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EXCELLENCE  
IN ENERGY  
ASSESSMENT

Elmhurst Energy Response to:  
“A Future Framework for Heat in Buildings”  
In Confidence

Prepared for: BEIS

8<sup>th</sup> June 2018



Domestic

Commercial

On Construction



## 1. Introduction

Elmhurst Energy is pleased that the Department for Business, Energy and Industrial Strategy (BEIS) is seeking a call for evidence for 'A Future Framework for Heat in Buildings' and we welcome the opportunity to respond to each question in turn.

The call for evidence asked 44 questions and Elmhurst's response to each of these can be found below. We hope you find our responses considered and useful for taking this vital matter forward in a progressive manner.

## 2. Questions and Answers

### 1. Do you agree that the policy framework should focus initially on enabling the market to drive the transition away from high carbon fossil fuels, and in the longer term on helping consumers and industry to comply with regulations?

Yes. The market has to be focused on as a priority because without cost – effective options, there is no incentive for consumers to make the switch from high carbon intensive fuels. This is similar to the transition away from diesel and petrol cars – not viable unless the alternatives are economically feasible, and the infrastructure is adapted to suit the needs of electric cars or increased use of public transport. Unless the government are willing and able to invest in driving down the cost of alternative fuels and heating equipment, or use a hypothecation tax to finance the shift, then they cannot expect that consumers will be a) financially able or b) willing to comply with regulations.

MEES is an example of how mandatory regulation fails if provisions in the market are not set up prior to the expected compliance period. Landlords are being expected to make the changes if no cost to themselves but there are very few schemes they can turn to for funding, meaning a very high percentage of properties are already being registered as exempt and the aim of MEES completely avoided.

It is also essential the government understand how they intend to measure success. There are four areas of focus highlighted in this consultation (keeping household energy costs down, maximising comfort, reducing carbon emissions, and improving air quality). All of these are measured differently so the government need to understand and publish how each will be measured, and whether they will complement each other, or become detrimental.



**2. How should government best engage with existing and emerging heating markets, consumers and other stakeholders, to ensure regulations are designed in a way that works for everyone?**

No regulation can possibly work for every home/ business in the UK but if you publicise far enough in advance, the more chance to invest in the necessary changes and the more compliance you are likely to see. The government can also engage by leading by example. They haven't led by example with MEES by stating that their social housing stock will be exempt from the regulations and as a result, private landlords are showing a general consensus that they are being penalised.

In terms of engagement, a mass market engagement is needed in energy efficiency as this will stimulate opportunities not only for the technology manufacturers and suppliers, but also for the SME's providing and installing heating systems, insulation and glazing because these are entrepreneurs and employers that also play a vital role in the growth of the UK economy.

New build markets already have regulations and must comply with the building services compliance guides and Part L Building Regulations to have their BRUKL/SAP report passed off by Building Control. For this area it should be a case of ensuring regulations are adhered to in all cases and enforcement from building control to ensure that what has been designed for use in the building has actually been used. There is an interesting opportunity here for Energy Assessors undertaking the BRUKL/SAP assessment and the new build EPC to sign of the 'as designed' is equal to the 'as built' through a site visit as they are likely to have a thorough and in depth knowledge of the building fabric and services installed.

This therefore means focus should largely be directed towards enforcement within existing buildings which may not face the scrutiny as new builds do and may not be identified clearly as being non-compliant with any polices/initiatives. This could easily be achieved through the process of completing an EPC, as this educates the consumers/ stakeholders in how the services used for heating the building perform and how well the building fabric is able to retain this heat. The EPC is also able to identify any areas for improvement which could be used by the owner or landlord to improve the heating/ fabric of the building.

It may also be worthwhile looking into a scrappage scheme similarly to that used in the vehicle market where consumers receive a payment for trading in their old and inefficient equipment to use towards a new and more efficient heating system.



**3. How could a firm end date for high carbon fossil fuel installations be delivered through regulations? How much time do manufacturers, suppliers and installers trading in high carbon fossil fuels need to prepare for a firm end to new installations?**

This will depend on many factors: How much investment will be dedicated to improving the efficiency of current systems available, innovation in new technologies accompanied by financial incentives to companies investing in driving improvements, the cost to consumers of the new initiatives, whether there will be incentives for suppliers and installers to purchase these to advertise and sell on.

Other mandatory legislation should also be monitored to see how high levels of compliance are. This should be looked at over a minimum of three years to be able to identify any trends in data. Elmhurst have the resources and data to monitor MEES compliance over a period of a few years to ascertain levels of compliance and would be happy to act as consultants to the government in providing this analysis.

The results on similar studies focusing on the mandatory carbon reporting legislation from 2013 onwards for the companies appearing on the FTSE 350 or the NASDAQ stock exchange. Immediate three year study showed compliance improved over a three year period but was not achieved by all companies.

No matter the approach the government decide to take, they need to ensure it demonstrates a medium- long term commitment to achieving the four areas of focus rather than the stop/ start approach that has been seen with previous similar initiatives which appear to change direction when governing parties change, or when finances are shifted away from the original aim.

