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26th March 2024

Dear Sir or Madam,

Re: Combined response to the Future Homes and Building Standard (FHS) and Home Energy Model (HEM) consultations

We submit the following response to the Future Homes and Building Standard (FHS) consultation. CSE were signatories in the coalition response led by the Good Homes Alliance[1]. We however wish to make further comments expanding on some of the points we contributed, and others made in the coalition response, relevant to our organisation's specific knowledge and expertise.

CSE is an independent national charity, established in 1979 to tackle climate change and end the misery of cold homes. We undertake practical work to support households and communities to act on energy, alongside original research and analysis to inform local and national policy. We have research expertise in complex data modelling and software engineering; low carbon planning including zero carbon building standards; renewable energy; energy regulation and its impact on vulnerable consumers; and energy programme evaluation; the fuel poverty and social distributional impacts of energy policy. CSE has provided consultancy services to planning authorities across England and to private developers, with a particular focus on developing effective polices to facilitate net zero carbon development.

[1] https://goodhomes.org.uk/future-homes-standard-consultation-response

We work closely with government and have recently given evidence in parliament to the Environmental Audit Committee (Sustainable Electrification inquiry[2]) and Net Zero Committee (Flexible Grid for the Future inquiry[3]) in respect of grid reinforcement, the de-carbonisation of the economy, renewable energy, and the role of the planning system within this. We particularly wish to stress the relationship between building standards and the decarbonisation of the wider energy system, which is not considered within the consultation.

Climate Science

It is worth briefly re-visiting the latest climate science. The IPPC's latest synthesis report[4] (March 2023) summarises the urgency with which we must cut emissions:

> *"Human activities… have unequivocally caused global warming, with global surface temperature reaching 1.1°C above 1850–1900 in 2011–2020. Widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere have occurred. Human-caused climate change is already affecting many weather and climate extremes in every region across the globe. This has led to widespread adverse impacts and related losses and damages to nature and people.*
>
> *Continued greenhouse gas emissions will lead to increasing global warming, with the best estimate of reaching 1.5°C in the near term... Every increment of global warming will intensify multiple and concurrent hazards (high confidence).*
>
> *Some future changes are unavoidable and/or irreversible but can be limited by deep, rapid and sustained global greenhouse gas emissions reduction…*
>
> *All global modelled pathways that limit warming to 1.5°C (>50%) with no or limited overshoot, and those that limit warming to 2°C (>67%), involve rapid and deep and, in most cases, immediate greenhouse gas emissions reductions in all sectors this decade.*
>
> *Climate change is a threat to human well-being and planetary health (very high confidence). <u>There is a rapidly closing window of opportunity to secure a liveable and sustainable future for all (very high confidence). The choices and actions implemented in this decade will have impacts now and for thousands of years (high confidence).</u>" (Our emphasis)*

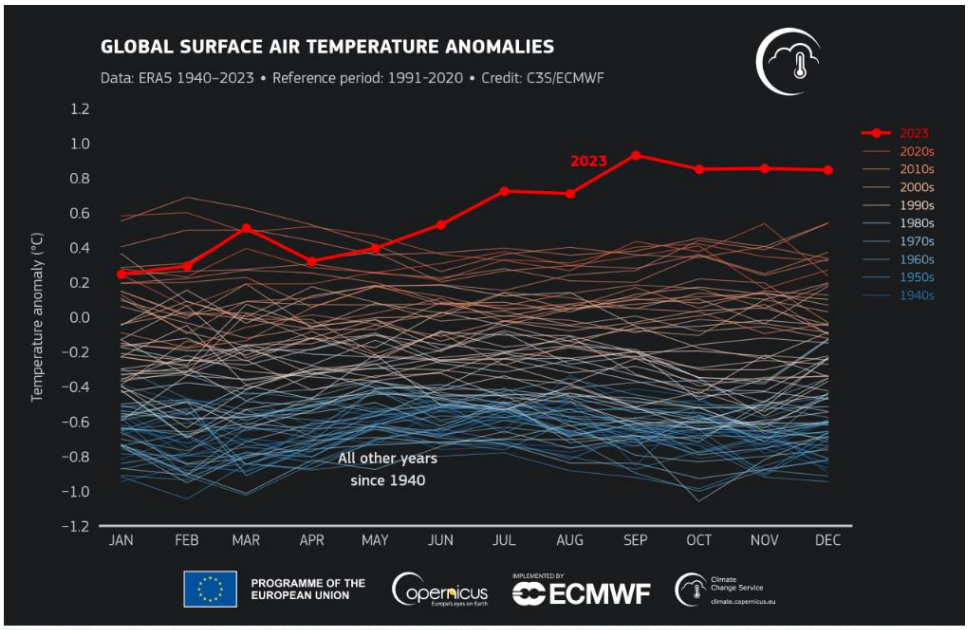
If anything, the climate data from last year was even worse than predicted by the IPCC. Copernicus, the EU Climate Change Service provides an additional reliable source of data in

