National Insulation Association

The Home Energy Model: Making the Standard Assessment Procedure fit for a net zero future

The Home Energy Model (publishing.service.gov.uk)

Closing Date: 27 March 2024
Response submitted by: **National Insulation Association**
For more information, please contact: info@nia-uk.org

About the National Insulation Association
The National Insulation Association (NIA) represents the insulation industry in the UK with a member base comprised of installers, system certificate holders, and manufacturers who provide a wide range of insulation solutions for homes and buildings. The NIA and its members are fully committed to maintaining and raising standards within the insulation industry.

1.	What are your views on the choice of name for the new model? Please provide your reasoning and any supporting evidence.
We are satisfied with the choice of name.	
2.	What are your views on the choice of name for the version of the model which is to be used to demonstrate compliance with the Future Homes Standard? Please provide your reasoning and any supporting evidence.
We are satisfied with the choice of name for the FHS assessment version of the HEM. It makes sense to include specific reference to the FHS, as this makes it clear what the model's application will be and distinguishes it from the underlying model.	
3.	What are your views on the potential implications of this proposed name change? Please provide your reasoning and any supporting evidence.
No comment.	
4.	What are your views on using the open-source code as the approved methodology for regulatory uses of the Home Energy Model? Please provide your reasoning and any supporting evidence.
The NIA welcomes the move to publish the open-source code, as this will aid transparency and promote greater understanding of the methodology among relevant stakeholders. It will also give industry experts the chance to scrutinise the code and suggest improvements or raise any potential concerns. This should improve the overall effectiveness of the model. If the open-source code is used as the approved methodology for regulatory uses of the HEM, we would like to see more clarity and guidance on what the process will be for dealing with errors in the code, in particular around liability and the transfer of risk. If there are errors with the centralised code, it is important that risk and liability is not transferred onto individual software providers who use the code as a basis for producing EPCs and determining compliance with	

building regulations. It is also important to avoid a situation whereby errors in the code become embedded into law.

It is important that making the open-source code the legal basis for the methodology does not act as a barrier to making necessary changes to the model in a swift manner. It must be possible for the HEM to be constantly improved and refined to improve its effectiveness. There is the potential that a codebase underpinned by regulation will be very slow to change. It is important that this does not act as a barrier to regular updates and improvements to the model. As mentioned earlier, if there are errors in the code, it is vital that these are rectified as soon as possible, without the need for a long, drawn-out regulatory process.

Whilst we agree with publishing the open-source code, it is important that other documents are published alongside it so that people not familiar with Python are still able to understand the methodology behind the model. It is encouraging to see that the Government will be publishing accompanying technical documents to provide further explanation about the model. This will ensure that the methodology is accessible to a wider range of people, thus aligning with the Government's objective to make the HEM more transparent.

5.	What forms of collaboration would you be interested in for future development of the Home Energy Model codebase? Please provide further details.

There must be a clear process for managing, evaluating and updating the codebase. It is important that industry is involved in this process so that they can shape the future development of the codebase.

6.	What are your views on our assessment of issues with the current SAP delivery model? Please provide your reasoning and any supporting evidence.

We agree with the issues outlined with the current delivery model, however it is unclear how the HEM will resolve all of these, in particular the inertia of the SAP methodology. If the codebase is embedded in regulation, this could complicate and slow down the process of making changes to the methodology. Introducing a centralised, cloud-based version of the code has the potential to enable quicker updates to the methodology. However, it is not entirely clear how this would operate in practice and what the relationship would be with accompanying regulations.

Lack of accountability is a key issue, however it is still unclear from the consultation proposals where the balance of accountability will lie with the HEM. We would welcome clarity on who will be accountable, whether this be the Government, BRE, or independent software providers. If the Government proceeds with a centralised, cloud-based version of the HEM, this could simplify the issue of accountability.