**4. What is the potential for non-domestic buildings to transition away from the use of high carbon of fossil fuel heating? Is the use of high carbon forms of fossil fuel driven by process heating requirements, with space and water heating requirements secondary to this? Are different solutions required for different heat uses and are there cleaner alternatives?**

Without analysis, it would be difficult to ascertain whether the use of high carbon forms of fossil fuel is driven more by space heating requirements or process heating demand. However, Elmhurst holds data on both EPC lodgements (focusing on space heating and building fabric performance),



and DEC lodgements (focusing on process energy use). We would be able to compare the two over a period of time to determine the greatest demand, and the movement of trends.

Yes, different solutions would be required because reducing processing demand is largely achieved through educating the occupants of the building in minimising energy usage and wastage (occupancy sensors, turning off computers). Whereas solutions required for different heating uses and finding cleaner alternatives are driven by innovation and cost.

Further, it is well documented in energy efficiency research that sole focus should not be placed on improving the performance of the heating systems without also looking to improving the building envelopes (fabric). This would reflect a scenario where you improve the efficiency of a tap without sealing cracks in the sink basin first; the improved efficiency would be lost through the poor thermal performance of the fabric. It may therefore be advisable that alongside investment and innovation in heating systems, innovation and improvement is made to building fabric insulation, elimination of thermal bridges, air tightness control, PVs, renewable, and shading devices etc. Any new build designs within an urban environment should also factor in the increased presence of urban heat island effect and combat solar gains, which in turn may improve the heat and cooling demand in buildings.

Government statistics document from July 2017 gives figures for space and process heating, what is causing the greatest demand and the most used fuel type. Statistics show that the domestic sector heating demand is dominated by space heating (83%) which comes predominantly from gas. Process heating accounts for 17% of domestic demand, again dominated by gas. For the services sector, space heating accounts for 74% of demand, mainly gas, and process heating (26%), shared fairly equally between gas and electricity. For the industrial sector, space heating accounts for just (27%) of demand, mainly because workshops and industrial process warehouses/ store rooms have no expectation of conditioning so are often left unheated. Of the space heating that is supplied, the greatest demand comes from bio energy/waste. Process heating accounts for the remaining 73% and the demand is focused on gas and electric.

The data extends back to 2010 and demonstrates a trend of heating demand in domestic sector being the most volatile because of comfort conditioning for homeowners/ tenants. The domestic heating demand fell on average between 2010 – 2014 which followed the negative trend from 1990 levels but the demand has then increased again since 2014. This may be related to the increasing demand for new build houses after the recession. Another key trend is the use of bio energy and waste in industry from 2014 – 2016 where there has been a 130% increase. This would suggest that this is where investment and innovation has started to cause a shift in heating demand fuel and this should be emulated through the services and domestic sectors.



**5. What do you think are the main technology choices for reducing heating emissions from off gas grid households, businesses and public sector organisations (e.g. transitional technologies)?**

No strong immediate opinions but this could be tracked at looking at lodgements for properties with good EPC ratings compared with those rated as F/G. Those ones with better ratings are likely to show if there has been a shift in the technology choices to drive improvements. Elmhurst again holds the data to be able to analyse this and produce a data trend, and are happy to consult with the government on this idea moving forward.

Research indicates that technology choices are renewable which are increasingly being designed into new buildings, ICT Technologies and smart metering, and using the same systems for both space heating and hot water (heat pumps). However, specific trends in technology choice are sometimes dependant on which fuel type is most convenient to the suppliers and end use consumers. In France, electricity is most convenient due to the constant supply fed from their nuclear power operations, whereas in other area, natural gas may be more convenient and secure so there would be less incentive to invest in electric based heating equipment.

**6. What do you think are the main technology choices for achieving near zero emissions from off gas grid heating (technologies which are consistent with our 2050 targets)?**

Similarly to above, we could be looking at A/ A+ rated EPC's and identify if there are trends in the technologies used to bring emissions to near zero/ to negative. Elmhurst are able to access data from EPC's that have been improved from E-G ratings to A/B and measure the most common trends in which systems have been chosen to bring the standard of heating upwards. As mentioned in the question above, Elmhurst would be happy to consult with the government on this moving forward.

Again it is vital that the 'measuring tape' is correctly set. For example EPCs contain both carbon emissions (CO<sub>2</sub>) and costs (£s), whilst advice can discuss comfort levels. This question is only interested in one measurement.

**7. What evidence is there that bio liquids can provide an affordable and sustainable alternative to fossil fuel heating? What are the technical barriers and what might the impacts on domestic and business consumers be? How scalable are sustainable supply chains and is there a maximum amount of bio liquids which can be supplied?**

No strong opinions.



- 8. What evidence is there that bio propane can provide an affordable and sustainable alternative to fossil fuel heating? What are the technical barriers and what might impacts on domestic and business consumers be? How scalable are sustainable supply chains and is there a maximum amount of bio propane which can be supplied?**

No strong opinions

- 9. Do you have any evidence on the air quality impacts of the use of solid biomass, bio liquids and/or bio propane?**

No strong opinions but this links back to the four objectives and how they may contradict one another. The Bio fuels may prove to reduce carbon emissions, and may have a positive impact on air quality but if they're expensive, this may hinder the transition away from fuel poverty. The government need to weigh up which of the four objectives is of highest priority.

