

## **Minutes of the meeting of the SAP Scientific Integrity Group 10<sup>th</sup> July 2015.**

### Attendees

#### **SAPSIG members:**

Neil Cutland (NC)  
Malcolm Bell (MB)  
Tassos Kougionis (TK)  
Richard Fitton (RF)  
Ashley Bateson (AB)

Apologies for absence – Bob Lowe, Kevin Lomas, Martin Searle, Simon Lannon, John Counsell

#### **DECC:**

Alan Christie (AC)

#### **BRE:**

John Henderson (JH)  
Les Shorrock (LS)  
Jose Ortiz (JO)

***The purpose of this meeting was for SAPSIG members to debate papers prepared, or in preparation, for the forthcoming SAP consultation.***

### Introduction

LS welcomed the members and briefly noted two points from the last meeting:

- The group had been expanded as recommended at the last meeting. Six people were invited to join the group and four had accepted. Two of the new members (RF and AB) were attending today's meeting.
- The meeting was addressing a key issue highlighted at the last meeting; namely the discrepancy between SAP and reality on CHP/district heating/heat networks. Work had been done on distribution heat losses from heat networks. A paper on this had been prepared and circulated, and was in the agenda for discussion.

There were some initial discussions about the role of SAPSIG in the SAP consultation process. It was clarified that SAPSIG was checking detail in the papers before they were issued and that, within the context of where SAP is used, the members were concerned with making sure that it is scientifically robust. They were not concerned with commercial or policy matters, although it was recognised that these sometimes would arise and could not be completely ignored.

The group had received nine drafts of papers for the SAP consultation. Papers on a further ten topics were being prepared (some were almost ready). A short paper summarising the proposed changes to SAP in all areas (appended to these minutes) had been circulated and

this provided a guide for the day's discussions, which were led by JH. The group's (anonymised) discussions are summarised below.

### Heating regime

Data from the EHS Energy Follow-up Survey (EFUS) had been used to check heating patterns and temperatures. This showed that most homes were heated twice per day, followed by those that were heated all day. These were roughly in a ratio of 5:2 and so the SAP assumption of morning and evening heating on week days and all day heating at weekends seemed entirely appropriate (even though the EFUS data indicates that few households actually change their heating pattern between week days and weekends). Temperatures were also broadly similar to those assumed in SAP.

**Therefore, no change to the SAP assumption was proposed. It was suggested that this recommendation should be emphasised more clearly in the paper.**

It was noted that over 50% of homes have one room or more unheated and so the SAP assumption of whole house heating was not entirely representative. However, for the purposes of labelling and building regulations compliance it was not appropriate to assume that householders were under-heating in this way.

It was suggested that the assumptions on heating usage needed to be made explicit and transparent. **A specific SAP Appendix setting out the heating regime assumptions could address this.**

It was noted that this was a topic that could be looked at in a lot more detail in future but it was important to always keep in mind the purpose of SAP which was benchmarking. Given this, **SAPSIG members confirmed that they were content with the proposal.**

### Storage heater secondary fractions

Data from the mid-1990s on homes with storage heaters had been analysed to investigate the secondary fraction (i.e. the on-peak heating contribution) that was observed. More recent data had been requested from BEAMA but nothing had been provided.

A paper had been circulated summarising the analysis. It showed a wide variation but indicated that the current SAP assumption was appropriate. **Thus, no change was proposed. SAPSIG members agreed with the proposal.**

However, it was noted that the reliance on data from twenty years ago showed a clear need for new data. This was an issue in various areas of SAP.

**A SAPSIG meeting (after SAP 2016 has been finalised) was proposed to highlight those areas where evidence / new research was required.**

## Community heating distribution loss

This topic was raised at the last SAPSIG meeting and had also been identified as a performance gap issue by Zero Carbon Hub.

