

FINAL



Consultation Response

**Home Energy Model: replacement for the
Standard Assessment Procedure (SAP)**

Prepared for: DESNZ

Date: March 2024

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1. Introduction

Elmhurst Energy are pleased that DESNZ are seeking a Consultation on 'Home Energy Model: replacement for the Standard Assessment Procedure (SAP)' and as such we are delighted to respond to each question in turn.

The Consultation asked 30 questions and we have answered them all below. We hope you find the responses considered and useful for taking 'Home Energy Model: replacement for the Standard Assessment Procedure (SAP)' forward in a progressive manner.

2. Questions and Answers

Chapter 2: The need to replace SAP

1. What are your views on the choice of name for the new model? Please provide your reasoning and any supporting evidence.

Elmhurst supports the name of the model changing from SAP to Home Energy Model for the reasons suggested in the consultation.

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.

Elmhurst believes the name for the Future Homes Standard version of HEM is sensible and clearly defines this version should only be used for demonstrating compliance with the standards.

3. What are your views on the potential implications of this proposed name change? Please provide your reasoning and any supporting evidence.

Elmhurst believes the name change will cause some disruption to the industry. The term 'SAP' has been used widely through the industry for over 20 years and some companies use this term in their trading names.

Elmhurst appreciates the reasoning for changing the name to Home Energy Model but do believe this will cause some confusion in the wider industry who are familiar with the SAP methodology and it's uses.

Chapter 3: A new home energy modelling ecosystem

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.

Elmhurst understands the use of open source code as the approved methodology for the Home Energy Model. However we are concerned that this will result in less peer review of the methodology as unless you are able to read Python it is not possible to understand the workings of the model. We do not believe having an open source code removes the need for a specification document. Individuals who do not have the capacity to interpret Python should still be able to refer to a specification document in order to understand the Home Energy Model.

Additionally for schemes such as ourselves we have built our business on being able to offer detailed technical support to our members which is possible by being able to scrutinise the engine via worksheets and the specification document. Again we do not believe this will be possible based on the open source code written in Python without a supporting specification document.

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

Elmhurst would welcome the opportunity to work together with Government on future development to the Home Energy Model 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.

As an approved SAP software provider Elmhurst have produced SAP software products based on the current SAP delivery model for over twenty years.

Generally, this model has worked successfully however for the implementation of SAP 10 this was very challenging. The delivery of the SAP 10

specifications and test cases was extremely poor with frequent errors, omissions and deadlines that were not met resulting in all SAP software providers having to produce products that were not up to the industry's expectations. The ramifications of this for the industry were severe with users unable to confidently assess compliance for Part L 2021 until almost six months after the regulations commenced. Elmhurst unfairly received a lot of criticism from the industry for this and there seemed to be little accountability or governance from other stakeholders in the process. Unfortunately, we are experiencing the same situation with the delivery of RdSAP 10 which has already led to delays in its implementation.

In regards to inconsistencies between platforms this would not be the case in the current delivery model if the test cases supplied were comprehensive, accurate and delivered on time. In the delivery of SAP 10 many of the test cases contained errors and did not adequately cover the new technologies introduced in the methodology. For example there was no effective test case to cover PV diverters until January 2023 when Elmhurst requested one due to queries on results from our members. As a result the savings from PV diverters were affected and assessment results were altered when this was clarified. This again resulted in frustration and cost to the industry who had to re-assess existing compliant designs.

However, Elmhurst believes there are benefits to the current delivery model which are not recognised in the consultation. The current process allows strong peer review of the methodology. This was evident during the implementation phase of SAP 10 where SAP software providers were regularly providing feedback in regards to the calculation specification which ultimately led to a number of changes to ensure accurate results were achieved. There is also a strict approval process for any SAP software product to ensure results are consistent and user interfaces meet the requirements of the specification. These must be maintained in any future delivery model.

To summarise Elmhurst do not believe the current delivery model is unsuitable for delivering HEM, but the governance of the current delivery model, delivery of test cases and specifications is where the issues lie. If these are addressed the current delivery model would be suitable for delivering HEM and would avoid the issues that occurred with the delivery of SAP 10.

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

Elmhurst understands that based on the perceived issues with the SAP delivery model why an alternative approach is being suggested. We believe there are some advantages to this proposal but also we have significant concerns;

Advantages

- Moving to a centralised version of HEM should ensure consistent results if the data entered into it from user interfaces is consistent.
- Making changes to the HEM engine will be easier to deploy across the industry.
- A centralised engine could be used for tailoring of EPCs so consumers could specify data fields such as occupancy to get a more accurate EPC.

