A field study of thermal comfort in low-income dwellings in England before and after energy efficient refurbishment. BUILD ENVIRON , 44 (6) 1228 – 1236

Q6: Do you have evidence from existing projects to demonstrate the costs and benefits of demand management solutions in reducing emissions?

Your answer:

The CALEBRE project is a four year (2008-2012), £2million research project, jointly funded by the Research Councils UK Energy Programme and E.ON. Final reporting from the project is due in early 2013. The Principal Investigator is Professor Dennis Loveday of Loughborough University. The project has looked in detail at both the technology and consumer acceptability of retrofitting existing homes, and provides valuable insights into what is likely to work for the majority of consumers.

The UK has a long history of energy efficiency programmes stretching back over forty years, initially as the Energy Conservation Demonstration scheme and later the EEO programme and CT work. The Post Occupancy Reviews of Building Engineering (PROBE) studies, reported over the years in the CIBSE Journa,l provide specific demonstrations of effective measure for improving the design and operation of non domestic buildings, coupled with examples of what does not work. The TSB Building Performance Evaluation programme has more recently invested in real monitoring and measurement of the effectiveness of a range of interventions in the energy performance of existing buildings. These all contribute to our knowledge of how to manage buildings for improved energy efficiency.

Q7: If you have been practically involved in managing heat demand in buildings, what lessons can you share?

Your answer:

Experience of CIBSE members indicates the following particular lessons:

A) Always reduce the demand for heat as much as possible through good building engineering physics applied to the design of the fabric and hot water services.

B) Energy efficient heating should as far as possible:

-- incorporate the most efficient primary plant to generate heat/hot water

-- ensure that heat/hot water is distributed (or generated) effectively and efficiently

-- include effective controls on primary plant and distribution systems to ensure that heat/hot water is only provided when and where needed and at the correct temperature

-- ensure the plant and controls are installed and commissioned correctly for efficient operation

-- be responsive to changes in climate, solar gains, occupancy, activity, and internal gains

C) The scale of heat energy saving measures can be difficult to quantify. In many cases fabric, plant and control measures can show very good cost effective savings but these can be masked by additional consumption by users. e.g. The savings achieved by installing additional insulation can be offset by occupants running the building at higher temperatures. This may be a key issue for the Green Deal. It is also an issue when seeking policy measures to reduce demand for heat.

D) Sub-metering of heat has become more common for individual buildings on multi building sites and is also more prevalent when monitoring CHP and heat pumps. These meters generally measure flow rate and temperature, and are notorious for giving false readings due to poor commissioning.

CIBSE provide the following relevant guidance in:

CIBSE Guide B - Heating, Ventilating, Air Conditioning and Refrigeration

CIBSE Guide F - Energy Efficiency in Buildings

KS14 Energy Efficient Heating: an Overview (CIBSE Knowledge Series 14)

KS10 Biomass Heating (CIBSE Knowledge Series 10)

An Applications Manual on Biomass Heating systems is currently in preparation.

These guides set out good practice and lessons learnt over many years by CIBSE members designing and operating buildings.

Q8: What policies should the Government pursue to promote or facilitate improvements in the management of heat use in buildings, both domestic and commercial?

Your answer: CIBSE responded to the DCLG as Consultation on changes to Part L of the Building Regulations, and agreed in principal with the proposal to introduce consequential improvements for domestic buildings, having called for such a requirement to be introduced in 2010. CIBSE has argued for some time that the greatest potential for reducing emissions is from the existing building stock, and indeed this is borne out by the Draft Impact Assessment that accompanied the Part L Consultation Package.

We suggested that the limits on application in Regulation 28 in the current Building Regulations should be retained. It would also be appropriate to require consequential works when a dwelling is created as a material change of use.

We believe that the proposals will only deliver the savings claimed in the consultation if supported by robust compliance and enforcement measures. We support the views of the Chairman of the Committee on Climate Change in his recent letter to Andrew Stunnell MP. Unfortunately we can see little evidence of such measures in the proposals, nor any significant allowance for the costs of enforcement in the Impact Assessment. We also note that the IA for the Green Deal suggests that voluntary take up will be low. If that is so, then is it at all credible to expect voluntary compliance with a potentially costly requirement for homeowners. The current proposals will need active measures to promote compliance, involving both Building Control and the Competent Persons likely to undertake much of the consequential improvement (CI) work. Without these measures the claims for carbon savings, energy savings or energy demand reductions made in the consultation are entirely fanciful.

We further suggested that the extent of the measures should be that combination of eligible energy efficiency measures, possibly taken in the order of priority as listed in the EPC, or from a list of "reasonable CI provision measures" with a combined value not less than 10% of the principal works.