This is the same logic for all heating fuel types, not just bio fuels. They all have different attributes for £s, CO<sub>2</sub> and air quality.

- 10. Are there any oil and heat pump hybrids currently on the market (in the UK or elsewhere), and if so how does the cost compare with conventional systems or with a heat pump? Could they be used with bioliquids? What impacts do they have for domestic and business consumers, for example in terms of ease of use and comfort levels?**

There is evidence of hybrid heat pumps on the market that currently run off oil boilers next to a heat pump. Grant UK supplies the Grant Vortex Air Range which combines vortex blue oil – fired boiler with an Aeron Inverter driven heat pump. However, these have not been tested and do not appear on the PCDF so are not available to consumers on a widespread basis. Further, the software used for completing domestic and commercial EPC's on existing buildings does not accept an input of hybrid heat pumps so their presence would make no difference to the EPC ratings currently. BRE have confirmed they are looking into this but it is not expected to be completed in the near future.

**11. We understand there are gas heat pump hybrids on the market that can be used with LPG. How widespread are these (in the UK or elsewhere) and how does the cost compare? Could they be used with bio propane or other biogases? What impacts do they have for consumers, for example in terms of ease of use and comfort levels?**

The European Heat Industry highlight that hybrid heat pump can switch from electric to natural gas consumption and vice versa when it is most convenient, and dependant on the fuel demand at the time.

This is termed the demand response. However, Elmhurst does not have any strong opinions on the use of hybrids relating to LPG, or how much they cost to consumers.

**12. What role might hybrids have in the short term to facilitate the longer term transition to clean heating off the gas grid?**

These systems may be considered a stop gap to begin phasing in the use of heat pumps on a wide scale. Once these are in place, the government can then start the progress to move away from the boilers associated with the hybrid systems and rely on just the heat pump.

**13. To what extent are space requirements an issue during a heat pump installation? How often are heating distribution systems replaced (hot water tanks, radiators and/or pipework)? How often are additional thermal efficiency measures for the building required?**

All systems should be sized and distributed correctly and appropriately to ensure they work for that particular building. It may be advisable that the advice on appropriate systems is given by the energy assessor who completes an EPC because they can use the recommendation report to determine an appropriate system and then scale to suit building requirement if necessary. The Heating Compliance Guide by CIBSE should be used on a wider scale.

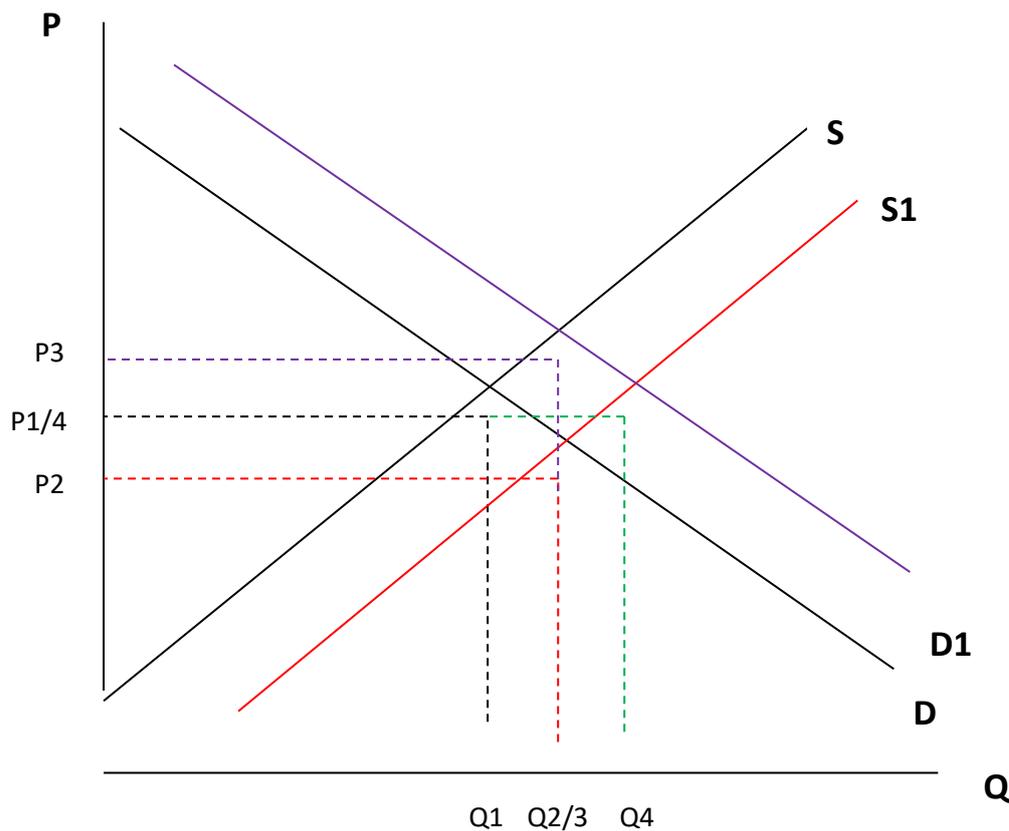
To emphasise again, the building fabric should always be looked at prior to installing any new heating equipment to ensure the heat is not lost through inefficient thermal barriers.

An EPC is the best way to look at all of these together as this is the nationally recognised calculation methodology that is based on a whole building approach. Otherwise a new highly efficient heating system can be installed, which 'ticks a box' for the policy; but it is not in the best interest of the buildings or occupants as the fabric could still be leaky and other missed energy efficient opportunities are not recognised.



**14. What potential is there for heat pump costs to come down (both kit and installation)? How can industry show leadership in making this happen?**

If the supply of heat pumps was to increase from S to S1, a price decrease would be seen from P1 to P2. This price decrease is likely to cause an increase in demand. As the model above shows, as the demand then increases, it is likely that price would then start to creep back up and it is therefore at this point that incentives would need to be launched to offset the price increases, as well as incentivising suppliers to keep supply at a constant high rate until the shift to efficient heat pumps has been made on a wide scale.





**15. Are there any drawbacks of smart/more efficient storage heaters, vs. other types of electric heating? And, if so, how are these to be overcome? What are the benefits of smart and more efficient storage heater products compared to traditional storage heaters? In which types and tenure of buildings are storage heaters most likely to be useful? Would storage heaters be a likely solution where electric heating is not currently used? How about where electric heating is currently the secondary heating source?**

The main drawback for the use of smart/ more efficient storage heaters is the cost in comparison to traditional electric heaters. Based on three quotes, smart heaters costs an average of 2 – 2.5 times that of traditional heating. Landlords and building owners would therefore need to analyse whether the cost savings brought about by the installation and use of smart heaters would be cost effective against the initial investment costs.

However, offsetting the higher initial purchasing costs is likely when investing in smart heaters such as high heat retention storage heaters. High heat retention storage heaters use the off peak fuel charges overnight to heat the bricks then release the heat through the day time to keep the building conditioned without the need to use peak cost fuel. The only time the peak day fuel would be required is if excessive heating was required to top up the temperature.

If the drawbacks are to be overcome then consumers need to be incentivised to make the shift, especially if their property meets the minimum standard of an E rated EPC because they are less likely to want to invest beyond their legal responsibility. The ECA scheme incentivises clients because businesses can immediately offset 100% of equipment purchase cost against their taxable profits. To qualify, the equipment being purchased must be within the top 25% of all similar equipment on UK market as per the ETL list. However, at present, storage heaters are not present on this list so companies are more likely to invest in other forms of heating. Air source heat pumps and such like are included and although they may be more efficient systems, they run during the daytime from peak fuel so would not reduce energy costs in the same way a high heat retention storage heater may do.

A similar approach was previously taken for domestic landlords through LESA (Landlords Energy Savings Allowance) which used to allow £1500 per dwelling house to be used towards the cost of acquiring and installing certain energy – saving items. However, as highlighted previously in our response, this is another example of a start/ stop policy approach that ceased in 2017 and is no longer available for use. This and other similar policies would likely have proven very effective in the ‘no cost to landlord’ principle of the Minimum Energy Efficiency Standards.



Storage heaters are typically more suited to office type buildings, especially in toilet and kitchen areas if split systems or similar systems do not serve these areas. To answer whether they would be a likely solution where electric heating is not currently used would depend on the current system present. If a building is already served by a highly efficient split system and a client has spent a considerable amount on this, they are unlikely to revert back to the use of storage heaters. Further, the use of electric heating could have a more considerable impact if there are PV panels present as the client would further reduce energy costs by limiting what they need to take from the national grid.

**16. Is there scope for more use of rural heat networks and community heating systems? What are the barriers and how might they be overcome?**

There is likely to be demand for more use of rural heat networks and community heating systems. There is little infrastructure to achieve this on an immediate basis so there would be substantial initial investment needed. Furthermore, some may argue it is not a sustainable solution long term because many district heating systems work from waste to energy (incineration plants) and there may be an argument that although it extends the rural networks, and may deter waste from landfill, it may bring about further problems in air pollution due to the increased nitrous and sulphur oxides. This process is unlikely to be signed off in light of the announcement recently that the Clean Air Act of 1958 is due to be re-written to tighten regulations on air emissions as the UK are not meeting targets. Further, it may be argued that rural heat networks support the focus on the top half of the waste hierarchy rather than spending time and money investing in other, cleaner alternatives for the future framework of heating buildings. This point relates again to the four objectives of this consultation and how they are all measured differently. This example highlights how the aims sometimes contradict one another, helping to improve the efficiency of heating systems but potentially worsening air quality in the mean time. The government should therefore make it clearer which question focuses on which objective.

Research from Bush et al. 2017 highlights the key benefits of district heating systems including the provision of heat sources that wouldn't otherwise be possible such as intermittent waste heat from industrial processes, large scale heat pumps, or geothermal heat. It also offers flexibility with options for seasonal storage to enable use of solar thermal heat sources through winter. Example countries with established district heating networks are Denmark, Finland and Sweden, stemming from oil crises in 1970 but they now face challenges of decarbonisation.

The UK is the perfect example of a country with an energy system that was not designed with district heating in mind, as it has a highly centralised energy system, liberalised market and high penetration of natural gas networks. Only 2% of heat demand is currently delivered via this



method. The main issue in the UK is that local authorities play a key role in enabling delivery of these district heating schemes with their extensive knowledge of the local geography, context and actors. However, the local level priorities do not always align with national visions for low carbon energy, and with local government cut backs, there are not currently the resources available to dedicate towards investment and delivery of wide scale district heat networks.