Concerns

- It is not clear if the centralised version is to be used for Building Regulations compliance and/or EPC production. We appreciate there is a FHS wrapper but it is not clear which aspect is held in the cloud; the HEM and/or the wrappers?
- For organisations who develop a user interface, what will the notice period be where changes are made to HEM that require an interface change?
- User interfaces for HEM may vary considerably which could result in differing outputs from the model. There must be a strict approval process for any user interface utilising the HEM engine for regulatory purposes.
- Due to the open source code there may be many user interfaces created. It is vital that these only allow production of Building Regulation compliance reports (BREs) by energy assessors who are members of accreditation schemes.
- Where maintenance and downtime is required, this will prevent the industry from generating results. How will this be scheduled, what level of warning will be provided to the industry?
- Where the results and engine are subject to query, who will be responsible for addressing these?
- Will the devolved administrations use the cloud based HEM? If not then software providers will need to produce their own engines anyway.

- Who will peer review the engine? The current delivery model allows SAP software providers to do this but this may be more difficult with a centralised engine even with open source code.
- Will the engine be able to cope with the number of requests made of it by energy assessors who are constantly amending models to check compliance solutions for their clients? The HEM: FHS consultation tool is already taking assessors substantially longer to complete assessments compared to SAP 10, and the generation of results can take 5-10 minutes. Elmhurst's SAP software is used by hundreds of users at any one time, often completing modelling work on numerous dwellings, who are used to instant results enabling them to work efficiently.
- Who will arbitrate if there is an issue with the cloud based engine that results in previously derived results changing?

On balance based on the above we do not feel a centralised engine will benefit the industry and would prefer to see improvements in the current delivery model to ensure the issues that occurred with the implementation of SAP 10 are not repeated for the use of HEM in the Future Homes Standard.

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

Elmhurst agrees the PCDB needs to be revised for the HEM. We have a number of issues with the delivery model of the current PCDB causing operational issues almost monthly. We often find the PCDB contains erroneous values which when reported to BRE require a new version of the PCDB to be issued. PCDB updates are typically made monthly but more recently have been made numerous times within the same month to address errors made by the BRE. We also see inconsistent formatting in certain data points, sometimes in contradiction to the PCDB specification, which causes issue integrating it into our SAP software products. There seems to be limited validation or testing of the current PCDB before being deployed where these issues are then picked up and have to be rectified by further updates.

One technology that seems sensible to add into the new PCDB is hot water storage/cylinders. The volume and standing heat loss for these products is well understood by the industry and for SAP assessors to be able to select these from the PCDB would reduce inconsistencies and increase accuracy of assessments especially where some of the new fields in HEM will have an

impact on the overall assessment of domestic hot water demand.

There are concerns in the industry, echoed by Elmhurst, that there is no published timeline or working groups proposed for the revision of the PCDB in HEM. It is vital that this is completed as soon as possible so that it is ready for when HEM is used for the Future Homes Standard in 2025.

Finally, in regards to default products these are currently held in the SAP specification. The performance data for these default products are long overdue a review as many have not changed for almost twenty years and are not reflective of modern performance standards.

9. What changes would you recommend to the PCDB data collection procedures? Please provide your reasoning and any supporting evidence.

No opinion

10. What changes would you recommend to the PCDB data requirements for particular technologies? Please provide your reasoning and any supporting evidence

No opinion

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.

Appendix Q has long been the process by which new/innovative technologies can make their way into the main methodology (main cannon). Due to the way the methodology develops; in that it is updated every few years in a ‘chunky’ way, it is a necessary process. Ideally, a technology that has already achieved Appendix Q status in the current version of SAP, should then be added to the main cannon/next version when an upgrade is in the planning stages. The process should be relatively simple and well understood in order to encourage uptake of the process and allow for a good flow of new technologies into the methodology in a controlled and low risk way.

It's the opinion of Elmhurst that the current process needs to be improved for the following reasons;

- It is not well understood and industry awareness, whilst improving, isn't ubiquitous or well sign posted.
- The process is initially confusing to those wanting to engage. The only documented process is on the BRE website, and this could be improved. Elmhurst would like to see more clear signposting from Government documentation and materials (websites) and clearer explanation of the likely routes through the process.
- Depending on the technology, the burden of gathering sufficient evidence to complete the Appendix Q process is significant and costly. This is a barrier to a startup or SME – often the birthplace of innovation. This often delays (sometimes indefinitely) a technology entering into the methodology which almost always slows down adoption and industry awareness of the measure.
- Currently, and based on the last two technologies gaining approval, it can take up to 2 years to gain approval (understanding the need for heating seasons etc). This is only slightly less time than it takes to update a methodology.
- Further to the above point, if the timing isn't favourable, the technology could then miss being included in the next round of methodology. We have seen this for recent successful applicants who have had to bear a further 3-year delay to be considered within HEM. This creates further barriers.
- The spreadsheet approach is complicated and open to error by those who need to use it (SAP and RdSAP Assessors). It is also very difficult to QA easily. Elmhurst strongly supports an integrated Appendix Q, where data needed from the engine is used to do the necessary Appendix Q sub-calculation is transferred and results received via an API/service.
- Furthermore, Elmhurst would welcome inclusion in any further discussion on this matter. We believe that our experience of building SAP software over the last 20 years and our knowledge of the underlying methodology would be hugely beneficial to creating a better process. This should be lead through SAPSIG and involved the Future Homes Hub.