At the moment, different software providers all have differing versions of SAP which can cause inconsistencies in results, although these tend to be small. Having a centralised, standardised code should help to minimise these inconsistencies in results. It should also help to clarify the accountability of different parties by providing one consistent version of the 'truth'.

7.	What are your views on the concept of a centralised, cloud-based version of the

	Home Energy Model, to be used for regulatory purposes? Please provide your reasoning and any supporting evidence.
We agree with the concept of a centralised, cloud-based version of the HEM. Currently, different software providers have differing versions of SAP which can lead to inconsistencies in results. Centralising and standardising the model will help to increase accuracy and minimise these inconsistencies. The ability to make quick updates to the central platform is key. It can be unclear where the balance of accountability lies with the current version of SAP, whereby different software providers implement differing versions of the methodology independently. Having a centralised, standardised model will help to clarify where accountability lies and transfer risk away from software providers. It is important that it is clear which body is ultimately responsible for the HEM (whether this be BRE or the Government). The provider of the centralised model (BRE for example) will need to understand and put in place appropriate support arrangements to allow independent software providers to easily build user interfaces around the central platform.	
8.	What are your views on revising the database of product characteristics (currently the "PCDB") for the Home Energy Model? Please provide your reasoning and any supporting evidence.
We agree with the intention to revise the database of product characteristics for the Home Energy Model. It is important that the PCDB is based on accurate and up-to-date data, and includes the most effective technologies currently on the market.	
9.	What changes would you recommend to the PCDB data collection procedures? Please provide your reasoning and any supporting evidence.
It is costly for manufacturers to get their products listed in the PCDB. This prohibitive cost means that many products are not listed on the database because it isn't worth the effort and cost for manufacturers to apply for their products to be listed. The process should be streamlined and made more cost-effective for manufacturers, as the cost of getting products listed is a significant barrier for many.	
10.	What changes would you recommend to the PCDB data requirements for particular technologies? Please provide your reasoning and any supporting evidence.
No comment.	
11.	What are your views on our assessment of issues with the way SAP currently recognises new technologies (currently the "Appendix Q process")? Please provide your reasoning and any supporting evidence.
We agree with the issues identified around the Appendix Q process. In general, the process is too costly and time-consuming which can act as a barrier for new innovative products being recognised via SAP. The HEM must make it easier for innovative new products to become recognised.	
12.	What are your views on the principles for how the Home Energy Model will recognise new technologies once it is in use? Please provide your reasoning and any supporting evidence.

We support the principles set out in the consultation for the how the HEM will recognise new technologies. However, more detail is needed on how the process will work in practice. The reformed Appendix Q process should focus on reducing the cost burden and length of time that it takes for innovative technologies to gain recognition, as this can prove a significant barrier to new innovations entering the market and becoming commercially viable. Ultimately, the HEM needs to enable innovation rather than hinder it.

The opportunity for continuous evaluation should enable regular "live" updates to the HEM which may make it easier and quicker for new, innovative technologies that come onto the market to be recognised by the HEM. Greater integration with other innovation routes such as ECO4 is welcome to avoid the need for companies to duplicate unnecessarily a process which can be costly and time-consuming. More detail is required on how this integration will work in practice.

The ability of innovative technologies to become recognised within SAP also depends on the underlying measurement standard. If the underlying standard is not broad enough to cover innovative technologies, then it is difficult for them to be introduced.

13.	What are your suggestions for how to integrate new innovative products into the Home Energy Model? Please provide your reasoning and any supporting evidence.

No comment.

14.	What are your suggestions for other wrappers that could be developed for the Home Energy Model in future? Please provide your reasoning and any supporting evidence.

The proposals identify the main wrappers that should be included within the HEM, excluding the very important EPC wrapper which will be consulted on later this year. In general, we welcome the use of wrappers, as they should improve on the SAP process, however, the HEM's modelling will only be as accurate as the data inputted into it, therefore it is important to choose the most suitable wrappers to achieve more accurate and reliable outputs.