[2] Environmental Audit Committee - Sustainable Electrification inquiry - https://committees.parliament.uk/work/7680/enabling-sustainable-electrification-of-the-uk-economy/

[3] Net Zero Committee - Flexible Grid for the Future inquiry - https://committees.parliament.uk/work/7831/a-flexible-grid-for-the-future/

[4] Climate Change 2023 - Synthesis Report (March 2023) - Summary for Policymakers www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_SPM.pdf

respect of the warming experienced in 2023. As illustrated in the graph below, regrettably, 2023 has seen rapid, unprecedented further acceleration of warming, even against recent climate records.



Monthly global surface air temperature [1] anomalies (°C) relative to 1991–2020 from January 1940 to December 2023, plotted as time series for each year. 2023 is shown with a thick red line while other years are shown with thin lines and shaded according to the decade, from blue (1940s) to brick red (2020s). Data source: ERA5. Credit: C3S/ECMWF.

Key messages from Copernicus[5] are as follows:

- *2023 is confirmed as the warmest calendar year in global temperature data records going back to 1850.*
- *The global mean temperature for the past twelve months (Feb 2023 – Jan 2024) is the highest on record, at 0.64°C above the 1991-2020 average and 1.52°C above the 1850-1900 pre-industrial average.*
- *Each month from June 2023 to February 2024 was warmer than the corresponding month in any previous year.*

The headline finding from Copernicus is that, as predicted by the IPPC, global temperatures for 2023 are already beyond 1.5°C above pre-industrial level. As is well known, as global heating heads towards 2 degrees, impacts become irreversible, with the risk of feedback loops being triggered increasing.

All the data and analysis from these impeccable sources points to the fact that a precautionary approach is needed in policy making, which pursues the fastest and deepest emissions reductions possible.

[5] Global Climate Highlights 2023 - https://climate.copernicus.eu/global-climate-highlights-2023?utm_source=socialmedia&utm_medium=tw&utm_id=gch23 & Copernicus: In 2024, the world experienced the warmest January on record - https://climate.copernicus.eu/copernicus-2024-world-experienced-warmest-january-record

Overall response

We welcome the end of fossil fuel heating and commitment to low carbon heating. We support integrated on-site renewables for new homes, and the extension of energy efficiency measures for dwellings created under material change of use. We welcome the proposed HEM as a replacement for SAP. These elements of the proposals should be implemented without delay.

However, echoing the comments of the coalition response headed by the Good Homes Coalition[6] (to which we were a signatory) further development of the FHS is needed. Government should therefore consult on a more robust standard which achieves net zero emissions in all new homes now, and which supports the decarbonisation of the wider energy system.

Written Ministerial Statement

We wish to take the opportunity to object to the Written Ministerial Statement on 'Planning – Local Energy Efficiency Standards Update'[7], which without justification or evidence seeks to curtail the use of local plan policies framed around energy metrics, and the advancement of robust net zero standards by local planning authorities.

We see significant advantages to the policy approaches being developed by LETI and UKGBC and to the policy approaches adopted by Cornwall and Bath and North-East Somerset. These policies are framed around an energy intensity metric (kWh/m2yr), achieve net zero carbon standards through optimised fabric efficiency standards, renewable heating, and on-site renewable electricity generation. They furthermore enable the decarbonisation of the wider energy system through maximising the provision of on-site renewables and enabling smart and flexible energy use.

Broadly speaking, these types of policies are what we and many other expert commentators believe are necessary to decarbonise buildings and the wider energy system.

