Written evidence submitted by the Understanding Risk Research Group, Cardiff University (HEA0129)

The Understanding Risk Research Group at Cardiff University conduct interdisciplinary research into public understanding of and engagement with the risks and benefits of new technologies and the environment, and the implications for everyday life of sustainable energy transitions. Working across the School of Psychology and the School of Social Sciences at Cardiff University it is funded through UKRI and other academic sources. Current and recent projects cited in this submission[1] include as follows:

The Living Well in Low Carbon Homes project in 2018-2022 (hereafter **LWLCH**).[2]

The Network Headroom, Engineering Upgrades and Public Acceptance project in 2020-2023 (hereafter **NEUPA**).[3]

UK Energy Research Centre projects between 2010 and 2023 (hereafter **UKERC**).[4]

The Energy Biographies project 2011 to 2015 (hereafter Energy Biographies).[5]

The Delivering Net Zero project in 2020-2022.[6]

The Flexible Integrated Energy Systems Programme in South Wales between 2016 and 2023 (hereafter **FLEXIS**).[7]

Most projects engaged members of the general public, including households from financially vulnerable sectors of society. Submission authors: Professor Nick Pidgeon, Dr Fiona Shirani, Dr Gareth Thomas, Dr Kate O'Sullivan and Professor Karen Henwood.

[1] What policy changes are needed to deliver energy efficient homes across the UK?

Stakeholders involved in the LWLCH project identified the supportive funding and legislative environment in Wales as key to the development of innovative low-carbon housing incorporating efficient fabric, solar generation, active grid connection, and energy storage. Funding from the Welsh Government's Innovative Housing Programme has been critical to enabling these, with our stakeholders describing it as otherwise challenging to compete with mainstream housebuilders.

[1] Note – short segments of this Cardiff University submission also appear in a separate submission to the inquiry by University College London on behalf of the UK Energy Research Centre, of which we are a part. However, in this document we have sought to elaborate our Cardiff and Wales specific findings and research.

[2] **LWLCH** formed part of the Active Building Centre Research Programme in which we studied both developer and resident experiences of new build homes with solar generation and associated grid-connection technologies. See http://www.abc-rp.com

[3] **NUEPA** explored challenges for residents from network disruptions associated with the move to domestic low carbon heating systems using deliberative citizen workshops.

[4] We have conducted several **UKERC** projects between 2010 and 2023 on public attitudes towards changes to the energy system, paying for the sustainable energy transition, and perceptions of low carbon heating options. See http://www.ukerc.ac.uk

[5] **Energy Biographies** was a part of the Economic and Social Research Council's Energy and Communities programme and developed creative and temporal methodology for the study of routine energy use and demand reduction challenges. See https://orca.cardiff.ac.uk/id/eprint/87333

[6] Jointly with Leeds University and Cultivate Consultancy **Delivering Net Zero** explored expert pathways for achieving the UK's net zero commitments. See https://www.deliveringnetzero.org

[7] In **FLEXIS** we studied multiple aspects of everyday life and energy system change in South Wales as impacted by prospective flexible low carbon energy systems.

Political support in terms of legislation including the Wellbeing of Future Generations Act (2015) was also reported as important. Because of this supportive policy and funding context Wales is currently a locus of innovation in housing[8].

Costs for households has, not surprisingly, emerged as a significant concern for people in our FLEXIS and UKERC studies, and in particular impacts of excessive costs on low income and/or vulnerable households. Participants expect substantial financial assistance in making changes to their heating system given this would be driven by government policy to decarbonise[9]. The NEUPA project also explored challenges of adapting existing homes for low carbon heating. Here participants understood the need to move away from fossil fuels and to improve home energy efficiency to meet UK climate goals. However, many were uncertain as to what changes they would be expected to make and when[10]. As highlighted also in our earlier Energy Biographies study of temporal issues focusing on everyday energy use practices in communities across the lifecourse,[11,12] more clarity in policy over anticipated changes, what these mean in terms of domestic heat decarbonisation pathway timeframes, and associated implication for households is desirable.