Fundamentally, the problem was that large fractions of the heat produced in centralised heating networks were being lost in distribution and these were much larger than SAP assumed. Work had been done and a paper had been circulated. This proposed more realistic distribution heat loss figures, based on data from actual schemes. There was also the facility to log individual heat networks in the Product Characteristics Database (PCDB). The paper was essentially providing three options:

- Use the new defaults (much less favourable than in SAP currently)
- Calculate the heat loss and apply the in-use factors
- Use data for a specific heat network lodged in the PCDB

There was a lot of discussion on this topic with no real conclusion being reached, other than agreement that this was a very difficult area. Some of the points raised were:

- Dwelling only schemes presented problems because there was no other “dump” available for heat
- There were lots of examples of “what is specified is not what is installed” so there was a real need for a competent person to check, and a very clear process to follow
- There was a lack of enforcement
- Sign off from the builder was needed to confirm that the specification had been followed
- There were gaps in the evidence (**it was proposed that this could be addressed by setting a timeline with the defaults getting worse unless evidence was provided to show otherwise**)
- The proposed changes would have a large political impact, such as on the ECO scheme (this is not SAPSIG’s concern but nonetheless it needed to be recognised. **This suggested that there was a need to talk to the technical team at OFGEM**)
- Etc.

**It was suggested that the consultation paper (not the technical paper on this topic) could invite comments by asking “is this a reasonable approach?” and “are there any other ways of handling this?”. However, it was thought that this would probably just generate a lot of comments and no clear way forward.**

Finally, it was noted that the distinctions made regarding the loss factor variation with dwelling age band was not well supported by evidence. **It was suggested that a better (perhaps theoretically based) justification for the age band distinctions should be investigated.**

## Lighting

The current approach to lighting in SAP has no granularity (the only distinction made is between low-e lighting and lighting that is not low-e). There is also no consideration of the level of lighting provided and whether this is too low or too high. A paper had been prepared and circulated which addresses these issues but remains consistent with the existing approach.

The proposed approach provides a penalty for too much or too little lighting, and a reward for good daylighting.

SAPSIG members felt that although the approach proposed was practical it was questionable whether energy assessors would be able to identify the different types of lighting present – it was often very difficult to access the bulbs to check. Assessors cannot be expected to have design skills in this area – they would simply need relevant information from the designer that they can enter into software.

**Thus, it was suggested that there was a need to talk to the energy rating companies about the practicality of the proposal.**

It was also noted that the baseline for the calculation was tungsten lighting which seemed odd since such lighting was no longer available. This occurs because of the necessary back-calculation to ensure compatibility with the existing SAP approach. **Members felt this needs reconsidering such that the calculation starts with the lumens required. In connection with this, the examples presented in the paper needed to be improved / more clearly presented.**

**It was noted that new evidence on lighting was available and should be used. Max Colmer was the relevant contact.**

At this point, one of the new members asked about the impact assessment of SAP changes. It was explained that DCLG would deal with this via the Building Regulations impact assessment. But it was noted that a consultation version of SAP (cSAP) would also be released at the same time so that people are able check impacts on their interests themselves.

## Chimneys and flues

A paper on heat losses from chimneys and flues had been circulated. Recent measurements of air flow in chimneys demonstrated a wide variation, but indicated an average that was about twice what is currently assumed in SAP. This was the basis for proposing a change to the chimney assumption in SAP. Coupled with earlier modelling work that had come to similar conclusions, this also suggested changes to the assumption for flues.

It was agreed that this was now more robust than it had been previously but a few reservations were expressed:

**SAPSIG members felt that the basis for the change to the assumption for flues needed to be better explained.**

**It was thought that comparisons between SAP 2012 and SAP 2016 calculations would be useful to show the impact of the changes (and this applied to other topics too).**

However, it was clearly not possible to cover all possible variations and combinations of assumptions so there were practical limits to what might be done, particularly if this was to be included in the consultation.

**At this point, one of the new members proposed that there should be a SAPSIG meeting to discuss all the feedback from the consultation (once this had been collated and analysed by BRE).**

### Hot water

Hot water use in SAP is presently based only on the number of occupants (which is determined from the floor area). The proposal that had been circulated aimed to expand this to take account of the uses of hot water – specifically showers, baths and other uses.

Showers in particular are important. They are fixed and identifiable features of a dwelling which account for a significant part of the hot water demand and also have interactions with other features, such as solar water heating and waste water heat recovery.

The proposal essentially rationalises the existing hot water calculation, and that developed for showers and associated devices, into one internally consistent calculation. It does this by calculating hot water use separately for three categories of use:

- Hot water required for showers
- Hot water required for baths
- Hot water required for other uses

In turn, this approach makes the solar water heating and waste water heat recovery calculations simpler and more explicit.

**SAPSIG members agreed with the proposed approach and thought that it was a step in the right direction. However, a clarification regarding the delivery temperature for showers was noted as being required in the present draft.**

The SAPSIG members indicated that the installation of lower flow shower heads should be encouraged. However, it was pointed out that some shower heads are much better at handling lower flows than others. **The sentence in the proposal regarding low flow showers was too restrictive at present and would need reviewing/amending.**

Ideally, a water draw off pattern specific to the UK needed to be defined but this was likely to be complicated. Recourse to the European Standard draw off patterns would probably be necessary.

Related to the topic of hot water, SAPSIG members had also received a paper directly from the waste water heat recovery (WWHR) industry. One member had also received a 'phone call from the WWHR industry prior to the meeting. They were requesting that some immediate changes be made.

AC provided an explanation as to the reason why the additional paper was circulated and invited the members to feedback their thoughts on the content.

The views of the industry were based on AIMC4 data which, it is claimed, show twice the benefit for WWHR devices than SAP indicates.

The SAPSIG members were concerned that they had not seen the AIMC4 data so there was no way of checking or verifying such claims. **The data needed to be made available so that the measurements could be better understood.**

However, there were also concerns that the AIMC4 data was from a controlled study, and that this might not be representative of UK households generally (e.g. on the length of time spent showering).

JH indicated that there was substance to some of the issues raised by the industry and so some amendments could be proposed to address these. Furthermore, consideration would be given to preparing responses to each of the concerns raised and also reviewing the data in the PCDB and Appendix Q database.

#### U values and psi values for elements adjacent to unheated spaces

The information presented in the paper on this topic was essentially just an updating exercise as far as U values were concerned. New figures had simply been generated for the existing tables. However, figures for psi values had not been provided before.

It was noted that the paper appeared much more complicated than it actually was because of the number of tables. **It was proposed that the tables could simply be removed from the SAP specification. The equations provide all that is needed to calculate the required figures. This would be looked into.** One member noted that there was some field data available against which calculations with the equations could be checked.

In general, SAPSIG members were content with what was proposed. There were some questions regarding the different air change rates assumed for corridors in flats and garages and about the assumed surface resistance. These were just matters of clarification rather than perceived problems.

However, the very real possibility of hot, but unheated, corridors in flats (i.e. heat from communal heating services pipes) was noted. This was difficult to address because SAP dealt with individual dwellings rather than whole buildings, but consideration should be given to whether such situations could be added to SAP.

### Thermal bridges / psi values

It was noted, firstly, that there was no overlap between this paper and the previous one. Again, the proposal was largely an updating exercise involving:

- Worsening the default  $\psi$ -value from 0.15 to 0.2
- Removing the “approved” values from Table K1
- Revising the default values (a table of revised figures being provided in the paper)
- Providing reference to the Certified Thermal Details and Products scheme database

SAPSIG members noted that the geometry and flanking U-value make a difference to the calculated  $\psi$  value so it was impossible to cover every possible situation. In this regard, a tolerance of +/- 10% in flanking element U-value was allowed in the proposal.

SAPSIG members could not see how anything better than what had been proposed could be done at present. In particular, the BRE database (i.e. the Certified Thermal Details and Products scheme) was seen as a step forward. **Thus, SAPSIG were content with the proposal.**

### Carbon factors

This, again, was essentially just an updating exercise. A paper had been circulated explaining the basis for updating the carbon emission factors and providing preliminary figures for SAP 2016. This did not yet cover primary energy factors but these would be added in a later version, using exactly the same basis.

One of the new members asked about the time period assumed, suggesting that a longer term assumption would be more appropriate. The difficulties with this (principally, uncertainty over what would happen to the generation mix for electricity over the long term) were explained as well as the argument for the three year basis that has been adopted, and the fact that (less robust) fifteen year figures are also provided for anyone that needs to undertake longer term calculations.

It was noted that this was always a contentious area, involving difficult compromises, but by thoroughly documenting the calculation process and the sources used we have been as robust and transparent as possible.

At this point, it was also noted that the industry is using SAP as a design tool (or, more to the point, a systems selection tool) even though it is expressly not intended for this. This meant that SAP assumptions, particularly on carbon factors, were important in driving changes.