In the absence of binding zero carbon standards set by national government, we see the development of robust and well evidenced net zero standards by local government as wholly positive. They should be supported in developing such policies.

Detailed comments in respect of Future Homes Standard

We are disappointed that of the Future Homes Hub's (FHH) five contender specifications for the FHS, as set out in its Ready for Zero report[8], only the two weakest options are being consulted upon.

[6] https://goodhomes.org.uk/future-homes-standard-consultation-response
[7] https://questions-statements.parliament.uk/written-statements/detail/2023-12-13/hlws120
[8] https://irp.cdn-website.com/bdbb2d99/files/uploaded/Ready+for+Zero+-+Evidence+to+inform+the+2025+Future+Homes+Standard+-Task+Group+Report+FINAL-+280223-+MID+RES.pdf

We strongly disagree with the Option 2 notional specifications because the lower building fabric standards and non-inclusion of photovoltaics (PV) and will lead to an additional £600-£700 per year on energy bills for the residents of new homes compared to the current Part L 2021 and Option 1 respectively, as set out in the FHS consultation.

In 2023, there were an estimated 13.0 per cent of households (3.17 million) in fuel poverty in England under the Low Income Low Energy Efficiency (LILEE) metric[9]. At a time of unprecedented fuel poverty, the Future Homes Standard offers an opportunity to design out, or at least significantly lessen, fuel poverty in new homes.

We consider that this framing of the proposed standards is too narrow. The objective of the Future Homes Standard should be to support the decarbonisation of the energy system as a whole not just individual houses. The consultation has not sufficiently considered the potential for new homes to actively support grid decarbonisation through maximising rooftop generation and energy efficiency, minimising energy demand and offering the potential to flex that demand. We note that the policy approaches being developed by LETI and UKGBC and adopted by Cornwall and Bath and North-East Somerset capture these benefits.

Likewise, the consultation considers costs and economic benefits too narrowly. The consultation should consider not just capital costs to developers, but the ongoing energy costs for occupants and the energy system costs the standards would give rise to, and the potential to avoid higher system costs through higher standards.

Meeting total renewable energy demand

Firstly, addressing the challenge of meeting our total future energy needs wholly from renewable sources, because of the electrification of heat, transport and industry, and the need in time to close fossil fuel generation plant, the demand for renewable electricity is expected to quadruple[10] by 2050.

It will be a significant challenge to meet this level of demand from renewable sources, therefore every effort should be taken to minimise energy consumption. In this respect we note that contender specification 4 from the Future Homes Hub's Ready for Zero report[11] has just 25% of the home heating demand compared to FHS Option 1 (CS2). We would like to see a published explanation and evidence from government on why they chose not to consult on what would have been an improved scenario for new homes.

It is even more regrettable therefore that the preferred option does not mandate rooftop solar, placing more pressure on the development of standalone renewable energy projects.

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[9] ONS, Annual Fuel Poverty Statistics in England, 2024 (2023 data)

[10] UK Electricity Strategy: Capacity, Demand and Pricing - Evidence for the BEIS Select Committee, 9th January 2023 https://committees.parliament.uk/writtenevidence/115773/pdf/

[11] Ready for Zero Task Group Report - Evidence to inform the 2025 Future Homes Standard - https://irp.cdn-website.com/bdbb2d99/files/uploaded/Ready+for+Zero+-+Evidence+to+inform+the+2025+Future+Homes+Standard+-Task+Group+Report+FINAL-+280223-+MID+RES.pdf

From our experience[12] of public engagement in respect of renewable energy, broadly speaking, the public would prefer to see solar panels being put on roofs before renewable energy plant is installed in fields, and our perception is that the government would too.

Government should therefore take all possible opportunities to maximise renewable energy generation within new homes and minimise energy demand in new development to reduce the scale of the challenge in decarbonising grid electricity.

Finally, the cost of installing solar panels continues to plummet. Analysis from MCS[13] suggests the cost of electricity from solar fell by 87% in the 10 years to 2023. Even assuming this rate of cost reduction slows, mandating the installation of rooftop solar should be seen as a no-regrets option which will help meet this demand, and reduce electricity bills for future occupiers at a modest capital cost. The costs of retrofitting the installation of solar PV to completed homes is much higher and makes little sense.