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.

Elmhurst agrees with the principles of recognising new technologies in the Home Energy Model. Ultimately being able to recognise new technologies within the model rather than requiring a new version of the model itself (as currently happens with SAP) will ensure it remains up to date with innovation.

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 opinion

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.

Elmhurst recommends that once the Future Homes Standard and new build EPCs wrappers are introduced a wrapper should be created for the production of existing dwelling EPCs as quickly as possible. Elmhurst agrees with the additional wrappers stated in the consultation.

Chapter 4: The new Home Energy Model – an overhaul

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

Elmhurst believes the increased time resolution in theory is a good improvement over SAP 10, but are concerned about the impact this will have on speed of delivering calculation results for the industry. Assessors are used to generating results instantly enabling them to efficiently assess different scenarios for clients quickly. The current speed of the consultation tool, taking at least 5 minutes to get a full set of results, is not sustainable for an industry where delivery of results is time sensitive.

An example of the impact of this is checking compliance when an airtightness test is completed. Often an airtightness test will be completed and the tester will contact the SAP assessor to check if the score achieved results in compliance with the whole dwelling performance standards. Currently in SAP this takes very little time, but in HEM to amend the data entry and generate results could take 5-10 minutes which is not ideal when the tester is waiting on site for a decision to be made.

Whilst we appreciate the need to improve the time resolution over the SAP 10 methodology, if this is the level of performance delivered from the proposed central engine this will cause significant issues for assessors and their clients that are used to, and have built business processes around, generating results instantly. Elmhurst strongly suggests the time resolution for the HEM: FHS wrapper is reviewed to arrive at a suitable improvement over SAP 10 but also that meets the needs of an industry that is time sensitive.

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

Elmhurst supports using a recognised industry standard for the basis of the Home Energy Model however we have concerns over the impact of the increase in time resolution as per our answer to question 15.

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.

Elmhurst agrees that the Home Energy Model needs to be able to account for energy flexibility and smart technologies much more effectively than SAP currently does. It is likely these areas will be key for new homes of the future and the Home Energy Model needs to be ready to adopt these without needed repeated overhauls.

Chapter 5: What is inside the Home Energy Model?

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

Elmhurst supports the methodological approach advocated. SAP had a number of limitations and/or assumptions in this area that contributed to the performance gap so the changes in HEM are welcomed here.

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

Elmhurst understand that the new methodological approach 'bypasses' the predicted overall heat transfer rate (HTC value) which is a familiar figure within SAP relating to the overall thermal performance of the building, if that is correct then you are at risk of undermining the departments significant investment in SMETERS technology.

There are now technologies (Smart HTC for example) that have the ability to measure this HTC value, and this is an important step when considering Building Performance Evaluation and closing the performance gap between 'as designed' and 'as built'.

Elmhurst believe in relation to fabric heat loss, the model should be able to determine the HTC value, which has an impact on the final calculation. Without this, technologies relating to measured HTC, such as Elmhurst's own Measured Energy Performance Scheme which allow building owners to model the actual performance of their buildings more accurately and give a direct comparison against the designed performance of the building, will not function.

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

Elmhurst supports the methodology for calculating thermal bridges. Data entry for linear thermal bridges in SAP 10 is already one of the most time consuming parts of the assessment process so making the process no more

complex is welcome.

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

Elmhurst agrees the divide by 20 rule was crude and welcomes the shift away from a single value leakage infiltration rate. We do however question the need to extrapolate a 4Pa test result (N4) up to N50 only for a divisor to be subsequently applied. It seems far more appropriate that the approach should accept N4 and N50 as being different input values obtained at different reference pressures and not seek to induce additional undue uncertainty.

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

Elmhurst supports the new methodology for calculating thermal mass. The methodology for calculating thermal mass in SAP (based on the innermost 100 mm of elements) was confusing for industry and did not reward good building practice.

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

No strong opinion

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

Elmhurst agrees that the SAP approach to shading was overly simplified and needed revising. There are concerns about the level of data input needed in the HEM: FHS wrapper for shading and we have detailed our thoughts to that in the HEM: FHS consultation response.

19.a What are your views on the methodological approach for calculating Domestic Hot Water demand? Please provide your reasoning and any supporting evidence

As domestic hot water demand is likely to become the largest energy demand in new homes it makes sense to calculate the demand on hot water events rather than assume this from number of occupants as SAP currently does.

19.b 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.

As domestic hot water demand is likely to become the largest energy demand in new homes it makes sense to calculate heat loss from pipework accurately rather than assume the 15% figure that SAP currently does.

There are concerns about the level of data input needed in the HEM: FHS wrapper for DHW pipework and we have detailed our thoughts to that in the HEM: FHS consultation response.

19.c What are your views on the methodological approach for calculating heat losses from hot water cylinders? Please provide your reasoning and any supporting evidence

Elmhurst recommends that hot water cylinders are incorporated into the new PCDB based on the additional data fields that will be required in HEM. This will improve the use of appropriate values and make using the HEM more efficient.

19.d 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 strong opinion

20.a What are your views on the modelling of heat pumps in the Home Energy Model? Please provide your reasoning and any supporting evidence.

As heat pumps are likely to be the most common source of space heating in the future it is vital HEM models their performance as accurately as possible. Elmhurst supports the improvements in HEM for this area.

20.b What are your views on the modelling of electric resistive heaters in the Home Energy Model? Please provide your reasoning and any supporting evidence.

Elmhurst recommends electric resistive heaters are incorporated into the new PCDB to aid the modelling of them in HEM.

20.c What are your views on the modelling of electric storage heaters in the Home Energy Model? Please provide your reasoning and any supporting evidence

Elmhurst recommends electric storage heaters are incorporated into the new PCDB to aid the modelling of them in HEM.

20.d What are your views on the modelling of heat networks in the Home Energy Model? Please provide your reasoning and any supporting evidence.

Whilst Elmhurst agrees that ideally Heat Networks should be only available from the PCDB, we have concerns about how many will be available at the point HEM is used for regulatory purposes. In over ten years since Heat Networks have been able to be added to the PCDB, only one has ever been present. There needs to be an appropriate solution to where a heat network is not available on the PCDB.

20.e What are your views on the modelling of boilers in the Home Energy Model? Please provide your reasoning and any supporting evidence.

No strong opinion

20.f What are your views on the modelling of heat batteries in the Home Energy Model? Please provide your reasoning and any supporting evidence.

Elmhurst agrees that the modelling of heat batteries needed to be revised for HEM as SAP does not adequately model these systems. Heat Batteries are becoming more common so it is vital HEM can model these accurately.

20.g What are your views on the modelling of air conditioning in the Home Energy Model? Please provide your reasoning and any supporting evidence.

No strong opinion

20.h 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.

Elmhurst recommends these technologies are incorporated into the new PCDB to aid the modelling of them in HEM.

20.i What are your views on the modelling of heat emitters in the Home Energy Model? Please provide your reasoning and any supporting evidence.

Elmhurst agrees that the modelling of heat emitters methodology in SAP needed revising for HEM. There are some concerns in the industry that HEM may lead the design of heating circuits which could contract what competent M + E designers calculate.

We have some concerns over the level of data entry needed and have detailed this in our HEM: FHS consultation response.

20.j 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 strong opinion

20.k 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 strong opinion

21.a 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 strong opinion

21.b What are your views on the modelling of solar PV in the Home Energy Model? Please provide your reasoning and any supporting evidence.

No strong opinion

21.c What are your views on the modelling of electric batteries in the Home Energy Model? Please provide your reasoning and any supporting evidence.

SAP currently applies a limit of 15 kW of useable capacity. We get many requests from energy assessors which are trying to model batteries that are larger than this so this must be reflected in the HEM.

21.d What are your views on the modelling of PV diverters in the Home Energy Model? Please provide your reasoning and any supporting evidence

No strong opinion

22. What are your views on future features development for the Home Energy Model? Please make suggestions, explaining your reasoning.

No strong opinion

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 strong opinion

Chapter 6: Validating the Home Energy Model

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.

Elmhurst support validation of the Home Energy Model against other energy rating methodologies. SAP has been subject to criticism by supporters of other methodologies such as PHPP so the validation work here should help prevent this in future.

25. What are your views on the validation work that has been carried out against realworld case studies (i.e. IEA Annex 58, Camden Passivhaus, and Marmalade Lane)? Please provide your reasoning and any supporting evidence.

Elmhurst support validation of the Home Energy Model against real world case studies.

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 strong opinion

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.

Many developers are building pilot sites in anticipation of the Future Homes Standard and we suggest some of these should be used to validate the Home Energy Model especially for the Future Homes Standard wrapper.

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 opinion

29. What are your views on the impact of proposed changes to the modelling ecosystem on those with protected characteristics? Please provide your reasoning and any supporting evidence.

No opinion


Environmental Principles Policy Statement


30. What are your views on the possible environmental impacts of the Home Energy Model core engine itself? Please provide your reasoning and any supporting evidence

No opinion

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