**17. Are there specific ownership and funding models that may be suitable for heat networks and communal heating systems in off gas grid areas?**

No strong opinion/ knowledge

**18. What evidence is available about further innovations to improve the performance, efficiency and customer proposition of heat pumps? Are there opportunities for innovation in delivery and installation, particularly those innovations that might reduce kit and installation costs, or hassle for consumers?**

No strong opinion.

**19. What is the role of the heating industry in delivering cost reduction through innovation? What steps are the industry already taking and what more could be done?**

The European heat industry brings together companies that are leaders in the production of efficient heating systems, and the leading engineers work together to provide heating solutions for all different building types with different heating and cooling demands, ranging from boilers, to solar thermal systems, heat pumps to fuel cells and radiators to under floor heating. There is a growing focus innovation in hybrid and digital solutions, and renewable systems. This project employs 120,000 people throughout Europe, and there is 700,000,000 Euros yearly investment in energy efficiency.

The focus of the investment has been on condensing boilers which can save up to 20% energy on standard boilers installed, heat pumps can cut consumption by over 50% by using mostly energy from their surroundings and micro CHP appliances can save over 30% energy and generates electricity. If this injection of investment for innovation continues then the engineers will be able to continuously work towards improving efficiency, the efficient systems will become more available and thus cost less for suppliers to buy stock. The main challenge will be ensuring the suppliers pass on the cost savings to the consumers.



A further challenge will be whether the UK will continue to gain any benefit from this funding post Brexit or whether it is limited to those within the European Union. In the past, when systems and chemicals have been banned in some countries at different times, the illegal substances and systems have been moved around the countries that don't yet have bans in place. Could the UK risk taking in all of the inefficient equipment if regulations are not adapted/ not adapted quickly enough during and after BREXIT?

**20. What other innovation opportunities and innovative technologies are available for rural homes off gas grid? At what technology readiness levels are they and do they require government support to move them towards the market?**

There seems to be a constant view that innovation is needed as a solution to problems when in some cases, this being one of them, the government fail to identify and maximise what is already available (Air source/ ground source heat pumps, PV panels, solar collectors, wind turbines). It is also not recognised what a different improving the building fabric can make but an EPC will show this.

**21. What can government do to ensure that future policy encourages and supports future innovations and cost reductions in technologies?**

Any future policies need to highlight the importance of the shift away from high carbon intensive fuel for heating to provide a background understanding for suppliers and consumers. Government need to ensure their support for future innovations is not just written into theory but put into practise by consistent commitment to long term investment. The government document on the Minimum Energy Efficiency Standards speaks of the commitment of the government to ensure that fuel poverty is reduced, energy efficiency is achieved and energy security is tenable. However, they have then suggested that domestic landlords are only expected to comply with improving the energy efficiency of their properties if they can do so at no cost to themselves but have made a critical failure in not providing the schemes to enable funding to become available on a large scale. Green deal and Eco have both tailed off in recent years and with local government cuts, local authorities are not in the financial position to offer schemes and grants to landlords. This has therefore already led to both mass non-compliance, or landlords to find it exceptionally easy to register their property as exempt for the next 5 years, avoiding compliance. This will now likely delay the positive effects of MEES for at least five years because even if the government are to imminently alter the cost to landlords, all those properties already registered as exempt will not have to make changes until their exemption expires.

They should also ensure they consult experts from outside of the government as concepts and ideas that work in a theoretical scenario may not work in practise and industry experts would be able to suggest how best to work with suppliers, innovators, and consumers.

Finally, policies should ensure they have a positive outlook on investing in improving energy efficiency, and play on the benefits to both suppliers and to end use consumers. Consumers firstly need educating in the importance of the policy and an understanding of why they are being asked to comply, and they will also, in some cases, need convincing of the benefits it will bring to them because if it doesn't appear to be a cost- effective improvement, they are unlikely to comply purely based on moral conscience. Consumers want two things: financial savings and convenience so these need to be emphasised. For the domestic sector, warmth and occupant comfort are also two big considerations that need to be factored into decisions. An EPC is the best way to educate consumers and demonstrate the need for improvements.

It should also be highlighted that although innovation may be needed in some circumstances, innovation is not always good. If, however, innovation is 'proven', then this will be beneficial and the National Calculation Methodologies (SAP & SBEM) should be built upon to incorporate this.

**22. Please provide views and evidence on how different obligation approaches could be used to drive the transition to clean heating during the early 2020's? Are there any areas worth specifically targeting? Do you have any views on other short term regulatory options that could be pursued, besides those considered above?**

MEES should be heavily analysed and scrutinised over the first 5 years through to the 2023 date where all non- domestic and domestic privately rented properties under new and existing lettings will be required to have an E rated EPC or better. Many properties will have to make amendments or install new heating equipment to meet compliance, and those who are altering their building fabric to meet the standards should also see a drop in heating demand because their building will retain heat more effectively. It is crucial that the local weights and measures authorities are given the resources and time to enforce these regulations properly.

It is likely that many companies and landlords will have the perception that they will not get caught for non compliance so the best results are likely to be achieved if high profile cases of non compliance are brought to court and published. It is also essential that the government push to respond to the consultation on no cost to landlord because this will incentivise landlords have to comply by spending a fair and reasonable amount.



EPC's are an effective ongoing approach as they look at both building fabric and the conditioning of the indoor climate which is highlighted as the 'whole house approach'. Having an EPC completed should not just be a legal tick box exercise for transactions but also a means of educating consumers in how their building is performing and where there is scope to improve. It is also worth highlighting that an EPC is based on factual inputs to the software so produces an objective view of performance.

**23. What do you think about the options set out above for an obligation? Do you have any evidence as to potential impacts, burdens, and unintended consequences?**

Covered above.

**24. What further options for short term regulation exist that we have not considered in this call for evidence? Do you have any evidence as to the associated impacts or burdens of any further options suggested?**

Mandatory Carbon Reporting – those companies who are legally obligated to publish their scope one and two emissions in their annual report should be measured closely and those using high carbon intensive fuels and producing large amounts of emissions should be targeted and tougher regulation imposed.

Compliance with building regulations – Ensuring there is compliance with the standards in the non- domestic and domestic building services compliance guides and Part L regulations for the minimum efficiencies of heating systems allowed in new build properties. There needs to be consistency in the building control checks of the as designed BRUKL reports to ensure that buildings are not passed off until their heating equipment meets the required standards, and that what was planned has also been fitted.

Banned use of certain refrigerants – Although the main focus of this consultation is heating in buildings, the government also need to be considering the increased use of cooling in buildings. As cities become warmer through urban heat island effect and global warming, there is increased cooling demand to combat the solar gains from many skyscrapers and similar buildings. Although fan coil systems use water for cooling, split systems and cooling units usually use refrigerants to deliver a comfortable and constant indoor climate. From 2015, there was a ban imposed on ozone depleting HCFC's (hydrochlorofluorocarbons) used in certain refrigerants including R22, this is due to extend to HFC 404A in 2020, and further to HFC 134A in 2022. However, the presence and



use of these remains wide scale across the UK, especially in units manufactured pre – 2004. New split systems being installed now use R410A as the main refrigerant, but those using the banned refrigerants have not yet been pushed to make the change unless they are found to be using it. This ban needs to be closely enforced and regulated and incentives should be available for those with pre- 2004 systems to make the change to new heat pumps as soon as possible.

It would also be beneficial to reinforce the idea of consequential improvements under Part L1B and L2B as part of the road map to zero carbon. The concept being that there is limiting benefits of an extension complying with building regulations for fabric and services, if the extension is not thermally separated from the existing building because the heat may escape through ill performing fabric in the existing building.

**25. How can DNO's or GDN's take a leading role in deploying clean heating?**

No strong opinions but if this route is chosen, then there must be financial investment and the deployment should not be voluntary.

**26. How can we encourage and unlock private sector finance in the absence of a subsidy?**

The concept of green mortgages should be enforced on a much wider scale. This again links to the idea of more EPC's being completed and assessors advising on improvements. Energy assessors could be developed into independent energy advisors who are able to provide advice after the EPC has been completed to ensure properties are improved.

This concept could also link to the Each Home Counts initiative.

**27. If there was some targeted subsidy, such as for low income or vulnerable households or for building local supply chains, what would this need to look like? Do you have any evidence that subsidy is needed?**

The local authorities may hold the data to be able to identify vulnerable households living in fuel poverty. It may then be advisable for these households to have an EPC completed to determine where improvements can be made to system efficiencies and/or building fabric. Once areas of focus have been determined, it would then be advisable for the Energy Assessor to provide local independent advice on how to improve the building and its conditioning acting as a whole building



independent review. This idea could be linked to Ecoflex, a dedicated source of funding to tackle those in fuel poverty. When improvements are suggested, Ecoflex could help to fund the changes.

**28. Novel business models for selling clean heating have not taken off in the UK market, why is this? What is needed to stimulate the development of this market in the UK?**

It may be reasonable to assume that these have not taken off due to the start/ stop approach of government strategies. Investors, innovators and suppliers have become involved in clean heating strategies that have then been stopped after they have invested their time and money. Having has their fingers burned; many are now reluctant to approach the subject again.

This has also been exacerbated by the low costs of gas and oil which provide no incentive for a switch to cleaner, currently more expensive, heating sources. Further, many landlords and building owners, particularly in the domestic sector, cannot afford the upfront costs of buying systems for clean heating so it is advisable that a 'pay as you save' model is needed to convince consumers to invest.

**29. What could be done, apart from subsidies, to encourage new approaches? Are there any approaches that have worked particularly well in other countries and that could be replicated in the UK?**

The main focus should be on the government looking back to the first intention of EPC's. They were brought about for consumers to be able to understand the building they were living/ working in and how well the fabric and conditioning was performing. This allowed them to identify sources of improvement and implement strategies to improve occupant comfort, and to create energy cost savings. The process of Energy Assessments and EPC's is used across many countries in the developed world, and in most cases, has proved an effective tool in making improvements to existing building stock and identifying improvements which should be planned into new buildings based on what has worked/ failed in those existing structures. However, a large proportion of homeowners, landlords, building owners, solicitors and estate agents still view EPC's as a tick box exercise in the sale/ let transaction, rather than an opportunity to improve the building in which they live/ work and potentially save considerable amounts of money. EPC's are a prime example of an existing framework which has the capacity to make large scale energy savings, air quality improvements, keep energy costs down and maximise comfort – all four objectives of this consultation, without the need for unnecessary new innovation focusing on new approaches. Where innovation is proven, then an EPC can be adapted to that approach. It is therefore advisable these are focused on as a priority for a tool used to stimulate 'a future framework for heat in buildings'.