We also agreed that the measures eligible for use as consequential improvements should be those listed in SAP to generate Green Deal assessments and Energy Performance Certificate recommendations and to determine eligibility for the Green Deal. However, with the possible exception of boiler replacements, where some potential CIs may not be listed in this approach. We suggest that the listed measures should be building works as defined in the Building Regulations 2010.

CIBSE agreed with the principle that a boiler replacement should trigger appropriate consequential works, but has reservations about how this will be applied in practice. CIBSE propose that the list of eligible measures be supplemented by those heating system related measures such as advanced controls and thermostats not already in place, since these are related to the trigger works, and will be within the skills and competence of the boiler replacement contractor.

CHAPTER 2: TRANSFORMING BUILDING-LEVEL HEATING

Q9: Do you agree with the barriers and opportunities set out in relation to heating and cooling solutions in homes and other buildings?

Agree

Please explain:

The general summary of heating (and cooling) technologies laid out in the consultation is reasonably sound. Even with the most modern gas boilers and state-of-the art insulation, we cannot continue to heat so many homes by natural gas and achieve an 80% cut in emissions. We can expect to see a diversity of systems – such as district heating, CHP and heat pumps. It is important that regulations, taxes and subsidies are sufficiently flexible and are directed at the end objectives, such as reducing carbon emissions, but are otherwise technologically neutral. At present, the complexity of the regulations and financial incentives risks leading to perverse outcomes.

If electricity is to replace a large proportion of gas in domestic heating, a much more sophisticated control system will be required: The four main objectives of this control system would be:

- To modulate the energy input to millions of heating systems depending on the availability and carbon intensity of the electricity supply and the criticality of individual consumers' needs.
- To limit the current taken through certain substations and other critical parts of the distribution networks to avoid overloads.
- To limit the rate-of-change of aggregate electricity demand, so avoiding sudden increases or decreases in generation demand.
- To balance the loads taken by heating systems with those taken by electric vehicle charging and other time-shiftable users.he smart grid will be.

This 'smart grid' will be essential if large-scale electrification is to be achieved.

It is also important to remember what goal Is trying to be achieved. Customers are not generally interested in the primary source of energy - they are interested in having homes or businesses heated to a comfortable level. Many studies on domestic energy make the assumption that people want their homes heated to a steady 21°C for most of the day, possibly with a reduction of a few degrees during the night. This may be true for certain groups of people (for example, elderly people in sheltered accommodation) but is not representative of most British households. Recent research on human comfort has shown that optimal individual room temperatures vary throughout the day but there are few commercialised control systems that

implement such a profile.

Research into how lifestyles may affect the optimum type of insulation and heating system for a particular building is in its infancy. More research is needed in these areas if rational decisions are to be made.

We particularly agree with the statement in the doc at 2.75 that 'Government needs to create the right climate for deployment and to build the market, working with industry to improve the affordability, efficiency and reliability of key technologies'

Q10: Do you have evidence from existing projects to demonstrate the costs and benefits of heating and cooling solutions in reducing emissions in homes and other buildings?

Your answer:

In the course of the Royal Academy of Engineering's recent study on heat (see response to Q2), some individuals reported instances of sub-standard installations of heat pumps which are discussed in the final report. More important than isolated anecdotal reports is the Energy Saving Trust's heat pump field trial that reported in September 2010. The results were very discouraging and showed that, with the present carbon intensity of electricity, all but a dozen of the 75 projects studied were not worth doing.

The consultation document makes the assumption that heat pumps will return a coefficient of performance (CoP) of 3, which is far greater than all but a few of the cases studied. It also makes the assumption that a heat pump can be used for domestic hot water, which has been shown to be seriously detrimental to the CoP.

We understand that some of the installations included in the EST study were not correctly sized, leading to adverse impact on the COP, but this requires further careful analysis.

Q11: If you have been practically involved in installing heating and cooling solutions, what lessons can you share?

Your answer:

See answer to question 7

Q12: What policies should the Government pursue to promote or facilitate low carbon heating and cooling solutions in homes and other buildings?

Your answer:

See issues raised about building regulations under question 8

Q13: What are challenges to skills development and capacity building to significantly increase the number of domestic renewable heating installations?

Your answer:

Skills shortages will be a serious barrier to decarbonising heating unless addressed effectively. As noted above, the Installation of insulation and new technologies such as heat pumps needs to be done to a high standard which will require better training, especially as heating systems become more complex, requiring a mixture of hardware and control systems suited to individual properties and lifestyles.

A new type of energy use professional will be needed. Recruiting these will compete with the demands of new nuclear power, offshore wind and other energy industries that are already flagging-up staff shortages. Skills shortage will potentially be a serious barrier to decarbonising heating unless addressed effectively.