The effectiveness of wrappers depends on how straightforward it is to interact with the core engine and what controls will be on it. At the moment, it is unclear how open the interface will be and how easy it will be to implement new wrappers. If it Is easy to add new wrappers and build software interfaces, then the wrapper system has the potential to be a lot more efficient than the current system, which can make producing an EPC quite a time-consuming and laborious process. If the wrapper process is efficient and accessible, it should be possible to quickly produce an output wrapper, whereas in SAP it can take hours to manually write up a report.

15.	What are your views on the increased time resolution offered by the Home Energy Model? Please provide your reasoning and any supporting evidence.

The NIA welcomes the increased time resolution offered by the HEM. This will increase the accuracy of the HEM compared to SAP and bring a range of other benefits including:

- More accurate modelling of heat pump performance and importantly the interaction with other building elements within the whole building system.

- Better alignment of the HEM with improvements in real-time monitoring and evaluation of building performance. Enabling these improvements to be reflected within the model will enhance its accuracy and help to close the performance gap.
- More recognition of the benefits of smart technologies and the importance of energy flexibility.

Despite the clear benefits of increasing the time resolution, we are concerned by the longer runtime of the HEM which has been identified as an issue by the Government. Industry urgently needs more detail and clarity on exactly how long the expected runtime of the HEM will be. It is very important that the HEM still has a reasonable runtime that does not make the model impractical to run. For instance, a runtime of 5 minutes, although not ideal, would most likely still be workable for industry. By contrast, a runtime of 15 minutes or more would represent a substantial challenge for SAP users and would significantly reduce the effectiveness of the HEM in practice.

16.	What are your views on the choice of BS EN ISO 52016-1:2017 (in its half-hourly form) as the basis for the Home Energy Model? Please provide your reasoning and any supporting evidence.

The move to BS EN ISO 52016-1:2017 which is a recognised industry standard seems reasonable. There are clear benefits associated with moving to a standard that supports the HEM's half-hourly simulation.

17.	What are your views on the ability of the Home Energy Model to model energy flexibility and smart technologies? Please provide your reasoning and any supporting evidence.

The half-hourly time resolutions of the HEM gives it the potential to model energy flexibility much more accurately than SAP.

The usefulness of the HEM for modelling energy flexibility depends on the range of applications it is used for. The existing SAP methodology focuses on the building as an asset and ignores the occupants and their energy consumption habits in favour of standardised assumptions. The HEM's potential for modelling energy flexibility is unlikely to be relevant when assessing a building's compliance with building regulations for example, as this is solely based on the building's performance as an asset. Energy flexibility is dependent on energy suppliers and occupants which is largely out of the control of developers and retrofit contractors.

It is clearly useful to have a model that can take into account energy flexibility and the use of smart technologies, particularly as these start to become more commonplace in homes. It is important to have a model that is responsive to changing patterns of energy consumption and the increased energy flexibility that smart technologies can bring for residents. However more detail is required from government on how it intends to use the HEM's potential capabilities around energy flexibility and smart technologies. For instance, this could be used to model custom energy demand,

18a.	What are your views on the methodological approach for calculating space heating and cooling demand? Please provide your reasoning and any supporting evidence.

We support the methodological approach for calculating space heating and cooling demand. The new approach, as well as the use of more detailed inputs, will model the space heating demand of buildings more accurately than SAP. It is possible that it will lead to a higher space heating demand calculation than SAP, which will incentivise greater reductions in energy demand through increased fabric efficiency.

18b.	What are your views on the methodological approach for calculating fabric heat loss? Please provide your reasoning and any supporting evidence

We agree with this approach.

18c.	What are your views on the methodological approach for calculating thermal bridges? Please provide your reasoning and any supporting evidence.

We agree with this approach.

18d.	What are your comments on the methodological approach for calculating infiltration and/or controlled ventilation? Please provide your reasoning and any supporting evidence.

