Department for Business, Energy & Industrial Strategy

Delivering a smart and secure electricity system

Consultation on interoperability and cyber security of energy smart appliances and remote load control

Response template

Closing date: 28th September 2022

July 2022

Any enquiries regarding this publication should be sent to us at:
SSESconsultation@beis.gov.uk

Invitation to respond to "Consultation on interoperability and cyber security of energy smart appliances and remote load control"

The consultation and supporting analytical annexe are available at: www.gov.uk/government/consultations/delivering-a-smart-and-secure-electricity-system-the-interoperability-and-cyber-security-of-energy-smart-appliances-and-remote-load-control.

The closing date for responses is September 28th 2022

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Response form

Please complete the below pages with your information, and email it to us as a word document to SSESconsultation@beis.gov.uk

Or send it as a hardcopy by post to:
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Information about you and your response

What is your name? *Prof. Sonja Oliveira, Assoc.Prof Anna Chatzimichali and Dr Ed Atkins*

What is your email address? *sonja.dragojlovic-oliveira@strath.ac.uk*

(If appropriate) What is your organisation? Click here to enter text.

Which of the following descriptions best describes you/your organisation?

- Private individual ☐
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Are you happy for us to contact you to keep you updated on the policy and consultation, including to notify you of stakeholder events and/or if we have follow-up questions on your consultation response? *Yes*

Consultation Questions

Please note below responses to select number of questions have been prepared by a team of researchers (Prof Oliveira, Assoc.Prof Chatzimichali and Dr Atkins) as part of ongoing work within EPSRC funded project ***GLOW ~ ENERGY META-NESTED BIO SYSTEM FLOWS-FROM THE HOME TO THE HUB*** (EP/V041770/1). The views indicated below are drawn out of the project literature review and initial engagement with project partners, whilst ongoing, initial insights may be helpful to the consultation.

1. What are your views on the initial proposed outcomes for cyber security of Energy Smart Appliances? Is there anything missing or not relevant?

The initial proposed outcomes do not appear to take into sufficient detail the highly diversified social and spatial characterisation of energy behaviour in domestic environments. Domestic energy behaviour and patterns of energy management take place within socially, spatially and digitally interdependent and nested physical and digital contexts. When it comes to domestic sustainable energy management and behaviour, the problem is not only or even primarily technical. While residents may be part of the problem, the initial proposed outcomes ignore the way in which the social, spatial and digital interdependent character of housing development and living embeds individual and collective attitudes and values[1]. Energy management technologies including energy smart appliances are parts of a broader energy ecosystem and can only provide value to residents when such value is co-created as part of a service, customisable according to individual and community needs. Current energy demand systems are designed to fit energy infrastructures, overlooking the interconnected ways that occupants live alongside one another in their homes[2] . Wider neighbourhood sustainable behavioural change can only be achieved through systemic shifts, however there are no studies that link the social, spatial and digital home infrastructure at both the individual and collective scales[1]. Attempts to develop community energy platforms have mainly focused on trading community generated energy often from the perspective of the network rather than the community, with little long-term effect or widespread adoption. With the community energy sector continuing to evolve and find new opportunities for smaller-scale and decentralised networks, it is necessary to explore how evolving digital technologies might be deployed in demand management at the neighbourhood scales.

Currently, there is no published empirical analysis on the socio-technical and spatial characterisation of Home Energy Management (HEM) technology use and development. It would therefore be helpful to facilitate evidence gathering drawn out of multiple methods including large scale field studies across different communities in different social, climatic and economic contexts in the UK.

Based on such analysis of empirical evidence that currently is yet to be undertaken in the UK, the socio-technical implications of cyber-security provisions along with residence security and privacy could be better considered. More specifically, dealing with vulnerabilities, profiling and automated decision making need to be addressed in a human-centred manner paying closer attention to the wellbeing of the population and the future of the energy ecosystem than currently articulated within the proposed outcomes. This cohesive much needed analysis could then help develop a much more nuanced responsive set of outcomes than currently possible.

2. Do you agree that the Smart Energy Code could provide the appropriate governance for development of common data standards? Please explain your answer.