[2] What are the key factors contributing to the under-delivery of the UK's government-backed retrofit schemes?

Across projects participants raises cost as a pressing concern[13,14 ,15], particularly in the context of recent energy price rises[16], citing paying energy bills, lack of funds for up-front investments, and reluctance to take on debt to finance retrofit.

Aside from concerns about bills, NEUPA found high satisfaction with current gas central heating (GCH) systems for convenience and comfort, and many participants did not see a need to change to low carbon heating, hence saw little current incentive to change.

NUEPA participants also expressed concerns about other perceived disadvantages of low carbon heating: many with combi-boilers described difficulty finding space for a hot water tank, and waiting

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[8] Henwood, K., Pidgeon, N., Shirani, F., O'Sullivan, K., and Hale, R. (2023) *Living Well in Low Carbon Homes Project Report*. Cardiff University: Cardiff. https://orca.cardiff.ac.uk/id/eprint/157428/

[9] Thomas, G., Flower, J., Gross, R., Henwood, K., Spiers., J, Pidgeon, N. (under submission) Inconvenience or Disruption? Citizen perceptions of in home and network impacts from heat decarbonisation in the UK

[10] Shirani, F. Thomas, G. Pidgeon, N. and Henwood, K. (under submission) Going backwards? A temporal perspective on public views of what constitutes improvement in domestic heating transitions.

[11] Butler, C., Parkhill, K., Shirani, F., Henwood, K. and Pidgeon, N. (2014) Examining the dynamics of energy demand through a biographical Lens. *Nature and Culture*, 9(2), 164-182.

[12] Groves, C., Henwood, K., Shirani, F., Butler, C., Parkhill, K., and Pidgeon, N. (2016). Energy biographies: narrative genres, lifecourse transitions and practice change. *Science, Technology and Human Values*, 41 (3) 484-508 DOI: 10.1177/0162243915609116.

[13] Shirani, F., Groves, C., Henwood, K., Pidgeon, N. and Roberts, E. 2020. 'I'm the smart meter': Perceptions and experiences of smart technology amongst vulnerable consumers. *Energy Policy* 144, article number: 111637. (10.1016/j.enpol.2020.111637)

[14] Groves, C., Shirani, F., Pidgeon, N., Cherry, C., Thomas, G., Roberts, E. and Henwood, K. 2020. 'The bills are a brick wall': narratives of energy vulnerability, poverty and adaptation in South Wales. *Energy Research and Social Science* 70, article number: 101777. (10.1016/j.erss.2020.101777)

[15] Pidgeon, N. and Demski, C. (2019) Paying for Energy Transitions. UKERC. https://ukerc.ac.uk/publications/paying-for-energy-transitions/

[16] Thomas, G., Flower, J., Gross, R., Henwood, K., Spiers., J, Pidgeon, N. (under submission) Inconvenience or Disruption? Citizen perceptions of in home and network impacts from heat decarbonisation in the UK

for hot water as inconvenient. This perception of technological change as 'going backwards' was viewed as off-putting for some[17]. Moreover, moving to electric heating would mean many consumers also changing from gas to electric cooking to avoid (gas) standing charges. Negative experience of electric cookers, and inability to pay for new appliances, was a further expressed reason for reluctance to change heating fuels[18].

[3] Which standards and assessment frameworks are needed to deliver a reliable, skilled workforce capable of transitioning UK homes to modern heating solutions?

Training and accreditation of a trusted and skilled workforce is critical to many sectoral challenges delivering net zero, hence should not be underestimated.[19] Members of the public could describe recognised standards for gas safety (Corgi / Gas Safe register) but are unsure about equivalents for low carbon heating systems, and how to find a qualified installer. Properly accredited training and well-publicised certification (for e.g. heat pump installers and retrofit measures) is a prerequisite for building public confidence.

[4] How might the Government support innovation in delivering local solutions?

We have consistently found significant mistrust of both private and public sectors[20,21,22,23], regarding the competence of public authorities tasked with commissioning low carbon infrastructure, and the integrity of public and private sector actors involved in local infrastructure and service delivery. Mistrust risks hampering uptake of low carbon technologies and practices. NEUPA participants expressed scepticism over the trustworthiness of energy suppliers and suggested that as a nationwide transition was required this should be government-led. They expected government to lead with information, policy and financial support, and a clearly articulated timescale for transitioning to low carbon home heating systems. However, they also saw a need for local advice services operating at arms-length from government and industry, who could provide independent advice on retrofit and financing [also point 5].

As in point [1], lessons can be learned from devolved nations. Close attentiveness to local place context is important for identifying which technologies are appropriate to different housing types and communities, and identifying how local adoption (or resistances to this) can be fostered. For

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[17] Shirani, F. Thomas, G. Pidgeon, N. and Henwood, K. (under submission) Going backwards? A temporal perspective on public views of what constitutes improvement in domestic heating transitions.

[18] Shirani, F., Groves, C., Henwood, K., Pidgeon, N., Roberts, E. and Thomas, G. (2021). *Mine water heating in Caerau: Thoughts from local residents*. 2020 Report. Project Report. FLEXIS.

[19] Delivering Net Zero Final Synthesis Report (2002) Universities of Leeds and of Cardiff with Cultivate Consultancy. https://www.deliveringnetzero.org/publications

[20] Parkhill, K., Demski, C., Butler, C., Spence, A. and Pidgeon, N (2013) *Transforming the UK Energy System; Public Values, Attitudes and Acceptability: Synthesis Report*. London: UKERC. https://ukerc.ac.uk/publications/transforming-the-uk-energy-system-public-values-attitudes-and-acceptability/

[21] Thomas, G., Cherry, C., Groves, C., Henwood, K., Pidgeon, N. and Roberts, E. (2022). "It's not a very certain future": Emotion and infrastructure change in an industrial town. *Geoforum* 132, 81-91.

[22] Thomas, G., Demski, C. and Pidgeon, N. (2019). Deliberating the social acceptability of energy storage in the UK. *Energy Policy* 133, 110908.

[23] Pidgeon, N. and Demski, C. (2019) Paying for Energy Transitions. UKERC. https://ukerc.ac.uk/publications/paying-for-energy-transitions/

example, communities with experience of poorly executed energy efficiency or technology installation in the past may be more reticent in signing up to other future changes to their homes[24].

Shifts to more localised energy supply, for example through the creation of waste heat networks (as currently occurring in Cardiff Bay), could create new opportunities for reliable low-cost heating. However, the geographically restricted nature of such networks can enact new inequalities at their boundaries[25], between those with access to the new forms of heat provision and those left to fend for themselves. There is also a risk that those subject to new forms of heat provision may find themselves subject to higher costs or new forms of monopoly power[26], pointing to the need for close scrutiny of regulatory powers in the area of localised heat decarbonisation.

[5] What role should customer choice play in the future planning of energy networks for home heating?

Our research on UK citizen views of energy system change shows a degree of choice in options as a value that people in Britain feel important for the energy transition to meet. However, it is not the sole or overriding driver of public views about desired change, and sits alongside strongly held beliefs about environmental protection, minimisation of waste, fairness to all (especially the already vulnerable), and adopting a long-term view on the right forms of sustainable energy system for the UK[27]. Similar findings were reported from the recent UK Citizen Climate Assembly[28]. Policies are unlikely to succeed, or be fully publicly acceptable, if they simply aim to optimise 'customer choice' – these other deeper values matter for publics.

While the notion of choice is important for our participants, some felt 'choices' do not exist in regard to domestic heating for those who cannot meet capital outlay, regardless of other preferences or overall lifetime costs[29]. NEUPA participants were accepting of new homes having low carbon technologies (e.g., heat pumps, high energy efficiency), and largely expressed support for the introduction of compulsory standards for this, since an individual could choose whether to live in a new-build home or not. However, changes to existing homes were seen as more complex, particularly if people were satisfied with the current functioning of their gas heating systems. Where participants thought government was 'forcing' change towards low carbon heating systems, they expressed a sense that the government should also pay for such an 'imposed' decision.

Participants also suggested that given the unfamiliarity of retrofit and low-carbon heating, choice in the absence of advice could lead many people to select inappropriate technologies or installers. 'One stop shop' style independent advice services, tailored to local housing, network availability, and the financial circumstances of each household was seen as a pre-requisite for making good choices,

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[24] Shirani, F., Groves, C., Henwood, K., Pidgeon, N., Roberts, E. and Thomas, G. (2021). *Mine water heating in Caerau: Thoughts from local residents*. 2020 Report. Project Report. FLEXIS.

[25] Pidgeon, N., Groves, C., Cherry, C., Thomas, G., Shirani, F. and Henwood, K. (2021). 'A little self sufficient town close to the beach': local energy system transformation through the lens of place and public things. In J. Webb, M. Tingey and F. Wade et al (eds) *Research Handbook of Energy and Society*. (Edward Elgar, Cheltenham).

[26] Thomas, G., Demski, C. and Pidgeon, N. (2019). Deliberating the social acceptability of energy storage in the UK. *Energy Policy* 133, 110908.

[27] Pidgeon, N. et al (2014) Creating a national citizen engagement process for energy policy. *Proceedings of the National Academy of Sciences of the USA*, 111 (Sup 4), 13606-13613. DOI: 10.1073/pnas.1317512111.

[28] See: https://www.climateassembly.uk

[29] Shirani, F., Groves, C., Henwood, K., Roberts, E., Thomas, G., Cherry, C. and Pidgeon, N. (2021). 'Who cares about valley people?' – lived experiences of energy vulnerability in the South Wales valleys. *Journal of Poverty and Social Justice* 29(1), pp. 103-120. (10.1332/175982720X16074511160827)

particularly in areas potentially subject to hydrogen conversion or district heating schemes where participants feared energy companies or local authorities may push some options over others. While most participants expected to be able to 'do their own research', depart from advice, and opt-out of local networks if desired, a trustworthy recommendation was seen as essential for guiding decisions, particularly for vulnerable consumers[30].

[6] Does the current state of consumer protections for low-carbon home technologies represent a barrier to uptake of these products?

Across a number of our projects public awareness of the need and options for decarbonising residential heating is very low[31], and when options are then described to people they express reservations about arrangements (both practical and financial) for the ongoing and future repair and maintenance of such novel technologies. Where many know to contact a plumber for gas heating repairs, participants were unsure as to who would be suitable to maintain low carbon heating systems, how they might find a reliable tradesperson to do this, and whether costs would be high because of the niche skills required? Some participants suggested that they would be reassured by combined 'billing and service' deals to ensure any issues could be dealt with quickly. However, others pointed out that this may be advantageous to homeowners but not appropriate for renters[32].

Our NEUPA research suggests that the type of agencies or institutions needed to give householders the confidence to undertake significant decarbonisation actions do not currently exist (see also responses to questions 3 & 5.), and members of the public also expressed significant uncertainty over where they might get advice and financing. Residential decarbonisation was seen as a particularly alarming prospect for participants in the private rental sector due to insecure tenancies and limited enforcement of tenants' rights. Participants in this sector expressed concerns that without better regulation, they could be left with more expensive heating technologies or would have to bear the full costs of heating upgrade through increased rents.

[7] How will the public be able to afford the switch to decarbonised heating?

See responses to question 2 and 5.

Many people are concerned about taking significant financial risks. In UKERC research exploring attitudes towards paying for energy transition[33], the primary responsibility is attributed to energy companies and government. This is because they are perceived to have the financial means and structural power to effect major change. Public willingness to contribute financially is conditional upon energy companies and government being committed to also do the same, although currently neither are particularly trusted in this regard. People's own financial circumstances are not necessarily the sole driving factor in their acceptance of costs, with procedural and distributive justice concerns also important. Hence, we recommend greater transparency and accountability in relation to energy costs and wider decision-making and practices, alongside innovative thinking on how to fairly distribute costs of the heating transition across society.

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[30] Thomas, G., Flower, J., Gross, R., Henwood, K., Spiers., J, Pidgeon, N. (under submission) Inconvenience or Disruption? Citizen perceptions of in home and network impacts from heat decarbonisation in the UK

[31] Smith, W., Demski, C., Becker, S. and Pidgeon, N. (2023) *Mapping the Landscape of Public Attitudes Towards Low Carbon Heating*. London: UKERC (forthcoming)

[32] Shirani, F., Groves, C., Henwood, K., Pidgeon, N., Roberts, E. and Thomas, G. (2021). *Mine water heating in Caerau: Thoughts from local residents*. 2020 Report. Project Report. FLEXIS.

[33] Pidgeon, N. and Demski, C. (2019) Paying for Energy Transitions. UKERC. https://ukerc.ac.uk/publications/paying-for-energy-transitions/

Participants in our research also identified a role for government in providing grants for more costly retrofit actions such as heat pumps and insulation upgrades, above and beyond what is currently available through the UK Boiler Upgrade Grant and other schemes. Many felt grants should cover the total difference between low carbon heating retrofit and a traditional boiler replacement. Such support is likely to be essential to enable most households currently struggling with the cost of living to access low carbon heating.

[8] How will decarbonisation plans be drawn up in each area?

Diversity in housing, and changing energy supply availability across the UK, means that suitable options are likely to differ across communities and geographical areas. Our UKERC[34] and FLEXIS[35] work has indicated the importance of local place, alongside social and historical context, when judging the suitability of various decarbonisation options and how they might be regarded in different areas. In the NEUPA study, participants from Liverpool spoke of local housing as associated with place and class-based identifications. Hence in Liverpool more localised heating systems often intersected with working class place identities and mistrust of national government. This gave rise to a strong preference for heat networks as an alternative pathway for communal modes of energy provision in the city, despite the construction-related disruptions that it may involve. In contrast, groups in other areas of the country (Cardiff, Gloucester, Scottish Borders) expressed more scepticism regarding the local appropriateness of heat networks and a preference for individual heat pumps instead[36]. In FLEXIS low-income participants expressed concerns over their areas being used as a test-bed for new low carbon technologies, which could give rise to significant ethical concerns if already vulnerable consumers found that their situations worsened as a result of interventions[37]. All of this points to a need to fully understand the social, community and historical context in advance of shaping the low carbon heating transition for any specific area of the UK. Local Area Energy Planning combined with in-depth citizen engagement, as currently being rolled out by Welsh Government, could have an important role to play here and learning from this programme could be applied nationally.[38]

[9] Do the current EPC frameworks help consumers make informed decisions on transition?

Expert stakeholders in the LWLCH project discussed EPCs and the role of legislation, such as the Affordable Housing Review in Wales, which will require all new houses built in Wales from 2025 to meet EPC A standards. They believe the Welsh Government Innovative Housing Programme has demonstrated this as an entirely feasible goal. Stakeholders also referred to carbon emissions varying for a property according to time of year and occupant behaviours, factors currently not recognised within EPC measurements. In particular, understanding occupant behaviours is key to accurate carbon and energy measurements, as when they do (or sometimes do not) use technology and homes in the ways developers intended[39,40]. The EPC system also needs to be modified to reflect

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[34] Parkhill, K., Demski, C., Butler, C., Spence, A. and Pidgeon, N (2013) *Transforming the UK Energy System; Public Values, Attitudes and Acceptability: Synthesis Report*. London: UKERC. https://ukerc.ac.uk/publications/transforming-the-uk-energy-system-public-values-attitudes-and-acceptability/

[35] Thomas, G., Cherry, C., Groves, C., Henwood, K.L., Pidgeon N.F. and Roberts, E. (2022) "It's not a very certain future": Emotion and infrastructure change in an industrial town. *Geoforum*, 132, 81-91.

[36] Thomas, G., Flower, J., Gross, R., Henwood, K., Spiers., J, Pidgeon, N. (under submission) Inconvenience or Disruption? Citizen perceptions of in home and network impacts from heat decarbonisation in the UK

[37] Shirani, F., Groves, C., Henwood, K., Pidgeon, N., Roberts, E. and Thomas, G. (2021). *Mine water heating in Caerau: Thoughts from local residents*. 2020 Report. Project Report. FLEXIS.

[38] https://es.catapult.org.uk/project/laep-in-wales/

the possibility that some homes of the future will be genuinely net-zero for their operational emissions - the ambition for the housing sector as with all other sectors[41]. Our conclusion is that current EPC frameworks do not provide the information to enable consumers to make informed decisions, with alternative ideas such as the buildings passport one possible innovation here.[42]

[10] Do standards need to differ for different types of housing?

As per [8], there is not a uniform technical solution to suit all housing, therefore different approaches and requirements are likely to be necessary. Care should be taken to ensure parity across housing types and to avoid perpetuating existing disadvantages and/or worsening the situation of already vulnerable householders. Parity issues also need to anticipate bespoke solutions for 'hard to treat' homes (many in rural locations), many with local and cultural heritage value[43].

[11] What is the role of different levels of government in developing, funding and implementing schemes?

Our NEUPA participants saw a clear role for national government in leading the transition to low carbon heating[44]. However, as per [8] understanding the ways in which particular places differ in their experiences of the impacts of heat decarbonisation is crucial[45]. Initiatives taken forward by devolved administrations – such as the Innovative Housing Programme, or Local Area Energy Plans – can demonstrate good practice and innovation. Local government in turn is best-placed to identify the needs of particular areas, but will need sufficient resources and powers (currently lacking in relation to the size of the net-zero infrastructure task) to enable local plans to be formulated and implemented.

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[39] Shirani, F., O'Sullivan, K., Henwood, K.L., Hale, R. and Pidgeon, N.F. (2022) Learning to live in an active home: household dynamics and unintended consequences. *Buildings and Cities*, Buildings and Cities, 3(1), pp. 589–604. DOI: https://doi.org/10.5334/bc.216.

[40] Shirani, F., O'Sullivan, K., Hale, R. and Pidgeon, N.F. and Henwood, K.L. (2022) From active houses to active homes: understanding resident experiences of transformational design and social innovation. *Energies*, 15, 7441. https://doi.org/10.3390/en15197441.

[41] *Delivering Net Zero Final Synthesis Report* (2002) Universities of Leeds and of Cardiff with Cultivate Consultancy. https://www.deliveringnetzero.org/publications

[42] See *Building Renovations Passport Report*. Green Finance Institute.

[43] Roberts, E. and Henwood, K. (2017) Exploring the everyday energyscapes of rural dwellers in Wales: Putting relational space to work in research on everyday energy use. *Energy Research & Social Science* https://doi.org/10.1016/j.erss.2017.10.023

[44] Thomas, G., Flower, J., Gross, R., Henwood, K., Spiers., J, Pidgeon, N. (under submission) Inconvenience or Disruption? Citizen perceptions of in home and network impacts from heat decarbonisation in the UK.

[45] Groves, C., Henwood, K., Pidgeon, N., Cherry, C., Roberts, E., Shirani, F., & Thomas, G. (2021). The future is flexible? Exploring expert visions of energy system decarbonisation. *Futures*, 130, 102753. https://doi.org/10.1016/j.futures.2021.102753