Managing Intermittency, balancing and decarbonising the grid

As important as the challenge of providing sufficient total renewable energy capacity will be the challenge of matching variable renewable energy supplies to variable energy demands, or in other words ensuring there is the right amount of renewable energy at the right time in the right place to meet our needs.

In parallel to the FHS consultation, the House of Commons Net Zero and Environmental Audit Committees are exploring the widespread capacity problems across our electricity networks, and the huge challenges around reinforcing the transmission and distributions grids at sufficient pace to meet the quadrupling of renewable electricity demand expected.

The Nick Winser Report[14], discussed in these sessions, sets out the need for the massive reinforcement of our distribution and transmission grids needed to support grid decarbonisation, concluding "…around four times as much new transmission network will be needed in the next seven years as was built since 1990."

National Grid ESO provide an indication of the likely costs of this reinforcement, recommending[15] By 2030 "over £60 billion of investment across both onshore and offshore network infrastructure to facilitate the connection of new offshore generation and other new renewable energy sources, while enabling the electricity network to run at the best value for consumers".

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[12] www.cse.org.uk/my-community/community-projects/future-energy-landscapes-community-consultation-method/

[13] www.mcc-berlin.net/en/news/information/information-detail/article/plummeting-prices-for-solar-power-and-storage-make-global-climate-transition-cheaper-than-expected.html#:~:text=MCC%2Dled%20study%20on%20the%20effect%20of%20technology%20and%20product%20in

[14] Electricity Networks Commissioner – Companion Report Findings and Recommendations https://assets.publishing.service.gov.uk/media/64c8e85219f5622360f3c0ee/electricity-networks-commissioner-companion-report.pdf

[15] www.nationalgrideso.com/future-energy/beyond-2030

Broadly speaking the electricity network is at or near capacity in many areas, limiting the connection of new renewable energy projects and the potential of operational projects.

Quoting the Nick Winser report[16], The National Grid Electricity System Operator (ESO) estimates that even with optimal reinforcement of the grid, annual constraint costs (paying renewable energy generators not to generate) could rise from around £0.5-1 billion per year in 2022 to a peak of £2-4 billion per year around 2030.

To be clear, whatever demands new homes place on the energy system, considerable grid reinforcement will be required, however optimal building standards can help reduce this challenge. Very well insulated homes which retain their heat will have lower total electricity demand, lower peak demands, and lower bills as well as greater potential to offer energy flexibility. With very energy efficient homes, it would be possible to turn their heating off or up for an hour with no detrimental impact on the residents. A panel of experts including representatives from the heat pump industry looked at the potential for heat pump flexibility. The session[17] found that heat pump flexibility has several use cases and most participants envisaged it being used without detriment to homeowners. Furthermore, in a trial of an automated heat pump flexibility service[18], participants were able to reduce their heat pump energy draw by an average of 800W during the Demand Flexibility service sessions in its first month of operation.

If you could do that with a million (6 KW) air source heat pumps (a little over 3 years' worth of proposed housing growth), you'd have 6Gw of energy flexibility on tap. The Future Homes Standard should ensure new homes are readied to provide these services.

The 2023 Second National Infrastructure report[19] emphasised the role of demand side reduction and improving efficiency and we believe increased resilience is needed (1 and 2 above) for new homeowners to resist price shocks, and for developers to be assured of affordable grid connections.

Furthermore, without the extensive use of demand side management, it will be difficult to balance the grid without utilising fossil fuel energy sources. This is recognised in the review of Electricity Market Arrangement consultation which sets out the case for building 22 – 28GW of unabated gas generation, "acting as back-up generators, to run less frequently as the UK continues to roll out other low carbon technologies"[20].

Are these system costs included in the consideration of costs?

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[16] https://assets.publishing.service.gov.uk/media/64c8e85219f5622360f3c0ee/electricity-networks-commissioner-companion-report.pdf

[17] Summary of findings from heat pump flexibility expert workshop www.creds.ac.uk/publications/summary-of-findings-from-heat-pump-flexibility-expert-workshop/

[18] www.current-news.co.uk/heat-pump-dfs-technology-delivers-grid-balancing-breakthrough/

[19] https://nic.org.uk/app/uploads/Final-NIA-2-Full-Document.pdf

[20] www.gov.uk/government/news/energy-secretary-takes-action-to-reinforce-uk-energy-supply#:~:text=The%20need%20for%20continued%20unabated,meet%20its%20net%20zero%20targets.