*This concluded discussion of the technical papers that had been circulated to the SAPSIG members.*

*The topics that follow were only very briefly discussed as the associated papers had not yet been completed (although some were almost ready) and so they had not been seen by SAPSIG.*

### Boiler efficiency

The paper, which was almost ready, proposes how to take account of the data from European energy labelling regulations, and also deals with adjustments for control types, etc.

It was noted that tests with low temperature systems were not showing the expected efficiency improvements and so maybe the recognition for such systems that was being proposed was too great. It was suggested, therefore, that the proposal should not rush ahead on this aspect at this stage.

### Ventilation

This paper will propose changes to the treatment of mechanical ventilation systems. It was intended to cover demand control ventilation as well but the industry has yet to produce suitable definitions of the different types, so this will not now be included.

It was noted that skills in installing MVHR systems are generally poor and so the performance of systems are often worse than expected from modelling. Some members had research results on the actual performance of systems that they would provide to DECC.

### Solid fuel heating

This paper will review existing defaults and explain their basis. It was likely that no changes would be proposed.

There was no real discussion of this topic.

### Heat pump efficiency

This paper will review current SAP heat pump efficiency defaults based on a DECC report that is currently being finalised, which looks at actual performance based on RHPP data.

The information from DECC is still awaited before this paper can be progressed. SAPSIG members noted that it was important to be absolutely clear about the system boundary that was being assumed when defining the efficiency.

### Solar space heating

There is little or no field data on which to base a calculation procedure so progress on this was difficult. The paper would just summarise existing knowledge, the prospects for including this technology in SAP, and would call for evidence.

There was no real discussion on this topic.



### MCS data for solar technologies

This paper would propose that data from MCS certificates can be used in place of assessor-collected data where it is thought to be more accurate (principally, the overshadowing factor that applies to solar collectors).

There was no real discussion on this topic.

### PV energy dumping

This paper will propose a change to the calculation where excess PV generated electricity is used to heat water rather than being exported to the grid as is currently assumed. This practice lowers household energy costs but it increases carbon emissions. There will be no substantive change to the model - this is essentially just an accounting exercise.

There was no real discussion on this topic.

### Cost data used in EPCs

This paper will list the costs of measures in the EPC at the time that the consultation launches. There will be no technical content for SAPSIG to review.

There was no real discussion on this topic.

### Overheating – “Appendix P”

This paper will propose minor changes to the overheating calculation, based on recommendations made by Zero Carbon Hub. It will involve tightening up the questions that are asked to make it harder to select unrealistic inputs or to deliberately cheat.

It was noted that Part L of Building Regulations was not actually requesting this so it was actually viewed by DCLG (and hence DECC) as a low priority.

SAPSIG members noted, however, that the recommendation from Zero Carbon Hub to improve SAP in this respect was made several years ago - so others still saw this as a high priority.

One member thought that the terminology being used was unhelpful. By calling this an overheating calculation it was encouraging the industry to perceive it as a thorough assessment that would ensure that overheating would not be a problem. It was suggested that it would be more appropriate to give it a different name, such as “solar gain test”, to avoid this perception.

Regarding the lack of priority attached to this topic, AC suggested that if the industry itself came up with a robust method to calculate overheating risks then DCLG would welcome this and would probably recommend its use.

### RdSAP U-value table

This paper will propose an updated table of default U-values for existing wall types. In particular, recent work on solid walls has shown that their U-values are considerably better than has been assumed. This is an RdSAP issue rather than SAP 2016. However, DECC feel that it is so important that it should be included in the consultation.

SAPSIG members noted that the better U-value for solid walls is, with hindsight, not surprising because of the inevitable presence of voids between the inner and outer layer of bricks.

**There was a request that SAPSIG members be provided with a link to what had actually been published on the solid wall study.**

### Any other business

One member highlighted the importance of heat interface units in communal systems, noting that there was an enormous variation in their performance across the market. These appeared to be completely absent from the discussions / papers. **It was proposed that heat interface units could be added to either the heat networks or the hot water paper.**

**Note: in the appended summary paper, which was discussed during the meeting, the “boiler efficiency” paper is indicated as having been provided to SAPSIG. In fact, this was not the case. That paper was not quite ready in time for the meeting.**

# Brief summary of SAP 2016 changes proposed

## Heating regime

Paper provided. EFUS data has shown that current SAP heating regime differs only slightly from average behaviour. No change recommended.