Development of a Smart Energy Code could help inform governance mechanisms of common data standards and this is welcome. However, there remain significant unknown implications for shaping the future of energy demand reductions and load shifting capabilities at scale for the smart home and smart grid of the future. A growing interest in sustainable energy transitions and energy democracy is accelerating opportunities for both communities and individuals to forge a new relationship with energy. Though a wide range of community-led sustainable energy projects are currently being implemented all around the world, they remain firmly anchored in a technology focused innovation paradigm that prescribes the use of HEM technology without contemplating any form of genuine reconfiguration, or new social contract for energy. HEM technologies and devices are currently not tailored according to residents' values, expectations, or experience.

Firms often adopt diverse strategies in terms of data governance and privacy or in communicating what a device does and how it operates[3]. Each firm records and unitises data in radically different manners, most of which are not made available nor explained to the resident. On the other hand, from the residents' perspective there is a lack of understanding of the value of such data, along with the ways such data are handled or how they can be utilised to inform decisions at an individual or community level. This is emphasised by negative reporting of smart meters and energy data as new forms of surveillance, as well as the imbalanced accessibility of new energy technologies across different social groups.

There is an urgent need to investigate how interconnected home energy management technologies utilise data and how the main principles of their operation are perceived by residents. There is also the need to consider uniform ways of communicating such information with residents,empowering them to take decisions that fit to their own needs and developing awareness of their individual and collective energy demands.

Low carbon innovations in household energy use interact with – and often alter or create new – patterns of energy justice. Patterns of property ownership, tenure and rental all define which energy technologies might be deployed in which settings. Household income also restricts the accessibility of technologies that might help manage demand and, with it, reduce bills. Energy poverty is fluid, with households entering periods of energy poverty throughout the year in response to external events and processes. Ensuring that new technologies, emergent data, and governance mechanisms are able to react to such changes and reduce incidences of energy poverty would ensure that households are able to live in dignity.

3. Do you agree that common systems could be required to mitigate system-wide risks? What issues will need to be considered in the design of such systems?

Please see answer to question above - the design of common systems is necessary but needs to include a wider spectrum of considerations beyond the technical attributes.

4. What issues will Government need to consider when reaching a decision on delivery approach for common systems?

There are still significant areas of investigation needed - including providing of empirical research as described above. Without such evidence, there are as yet unknown and unprecedented risks that

could have unintended consequences on energy and digital justice and equity as well as issues of privacy, ethics and sustainability more broadly on a wide range of communities and the population at large.

5. What are the key considerations for design of governance during the development, transition and delivery phases of implementation?

Design of domestic smart energy governance needs to include a number of social, spatial and technical considerations at all stages of development, transition and implementation. Drawing on methods developed by project GLOW[1] there needs to be greater inclusion and consideration of:

~social characterisation of smart energy use - across different types of households – this would include a qualitative understanding of how different households approach use of smart energy, their daily rhythms and energy as well as privacy needs and how this may/may nor relate to an equitable community energy demand building upon work by Hargreaves and Midlemiss (2020)[4].

~spatial characterisation of smart energy use – across different types of homes and spatial layouts. Initial insights from GLOW project as well as findings from Oliveira and Marco (2018)[5] are suggesting that spatial behaviour can have an impact on energy demand across multiple dimensions – greater investigation into this across different spatial typologies- a household, street, neighbourhood, town, city would be beneficial to helping determine how governance mechanisms set up operate across different spatial contexts.

References

1. Oliveira, S., Badarnah, L., Barakat, M., Chatzimichali, A., & Atkins, E. (2022). Beyond energy services: A multidimensional and cross-disciplinary agenda for home energy management research. *Energy Research & Social Science*, *85*, 102347.
2. Ben, H., & Steemers, K. (2018). Household archetypes and behavioural patterns in UK domestic energy use. *Energy efficiency*, *11*(3), 761-771.
3. Chatzimichali, A., and Chrysostomou,D (2019,July), Human-data interaction and user rights at the personal robot era. *Paper presented at 4th International Conference on Robot Ethics and Standards: Artificial Intelligence, Robots and Ethics,* London,UK
4. Hargreaves, T., & Middlemiss, L. (2020). The importance of social relations in shaping energy demand. *Nature Energy*, 1-7.
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