We recognise that the first priority must be to keep the lights on, and that what we have suggested will not be the whole solution to reducing grid reinforcement and back-up generation costs. Nevertheless, the building regulations should make the most of the opportunity to reduce the pressure new homes place on the electricity grid, and the need to transmit electricity around the country.

Rooftop PV should be mandated as the norm for new developments, the fabric efficiency and air tightness standards should be increased to increase householder comfort and achieve a level of thermal resilience and stability to permit sufficient flexibility for grid peak load management.[21]

Embodied Carbon

We agree with the comments from the Good Homes Alliance about the need to regulate embodied carbon in new buildings. Embodied carbon currently makes up 20% of UK built environment emissions. As grid electricity de-carbonises, it will become more and more important. Policies to measure and limit embodied carbon and apply circular economy approaches within the construction sector are urgent and should be part and parcel of a fit-for-purpose FHS.

Real-world performance of homes

Question 40 focuses on voluntary post occupancy performance testing for new homes. We answer (b) i.e. we support this and would like to give further input.

Monitoring the performance gap via post-occupancy testing has been identified as a key mechanism to improve standards. We are therefore disappointed to see that DLUHC is proposing that this remains voluntary (which realistically means it's unlikely to be taken up).

A challenge for post-occupancy in-situ measurement in policy (for retrofit as well as for new build) has been the inability to account for its benefits within government policy cost-benefit analyses. The FHS Impact Assessment recognises this, stating that 'without a consistent, or agreed, performance gap 'number' to include in Financial Modelling, 100% compliance must be assumed'. Without better information homeowners will be unable to verify the performance of their homes (maximising the benefits to them of lower bills and higher property values) and Government will not be able to monitor building standards.

The cost of post-occupancy in-situ measurement in existing homes has fallen dramatically (in the £100s rather than £1000s). If post-occupancy performance monitoring was mandated, then this would drive costs down further. We support Knauf Insulations proposals for in-use measurement to be required for a minimum 10% of completions for the top 25 house builders. It should be voluntary for others but with a clear indication it will become mandatory in time.

[21] www.gov.uk/government/publications/building-for-2050

In reference to Question 41, the 'Future Homes' brand should be saved for those that achieve a highly consistent level of fabric compliance in homes measured (see above).

Comments in respect of the Home Energy Model

We strongly support and welcome the replacement of SAP with the Home Energy Model. It promises to provide more accurate modelling of building performance and greater accuracy with result to low carbon heating and cooling of buildings (e.g. heat pumps and heat networks).

We are very supportive of the increased time resolution for HEM. This brings it more closely in line with other developments such as Half Hourly Metering, and greater granularity of data will ensure more successful consideration of new heating measures such as heat pumps. This change should also enable the modelling of smart technologies and flexibility, including energy storage and load-shifting, all functions necessary to address the concerns we raised above about managing grid capacity, and decarbonising the energy system as a whole.

While the consultation document notes the potential for future inclusion of time-of-use tariffs, with domestic demand side response models already in operation, such as the Demand Flexibility Service, we would recommend accommodating this in HEM earlier rather than later. Given a variety of potential tariffs are arriving on the UK market, this is not a long-term proposition for UK homes, and earlier integration can provide a more accurate set of HEM results.

Similarly, we welcome the proposed wrapper approach, enabling HEM to be used for several different use cases, including modelling building performance for the purposes of building regulations, Energy Performance Standards, informing Retrofit plans, more accurate sizing of heat pumps.

The open-source approach is also strongly welcomed, allowing the creation of innovative products and services for use cases that we cannot yet envisage.

In closing we re-iterate the comments from the Good Homes Alliance, that the positive elements of the proposals should be implemented without delay:

- the end of fossil fuel heating and commitment to electric heating.
- the extension of energy efficiency measures for dwellings created under material change of use.
- The replacement of SAP with HEM.

However, a further iteration of the Standard should be developed to address our concerns above and the concerns of others.

Yours sincerely

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