When condensing boilers were made a requirement for most replacements through the Building Regulations the Energy Efficiency Best Practice Programme provided training for all plumbers to bring them up to speed. It was a major undertaking and even then the transition wasn't entirely trouble free. The challenges to skills development and capacity building required by the proposed move to renewable heat are gargantuan by comparison.

Q14: Do you have evidence on the viability, economics and performance of hydrogen in building heating applications, including distribution through existing gas pipes?

Your answer:

CHAPTER 3: DEVELOPING HEAT NETWORKS IN THE UK

Q15: Do you agree with the barriers and opportunities set out in relation to heat networks?

Agree/Disagree/I don’t know (Please delete as appropriate)

Please explain:

The consultation §3.11 discusses the low take-up of heat networks in the UK In comparison to other regions such as Scandinavia. There are features of British housing and local government that mitigate against communal networks:

- England has a higher proportion of owner-occupation than the European

average;

- There is a strong political driver for competition, not collaboration. The Scandinavian model of, after a few years, charging residents for the district heating scheme in their street, whether or not they use it, is likely to be politically unacceptable.
- Urban roads are highly congested and there are strong disincentives against large scale road works to install heat pipes;
- Over 60 years, local authorities have progressively lost much responsibility for institutions such as schools, hospitals and social. Their ability to act as the focus for district heating schemes therefore become severely restricted in comparison with their previous level of control or those of other countries.

Section 3.18 recognises that “developers therefore need a high degree of certainty that they will continue to have a sufficient customer base for the long term to assure a return on the investment. One way of ensuring this customer base is for heat suppliers to seek long-term contracts with their customers. Consequently, networks are often best developed by starting with low risk customers who can commit to long term contracts, such as public sector buildings, social housing and some commercial and industrial buildings.” This may have been a credible strategy in the 1970s, when Sheffield and Leeds schemes (quoted in the consultation) were initially developed. It is unlikely to be a practicable proposition in current circumstances.

We agree with the technical proposal however the costs and behavioural barriers are not to be underestimated and the history of pursuing CHP and District Heating in the Energy Efficiency Best Practice Programme provides plenty of evidence of just how difficult it will be without major central investment and push.

It is worth noting that the much praised National Heat Map (Fig3 p68) was originally an output from the Energy Efficiency Best Practice Programme.

Q16: Do you have evidence from existing projects to demonstrate the costs and benefits of heat networks in reducing emissions, alleviating fuel poverty or reducing fuel consumption?

Your answer:

There are a wide range of examples of highly successful district heating in the UK such as those in Pimlico, Southampton, Birmingham, Exeter, Leicester, Nottingham, Newcastle, Woking, Sheffield, Shetland, Edinburgh, to name just a few. There are many more small scale district heating networks on university campus, multi building hospitals, large housing schemes etc - case studies are available on the CHPA and their members' web sites.

Q17: If you have been practically involved in setting up heat networks, what lessons can you share?

Your answer:

These lessons will be set out in the forthcoming update to CIBSE AM12 - CHP in Buildings, see answer to Q2.

Q18: What policies should the Government pursue to promote or facilitate heat networks?

Your answer:

District Heating infrastructure is expensive and previous grant schemes have contributed significantly to DH implementation.

District Heating requires extensive heat mapping and feasibility work and a subsidy towards this type of work could encourage more DH. The GLA have been leading a large number of heat mapping exercises across London and this has identified potential DH systems that are now moving towards implementation. In this way pockets of cost effective DH can be installed and will usually grow and inter connect.

Q19: Do you see the need to regulate the supply of heat through heat networks and, if so, how?

Yes/No/I don't know (please delete as appropriate)

Please explain:

We do not see a need to regulate this area.

CHAPTER 4: TRANSFORMING INDUSTRIAL HEAT

Q20: What technical and financial barriers could prevent the switch to low carbon heating technologies on industrial sites?

Your answer:

We don't see any particular technical barriers. However, DH infrastructure is expensive and previous grant schemes have contributed significantly to DH implementation. Such incentives could encourage more heat to be supplied from industrial sites into the built environment.

Q21: What scope is there for further reductions in emissions through energy efficiency in industrial processes?

Your answer:

It is common to find heat from industrial processes being rejected without any thought given to adjacent heat demands. Industry seldom looks over the wall to the hospital, school or housing next door. Government should seeks ways to incentivise the provision of industrial heat into the built environment.

Q22: Do you have evidence from existing projects to demonstrate the costs and benefits of approaches to reducing emissions from industrial heat, including combined heat and power?

Your answer:

Q23: If you have been practically involved in projects that sought to reduce emissions from industrial heat, what lessons can you share?

Your answer:

Q24: What policies should the Government pursue to promote or facilitate reduction in emissions from industrial heat?

Your answer:

Q25: What policies should the Government pursue to promote or facilitate recovery of waste heat from industrial processes?

Your answer: