

Response to: Call for evidence: Decarbonising heat in homes (Decarbonising heat in homes inquiry)

<https://committees.parliament.uk/work/645/decarbonising-heat-in-homes/>

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1 Preamble

This consultation contributes to an inquiry focusing on the policies and regulations needed to decarbonise heating in residential buildings. The [Terms of Reference](#) make clear that the inquiry is to focus on heat (it does not mention cooling) and on technologies, regulations and incentives that can encourage the 'uptake' of low carbon heat.

However, heating is part of a wider system that delivers *comfort* and so to properly address the problem, the Terms of Reference need to ask more broadly:

- *how can we achieve low-carbon comfort?*

In other words how are we going to deliver thermal comfort in the UK given known trends of climate, social norms of (i.e. demand for) cooling and built form while emitting (net) zero carbon dioxide?

Low-carbon comfort (Chappells & Shove, 2005; Shove et al., 2008; Ormandy & Ezratty, 2012) is a systemic problem (as opposed to just a heat technology problem) and we can achieve it by a combination of:

1. Fabric-first design and retrofit standards to *significantly* reduce the amount of energy required to achieve comfort **and**...
2. Reducing the carbon intensity of the (reduced) energy that is still required.

Overly-focus on the second aspect could be a strategic error because reducing the amount of energy required for comfort (item 1) could substantially reduce the difficulty and cost of achieving item 2. Indeed, it may even lead to different pathways than might be presumed to be optimal if we focus only on item 2.

In responding to the consultation questions, this response therefore refers to both aspects where possible.

2 About the author

Dr Ben Anderson is Principal Research Fellow within the Energy & Climate Change Division of Engineering and Physical Sciences at the University of Southampton. He leads a portfolio of research projects with a particular focus on domestic energy demand. Interests include 'big' data-driven analysis of habitual energy and water consumption; the impacts of interventions or natural socio-technical change on patterns of demand and the linkage of 'appliance' monitoring with traditional forms of social science data in support of socio-technical innovation.

Ben has provided advice and consultancy to the UK Departments for Environment & Rural Affairs and Energy & Climate Change (DECC, BEIS), the Scottish Government, water/energy sector corporates and NGOs on patterns of domestic energy & water use. He recently completed a 2-year EU-funded Fellowship hosted by the University of Otago. During this time, he provided advice to BRANZ Ltd, the Ministry of Business, Innovation and Employment (MBIE), the NZ Energy Retailers Association (ERANZ) and the Energy Efficiency and Conservation Authority (EECA) on domestic energy demand and consumer behaviour.

3 Questions addressed (selected)

Q2: What key policies, priorities and timelines should be included in the Government's forthcoming 'Buildings and Heat Strategy' to ensure that the UK is on track to deliver Net Zero? What are the most urgent decisions and actions that need to be taken over the course of this Parliament (by 2024)?

If we focus on **low carbon comfort** then our policy focus has to be:

1. Energy efficiency (fabric first) – if we get this right then heat (and cool) energy demand will be radically reduced
2. Low carbon energy (supply) – if we need a lot less of it, this could change the optimum mix and delivery mechanisms
3. Habits & practices – what are the population's domestic comfort habits (including ventilation) and what needs to change as part of *low carbon comfort*...?

Re 1 (energy efficiency):

The most critical barrier is that BEIS is now tasked with fixing poor energy efficiency and carbon Intense comfort services that could have been avoided via higher standard building regulations at build time. Thus:

- Priority 1: MHCLG to ensure that new builds are at the lowest practically achievable energy (e.g. kWh/m²) and carbon intensity (e.g. tCO₂/m²) standards and
- Priority 2: MHCLG and/or BEIS to ensure that all retrofits are at the lowest practically achievable energy (e.g. kWh/m²) and carbon intensity (e.g. tCO₂/m²) standards.

It is crucial that the UK legislates to ensure any new refurbishment or new build should have the highest standard possible through mandating the lowest practically achievable energy intensity – such as the PassivHaus space heating standard of 15 kWh/m² – which can then be met using low-carbon heating/cooling services of the kind this inquiry is intending to explore. This will need national policy change and it is worth noting that New Zealand has just closed a consultation on exactly this approach for new-builds as a pathway to a similar standard for retrofits¹. We need to catch up...

Re 2 (supply):

Please see UKCRIC and other engineering/technology focused contributions.

Re 3 (norms & practices):

Previous work by the DEMAND research centre² has highlighted that norms of comfort are dynamic and can be adjusted through various steering interventions – including establishing new norms and energy cultures (Stephenson et al., 2015). This has been particularly proven in the case of cooling in other countries (e.g. Japan) but it is less clear that this is useful in the case of healthy winter comfort levels although there is some evidence from the DECC/BEIS EFUS study of what might be termed 'excessive' winter heating (Building Research Establishment, 2013). Policy settings should not be

¹ <https://www.mbie.govt.nz/have-your-say/building-for-climate-change-transforming-operational-efficiency-and-reducing-whole-of-life-embodied-carbon/>

² <http://www.demand.ac.uk/influencing-demand/>

fearful of attempting to design new norms and energy cultures if those are required to ensure substantial carbon emission reductions through obviating the need for as much energy input.

See also the response to Q6 & Q8 below.

Q4: What are the barriers to scaling up low carbon heating technologies? What is needed to overcome these barriers?

A key but rarely recognised barrier is that the majority of consumers are not 'rational actor' cost optimisers when it comes to energy in the way that we assume businesses to be (Ambrosio-Albala et al., 2020; Hargreaves & Middlemiss, 2020; Strengers, 2014). This means they do not necessarily (or even generally) respond to economic incentives to reduce energy demand (Buckley, 2020).

Thus, even when:

1. full information on the benefits and easy access to funding is provided (or a service is provided for free) and
2. economic incentives (such as potentially lower energy costs) are in place

...a plethora of other personal, relational and cultural factors can act as a barrier to dwelling. Improvement/intervention (Ambrose, 2015; März, 2018; Chisholm et al., 2019) as is known to be the case for energy retailer switching (Ambrosio-Albala et al., 2020).

This suggests that much more research is required to understand the social and energy cultures contexts, pathways and processes of home energy efficiency and/or low carbon heating upgrades (Rau et al., 2020). This work and any subsequent policy or regulatory action that derives from it needs to acknowledge that the 'information deficit' model is insufficient. In other words, households do not act due to a lack of information, they do not act *despite* access to information.

Q5: How can the costs of decarbonising heat be distributed fairly across consumers, taxpayers, business and government, taking account of the fuel poor and communities affected by the transition? What is the impact of the existing distribution of environmental levies across electricity, gas and fuel bills on drivers for switching to low carbon heating, and should this distribution be reviewed?

and

Q6: What incentives and regulatory measures should be employed to encourage and ensure households take up low carbon heat, and how will these need to vary for different household types?

If appropriate new build standards have been implemented (see Preamble, Q2 above and Q8 below) then there should be no need for new builds to 'switch'.

In contrast existing building stock will require intervention and this requires an understanding of how to incentivise (or require) *both*

- fabric-first energy efficiency interventions (to reduce the energy required for comfort)

and

- the provision of low-carbon heat/cool to ensure comfort that cannot be delivered by the building fabric.

From the 'rational actor' point of view this will require the benefits of intervention to outweigh, over some period of reasonable time, the costs.

Currently the estimated mean cost of sufficiently upgrading dwellings in EPC bands A-E is ~£13,000 and F&G is ~£27,000 (MHCLG, 2020)³ while the annual 'post-improvement notional total energy current cost (£/yr)' is estimated to be £410 (band A-E) and £510 (bands F & G). If these values are close to robust then there is clearly very little financial incentive for a home-owner to upgrade their dwelling (see also (Committee on Climate Change, 2019)).

In combination with the points made in response to Q4 above, and if we persist in believing that economic incentives are effective, this implies the need to consider some combination of:

1. A sufficiently punitive future Residential Carbon Tax to incentivise capital investment in order to avoid a future tax liability. This is likely to be progressive since the highest emitters will usually be those who spend most on energy who in turn are usually (but not always) the least deprived;
2. Access to finance to ensure that the capital investment can be made to avoid that tax liability by those who do not have sufficient capital;
3. Legally enforceable retrofit performance standards to ensure that the invested capital is not mis-spent and that appropriately low energy (kWh/m²) and carbon intensity (tCO₂/m²) is achieved;
4. Provision of trusted intermediaries who can help householders to overcome relational, cultural and normative barriers (see Q4) by extending support competencies beyond the merely technical aspects of socio-technical change (Hargreaves & Middlemiss, 2020; Rau et al., 2020)⁴.

In this respect an equitable Carbon Tax would need to:

- avoid penalising social and private renters who have no ability to reduce the building fabric-related emissions of their rented homes;
- avoid penalising disadvantaged households who already spend a large proportion of their income on energy (c.f. VAT);
- incentivise investment in energy efficiency and low carbon comfort technologies by *both* landlords and owner-occupiers;
- incentivise all occupants to reduce and/or shift the energy demand over which they do have control away from (currently) carbon intensive periods – such as cold, calm evenings in winter (Staffell, 2017; Staffell & Pfenninger, 2018).

It is possible that some form of rising block tariff directly tied to the level and temporal carbon intensity (Khan et al., 2018; National Grid ESO, 2017) of electricity and gas consumption at the dwelling level could be used.

If these measures, and in particular a Carbon Tax + finance scheme, do not have the desired effect then politically unpalatable though it may be, regulation to *require* appropriate retrofits using some form of enforceable shared/socialised cost model may be the only option if we are to achieve our carbon emission reduction goals.

3

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/898343/Energy_Chapter_3_Figures_and_Annex_Tables.xlsx

⁴ See e.g. <https://www.cse.org.uk/news/view/2495>

Q8: Where should responsibility lie for the governance, coordination and delivery of low carbon heating? What will these organisations need in order to deliver such responsibilities?

Governance must be central with nationally defined standards or regulations which Local Authorities are at liberty to exceed. Local Authorities are best place to ensure local regulation through existing Building Control and other processes and to provide co-ordination. Delivery should be left to agile contractors bidding for contracts let by property owners or developers. Local Authorities can play a key role in aggregating local demand from private home-owners, acting as a procurement mediator ensuring best value and quality so that national standards are met or exceeded.

Crucially, governance will require the alignment of:

1. MHCLG – who could set appropriate standards and processes via planning and building control for both new build and retrofit so that any building constructed or retrofitted after 2021 needs no further decarbonisation intervention;
2. BEIS – who could ensure appropriate regulations, mechanisms and support to:
 - a. require existing dwellings to meet MHCLG’s new stringent fabric-first retrofit standards by (e.g.) 2030 and;
 - b. ensure interventions in those dwellings that for whatever reason escape the planning and building control process **and**
 - c. incentivise non-housing related transitions or interventions.
3. Treasury – who would need to integrate a Carbon Tax into the existing national and local taxation system to minimise unanticipated consequences, ensure fiscal neutrality where possible and prevent inequity.

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