We agree with the methodological approach for calculating infiltration. This should increase accuracy because it takes into account more factors and uses wind speeds updated on an hourly basis, making it much more receptive to changes in weather conditions. The omission of other contributing factors such as wind direction and "stack effect" from the HEM are unlikely to have a significant effect on the accuracy of the modelling. However, we would support their future inclusion, along with any other updates which increase the granularity and accuracy of the modelling. We also support replacing the fixed minimum dwelling ventilation rate with a wrapper input value as this will make the modelling more dwelling-specific.

18e.	What are your views on the methodological approach for calculating thermal mass? Please provide your reasoning and any supporting evidence.

We welcome the approach to include the entire building envelope within thermal mass calculations. This should produce a more accurate calculation than SAP 10.2 which only takes part of the construction envelope into account. Including warm up and cool down rates will also increase accuracy compared to the current approach based on a one-off, instantaneous value which doesn't reflect how buildings warm up and cool down in practice.

While we support the desire to be as accurate and dwelling-specific as possible, we do not agree with the proposal to include the thermal mass of furniture in thermal mass calculations. Many properties, especially in the non-domestic sector, are unfurnished. It is not clear how the current approach would account for unfurnished properties. Furthermore, it doesn't make sense for furniture to be taken into account when determining a building's SAP rating or compliance with building regulations. This is often out of the control of developers and may depend on the personal choices of residents. We do not think that the negligible increase in accuracy that including furniture in thermal mass calculations will bring outweighs the issues that this approach may create.

18f.	What are your views on the methodological approach for calculating solar gains and solar absorption? Please provide your reasoning and any supporting evidence.

We support the approach for calculating solar gains and solar absorption, as it should provide more accurate results than the current version of SAP.	
18g.	What are your views on the methodological approach for calculating shading? Please provide your reasoning and any supporting evidence
No comment.	
19a.	What are your views on the methodological approach for calculating Domestic Hot Water demand? Please provide your reasoning and any supporting evidence.
No comment.	
19b.	What are your views on the methodological approach for calculating heat losses from Domestic Hot Water pipework? Please provide your reasoning and any supporting evidence.
We are pleased to see that the model will take into account pipework, rather than using a standardised assumption. This will improve the accuracy of the model, as factors such as insulation levels can have a significant impact on heat losses from pipework.

However, the methodology does not seem to take into account the location of the pipework which could influence the calculation. It is important to distinguish between sections of pipework that are in the thermal envelope and those that are outside of it (in the roofwork, for instance) because heat loss from pipework in the thermal envelope could contribute to space heating, thereby skewing calculations. | |
19c.	What are your views on the methodological approach for calculating heat losses from hot water cylinders? Please provide your reasoning and any supporting evidence
We agree with this approach.	
19d.	What are your views on the methodological approach for calculating incidental gains from domestic hot water? Please provide your reasoning and any supporting evidence
No comment.	
20a.	What are your views on the modelling of heat pumps in the Home Energy Model? Please provide your reasoning and any supporting evidence.
No comment.	
20b.	What are your views on the modelling of electric resistive heaters in the Home Energy Model? Please provide your reasoning and any supporting evidence.
No comment.	
20c.	What are your views on the modelling of electric storage heaters in the Home Energy Model? Please provide your reasoning and any supporting evidence.
No comment.	
20d.	What are your views on the modelling of heat networks in the Home Energy Model? Please provide your reasoning and any supporting evidence.
No comment.	
20e.	What are your views on the modelling of boilers in the Home Energy Model? Please provide your reasoning and any supporting evidence.
No comment.	
20f.	What are your views on the modelling of heat batteries in the Home Energy Model?