## Boiler efficiency

Paper provided. This paper proposes how to make use of data from European energy labelling regulations. It also suggests how efficiency could be varied for various control types, plus other adjustments.

## Storage heater secondary fractions

Paper provided. Field data from 1990s assessed showed current factors look about right, so no change proposed here.

## Community heating distribution losses

Paper provided. Evidence is presented that real-life distribution losses are far higher than have been assumed in SAP. Significantly higher default figures are proposed, which it is hoped will encourage the use of actual data.

## Lighting

Paper provided. It is proposed to make a significant adjustment to the lighting calculation to allow for actual lamp efficacy to be used, where known, and to take account of the quantity of fixed lighting provided.

## Thermal bridges

Paper provided. We propose to worsen the  $\gamma$ -value default for new homes from 0.15 to 0.2; to remove the outdated column of 'approved' psi-values; to update the column of 'default' psi-values; and to allow the use of psi-values taken from databases deemed to contain reliable data.

## CO2 factors

Paper provided. CO2 and primary energy factors have been updated to represent their predicted average values for the period 2017-19.

## Hot water

Paper provided. The proposal here is to take into account shower and bath type(s) and presence to improve the accuracy of calculation of hot water requirement (while leaving it still entirely independent of occupant behaviour). This will also allow improved treatment of solar water heating and waste water heat recovery.

## U and Psi-value correction factors

Paper provided. Updates to several of the U-value correction factor tables (e.g. for adjacent unheated sheltered spaces) have been proposed to bring them into line with modern build standards. A new correction procedure for psi-values of junctions adjacent to unheated sheltered space is proposed.

## Chimneys and flues

Paper provided. Higher ventilation rates are recommended for chimneys (roughly double). The paper also recommends higher rates for flues and split into more types.

## Ventilation

Paper not yet provided. This paper will propose a number of changes to treatment of mechanical ventilation systems. It was also intended to propose how to treat demand controlled ventilation systems, but industry hasn't yet come up with suitable definitions of what types are, so this is now likely to come through Appendix Q later.

## Solid fuel heating efficiency

Paper not yet provided. This paper will review existing defaults and explain their basis (and why different from other published figures, e.g. MCS). Probably no change required, just explanation.

## Heat pump efficiency

Paper not yet provided. This paper will review current SAP heat pump efficiency defaults based on a DECC report currently being finalised looking at actual performance based on RHPP data.

## Solar space heating

Paper not yet provided. There is little or no field data on which to base a calculation procedure. This paper will summarise the situation (existing knowledge, prospect of inclusion in SAP) and call for evidence.

## Use of MCS data for solar technologies

Paper not yet provided. This paper will propose that data from MCS certificates can be used in place of assessor-collected data as SAP inputs where it is thought to be more accurate – e.g. overshadowing factor. We are also hoping to propose an improved method for deriving an overshadowing factor for

solar collectors where no MCS data is available, since this has a significant effect on the performance of PV in particular.

## **PV energy dumping**

**Paper not yet provided.** This paper will propose a change to the calculation where devices are installed which use surplus electricity generated by PV to heat a hot water cylinder, instead of exporting it to the grid as is currently assumed. This has an impact on the dwellings fuel costs (lower) and CO2 emissions (higher). The change will really be an accounting exercise rather than adjusting the modelling.

## **Cost data used in EPCs**

**Paper not yet provided.** This paper will simply list the EPC costs of measure that are current at the time the consultation goes live. It's just a formality. It will contain no technical content for SAPSIG to review.

## **Overheating – ‘Appendix P’**

**Paper not yet provided.** This paper will propose minor adjustments to the overheating calculation, based on recommendations made by ZCH. There is no appetite in government for significant changes at this time, but it will be possible to tighten up the way in which questions are asked to make it harder to enter unrealistic inputs, by asking positive Yes/No questions rather than choosing from too-vague categories in tables.

## **RdSAP U-values table**

**Paper not yet provided.** This paper will propose an updated table of default U-values for existing wall types. This was mainly prompted by the solid wall study showing solid walls have a considerably better U-value (on average) than assumed. This is really an RdSAP issue, but DECC feel it is important so deserves to be consulted on.