Further, if the government decides to overlook the potential negative environmental impacts on air quality and opt to develop the district heating network in the UK, they should look to Denmark as an example of how the system can be implemented and how best to deal with the bi-products of burning waste for energy. The City of Copenhagen now relies on district heating for 98% of its heat.

**30. What could be done to support a whole-house approach of combining interventions and technologies?**

Initially mass engagement is required to educate building owners in why energy efficiency, especially heat in buildings, is paramount if we are to strive towards reducing energy bills, increase industrial competitiveness with the developing and emerging economies, and protect the environment for future generations, therefore achieving economical, social and environmental long term sustainability and security. The best way to do this is by completing EPC's on houses, and commercial premises. This enables occupants to identify poor building fabric and poorly performing conditioning systems. The energy assessor is then able to provide independent recommendations to how these can be improved with their extensive knowledge of UK buildings and heating systems. Heat and energy efficiency are considered to be inextricably linked and it is therefore recommended we take a whole house holistic approach to managing the heat we use. This involves improving the building fabric in the first instance then learning to heat then sustainably and efficiently, as to address one without the other leads to sub-optimal results for homeowners, building owners, investors and government.

**31. How can government best tap into and support community and local authority efforts? Are there any successful examples that can be built upon?**

The government should look to lead by example in the way the Scottish government have. Scotland's Energy Efficiency Programme (SEEP) has designated energy efficiency as a national infrastructure priority, designed to help local authorities pilot new and innovative approaches to energy efficiency with community groups and businesses. A similar initiative should be implemented as a matter of urgency and as a way of using the public sector to stimulate compliance in the private sector.

**32. What could be done to drive action from local planning? What are the pros and cons of approaches that rely on local planning? What evidence is there that such approach produces desired outcomes?**

There are four objectives of this consultation and the importance of each may differ on a local basis compared with nationally. It may be that air quality is the biggest concern in cities and so the framework for heat in buildings would largely be focused on improving air quality, whereas in rural locations that may not have access to the national grid, fuel poverty and energy costs may be of more concern because these areas rely on alternative fuels which are, at present more costly.

Local planning can also push for the buildings to be designed and built far above the minimum standards of compliance rather than just meeting their requirements. This would ensure buildings and their services are planned with long term sustainability in mind rather than a short term fix that will need to be re-addressed in the near future.

**33. Do local approaches provide a possible model for delivering a firm end to fossil fuel installations through regulations? For example, by establishing oil free zones starting where it is most deliverable, and joining them up over time.**

Local approaches are only viable if there is the time, funding and manmade resources to dedicate to the delivery and enforcement. Whilst local government authorities suffer the pressures of central government cuts, they have to weigh up and balance where they dedicate their limited resources and at present, it is unlikely that heat in buildings and energy efficiency is a high priority compared with the challenges of homelessness, social services and education provision. It would therefore need to be

considered by government whether this is a viable approach using public services or whether they need to invest in private services to regulate and operate.

Similarly with national approaches to deliver a firm end to fossil fuel installations, these strict regulatory approaches must be accompanied by incentives, opportunities and potentially subsidies if landlords, owners etc are expected to comply.



### **34. How can we increase consumer awareness and interest in clean heating technologies?**

Continue with smart meter installation as this is making consumers consciously aware of their fuel consumption for heating and how to reduce this.

Research by Daikin UK in 2015 showed that consumers were more aware of heat pumps (53%) than any other renewable technology, followed by solar thermal (42%) and solar PV (31%). Approximately 25% of those questioned were also familiar with hybrid systems combining a renewable energy with a boiler. However, only 17% of homeowners have had any interaction with a renewable technology, while only 4% have had one installed in their home. Awareness of RHI was just over 33%. It is highlighted that of those who have installed renewable technology, more than half have made use of RHI. However, it is also recognised that this has begun to tail off in the past couple of years due to large scale exploitation of the incentive by a small minority of applicants.

Independent Energy Assessors producing EPCs can give advice in the home/business; they can base this advice on the asset (building) and the occupation. By engaging consumers with local experts in an independent way, this will help improve awareness of clean technologies.

Capital cost is cited as the most common barrier to adoption so it has been stressed that there is a need for testimonials, case studies, demonstration equipment and site visits. The principle of 'pay as you save' should also be reinforced here as this may combat the high initial costs.

### **35. What are the best methods of engaging directly affected consumers?**

Publicise cost savings, improving occupant comfort, increasing asset value, improving building operating performance (decreased maintenance and repair frequency and cost).

The most effective way of engaging directly with affected consumers is to complete an EPC and have a local independent energy assessor explain the EPC and associated recommendations report to identify improvements which should be made, and demonstrate the cost savings they could bring about to offset the initial capital investment.