	Please provide your reasoning and any supporting evidence.
No comment.	
20g.	What are your views on the modelling of air conditioning in the Home Energy Model? Please provide your reasoning and any supporting evidence.
No comment.	
20h.	What are your views on the modelling of other Domestic Hot Water heating (e.g. immersion heaters, point-of-use, solar thermal) in the Home Energy Model? Please provide your reasoning and any supporting evidence.
No comment.	
20i.	What are your views on the modelling of heat emitters in the Home Energy Model? Please provide your reasoning and any supporting evidence.
No comment.	
20j.	What are your views on the methodological approach for calculating pumps' and fans' energy consumption in the Home Energy Model? Please provide your reasoning and any supporting evidence.
No comment	
20k.	What are your views on the modelling of controls for heating and/or hot water in the Home Energy Model? Please provide your reasoning and any supporting evidence.
No comment.	
21a.	What are your views on the current priority order for allocating electricity supply and demand in the Home Energy Model? Please provide your reasoning and any supporting evidence.
No comment.	
21b.	What are your views on the modelling of solar PV in the Home Energy Model? Please provide your reasoning and any supporting evidence.
No comment.	
21c.	What are your views on the modelling of electric batteries in the Home Energy Model? Please provide your reasoning and any supporting evidence.
No comment.	
21d.	What are your views on the modelling of PV diverters in the Home Energy Model? Please provide your reasoning and any supporting evidence.
No comment.	
22.	What are your views on future features development for the Home Energy Model? Please make suggestions, explaining your reasoning.
We welcome the Government's commitment to develop future features in the open. Given that there are key elements of the model which are yet to be finalised and may require further development, it is important that industry is properly consulted throughout its ongoing development, so that businesses can give their views and inform the development of aspects like future features. The freedom to interact with the open-source code without too many restrictions will be important for software designers. This will allow them to build user interfaces and develop different end uses for the model without a prohibitive cost of entry.	
23.	What data or evidence do you have which could support the future development of

		features within the Home Energy Model? Please provide further details.
No comment.		
24.		What are your views on the inter-model validation work that has been carried out (i.e. comparison against SAP 10.2 and validation against PHPP and ESP-r)? Please provide your reasoning and any supporting evidence.
We agree with work carried out to benchmark against other models. This approach is sensible and takes account of the most relevant models. It is likely that the introduction of the HEM will shift the goalposts compared to SAP, most likely resulting in lower SAP scores and requiring higher standards of energy efficiency for compliance with building regulations. This is generally positive as it supports the transition towards more energy efficient, 'Net Zero Carbon ready' buildings. However, it is important that this aspect of the HEM's implementation is carefully managed in a way that does not have a detrimental effect on residents, retrofit businesses, and others in the sector.

The findings of the inter-model validation seem to be generally positive. It is critical that these learnings, particularly the areas for improvement identified, are fully addressed in the next stage of the HEM's development. | | |
25.		What are your views on the validation work that has been carried out against real-world case studies (i.e. IEA Annex 58, Camden Passivhaus, and Marmalade Lane)? Please provide your reasoning and any supporting evidence.
The validation work against real-world case studies is encouraging. It suggests a fairly high level of accuracy within the HEM when compared to real-world performance data. The Marmalade Lane case study findings show that the HEM was consistently more closely aligned with measured data than SAP 10.2, which is positive. This shows that the HEM is significantly more accurate than SAP in practice, and its introduction should help to close the performance gap between predicted and monitored energy use, which is one of the model's primary aims.		
26.		What are your views on the lab testing validation work that has been carried out (i.e. on boiler cycling and heat pumps providing DHW)? Please provide your reasoning and any supporting evidence.
No comment.		
27.		What examples of real-world case studies, or other data, do you suggest be used to further validate the Home Energy Model? Please provide further information.
Contractors and software developers will run their own modelling using the open-source code. It is important that government carefully considers any feedback or issues that arise from independent modelling conducted by industry. It will also be important to gather more data on how residents' behaviour affects the HEM's modelling, as this is not explored in detail by the real-world case studies.		
28.		What suggestions do you have for further validation exercises that could be undertaken to refine the Home Energy Model? Please make suggestions, explaining your reasoning, and providing any supporting evidence.
No comment.		