**36. How can we best work with heating engineers to benefit from their knowledge and experience, and their access to customers?**

No strong opinions

**37. What steps are needed to ensure installers, manufacturers, and the entire supply chain have access to new skills frameworks?**

No strong opinions

**38. What should the respective roles be for the fossil fuel market and the low carbon heating market in ensuring installers have the skills they need for the future?**

No strong opinions.

**39. What other options should we be considering to target key barriers to taking up clean heating?**

Previously, clean heating strategies have been fed down from the top but with the stop/ start policies and ever changing governments with conflicting ideas on how clean heating should be achieved; the top down method has never had any notable success. It is therefore advisable that the policies should be implement from the bottom up but allowing consumers to understand their energy use and building performance through EPC's and their associated recommendation reports, as they will then stimulate change in fuel use depending on how they can save money, maximise comfort. However, they are unlikely to make any changes from cheaper conventional fuels unless there are financial incentives in place to make the switch cost – effective.

**40. What intervention would make the biggest difference ahead of any regulation?**

See answer to question 44 for future proofing buildings and planning decarbonisation into new buildings.



**41. Why is oil being installed in some new buildings currently? Are there particular factors or characteristics that are leading to oil being chosen over lower carbon alternatives? What are the barriers to installing a clean heating technology in these buildings?**

Prices used by SAP/RdSAP for calculation of fuel costs		
From January 2018		
Fuel	Standing charge £/year	Unit price p/kWh
mains gas	87	4.01
bulk LPG	70	6.53
bottled LPG		10.45
heating oil		3.66
house coal		4.14
anthracite		4.22
manufactured smokeless fuel		5.22
wood logs		4.65
wood pellets secondary		6.08
wood pellets main heating		5.5
wood chips		3.47
dual fuel appliance		4.51
standard tariff	70	16.12
7-hour tariff high rate	8	18.97
7-hour tariff low rate		7.06
10-hour tariff high rate	7	18.22
10-hour tariff low rate		10.06
18-hour tariff high rate	11	14.72
18-hour tariff low rate		10.01
24-hour heating tariff	31	9.64
electricity sold to grid		16.12
community	87	4.89
community CHP		3.42

Oil has been used in new buildings more recently for two main reasons. The first being, according to the latest SAP tables for fuel prices released in January 2018 show that oil remains cheaper per kWh than natural gas, as has been the case for the last 5 years or so. As consumers are largely stimulated solely on financial savings rather than any moral obligation to use clean fuels, they are likely to continue to make this choice until it no longer becomes financially viable.

Secondly, SBEM software used in non domestic regulations shows that oil produces less kgCO<sub>2</sub>/kWh than grid supplied electricity, so where there is no natural gas supply, building owners are likely to use oil over electricity to fuel the heat for their building. This is not necessarily related to cost being a new build, but more likely, because they produce less CO<sub>2</sub>, they would be installed to ensure the building meets BRUKL compliance to be passed off by building control.

Once again this highlights the fact that the building regulations use carbon to measure compliance via target setting for the building/home. Consumers tend to be more motivated in general on price, which is what appears on the associated EPC. Neither of the measurements is incorrect, it is just essential that the objective of the policy is clear from day one.

**42. Do you have any evidence of the cost of retrofitting clean heating in current new build, compared to the cost of building to that standard now?**

No strong opinions

**43. What are the relative costs and benefits of installing clean heating systems in the new build compared to installing future proofing measures?**

No strong opinions

**44. What would be the most cost- effective and affordable measures to decarbonise new buildings? Please make reference to specific forms of clean heating or future proofing measures.**

Regulations are a key driver in future proofing but there is a gap between appeal for proofing and lack of effective implementation by building professionals. There appears to be a lack of understanding of the term 'future proofing'. There is currently very little to no established design – support framework to readily incorporate a long – term perspective into the energy design of buildings. The barriers are distinguished between technical, cultural and organisational.

Technical – disconnection between appeal of future proof and readily available approaches for effect implementation. Need to use Life cycle analysis.

Organisational/ cultural – Short term perspective prevalent to construction sector of conflicts with long term principles of sustainable design. Related to convincing shift from 'build it now, fix it later' scenario. Building professionals have little interest in whole life costs due to decisions being driven by short payback periods and desire for quick revenue generation.

To overcome the lack of effective implementation by building professionals, Part L regulations must have a clearer route, and building control must stringently control building fabrics and services that are to be signed off, and if they do not have the resources to strictly enforce this in all cases, the BRUKL compliance aspect of their role could look to be incorporated in the role of



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the Energy Assessors, and overseen by Accreditation Bodies. At present there is a focus on just meeting the minimum requirements of Part L rather than looking to go above and beyond the minimum expectations. It may therefore be recommended that incentives are provided to ensure building professionals use fabrics and services that are considerably better than those at the baseline level of compliance.

Ideas if barriers can be overcome – PV panels incorporated into the roof design of many if not all buildings, transpired solar collectors (retention and delivery of heat).

However, it is not clear whether this question relates to future proofing the buildings for each of the four objectives, or all together so suggestions may differ depending on the desired outcome as policies contradict each other.

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