The Foundry
5 Baldwin Terrace
London
N1 7RU
020 7704 3503
www.goodhomes.org.uk

Good Homes Alliance

Response to SAP Consultation 2017

Emailed to:

buildingheat@beis.gov.uk

Department of Energy & Climate Change,
3 Whitehall Place,
London,
SW1A 2AW

Proposed Amendment 1 Updating Carbon Emission Factors

Consultation Question:

1. *Do you agree with the proposal to use the methodology set out in the technical working paper for calculating carbon emission factors and update the figures?*

GHA Answer: Yes, but we would support and reiterate the view expressed by the Solar Trade Association:

"We note that the assumed carbon intensity of grid electricity has been reduced to a level that is 76.6% of that in SAP2012. The same carbon intensity figure is used for electricity bought in from the grid and for electricity exported to the grid.

For Solar PV this means that 30% more kWh/year would be required for the same impact on the DER, so 30% larger solar systems will be required for the same carbon benefit (all other things being equal), harming PV's competitive position relative to other measures to reduce carbon emissions.

STA is not proposing any amendment to the proposals in the consultation but wishes to take this opportunity to highlight a coming issue with the entire structure of SAP. By targeting carbon emissions with backstop thermal insulation values in the fast-approaching situation of low carbon electricity, there is a risk of unintended consequences. As the carbon intensity of electricity approaches that of gas, developers will be able to meet regulations in the most cost effective way with resistive heating, which in turn will drive higher electricity demand and make the task of further grid decarbonisation that much more difficult and costly.

Continuing to target carbon emissions in a future where grid electricity is low carbon will also remove the incentive SAP provides for housebuilders to include solar in their designs.

We suggest BEIS seriously consider a change from a carbon emissions target to a net energy consumption target in the revision of SAP subsequent to SAP2016."

Proposed Amendment 2 – SAP heating regime

Consultation Question:

2. *Should we keep the current set of heating patterns set out in SAP or move to using two heating periods every day of the week?*

Please provide supporting information for your view.

GHA Answer: We believe SAP should reflect as far as possible a current range of occupancy and heating patterns. Any improvement to the accuracy of SAP calculations for heating demand would be very welcome. SAP has been proved to be an inaccurate tool for assessing actual heating demand (Predicted vs. Actual) and cannot be used to inform heating systems designs as a result. Any improvement is therefore welcome to maintain momentum toward a more accurate SAP heating demand prediction.

Proposed Amendment 3 – Distribution loss factors for heat networks

Consultation Question:

3. *Do you agree with the proposal to amend default Distribution Loss Factors for Heat Networks?*

GHA Answer: Yes, evidence suggests this, a more accurate approach, is more appropriate.

Proposed Amendment 4 – SAP's lighting calculation including RdSAP

Consultation Question:

4. *Do you agree with the proposal to change the way that lighting is calculated in SAP?*

GHA Answer: Yes, a more accurate assessment of low energy lighting and recognition of LEDs would be welcome.

Proposed Amendment 5 - Treatment of thermal bridges

Consultation Question:

5. *Do you agree with the proposal to remove the default values in Table K1, review default values as proposed, and recognise Certified Thermal Details and Products schemes? Do you agree with the proposal in due course to amend the default y value to 0.2?*

GHA Answer: Yes and yes.

Proposed Amendment 6 – Treatment of areas next to unheated spaces

Consultation Question:

6. *Do you agree with the proposals to adjust U values and Ψ - values for elements next to unheated spaces?*

GHA Answer: Yes, a more accurate approach would be welcome.

Proposed Amendment 7 – U - Values for walls in existing dwellings – RdSAP

Consultation Question:

7. Do you agree with the proposal to change the default U - values for walls for existing buildings in RdSAP?

GHA Answer: Yes

Proposed Amendment 8 – Hot Water methodology in SAP

Consultation Question

8. Do you agree with the proposal to amend the hot water methodology in SAP?

GHA Answers: Yes, a more accurate approach would be welcome and we would also support the STA response also (copied below).

"STA welcomes a review of the hot water calculation in SAP. As homes become better insulated, the hot water usage becomes the most significant heating requirement. A more accurate calculation is clearly justified, even at the expense of a small increase in complexity.

In the course of the SAP 2012 consultation, STA discovered that the average hot water use value used in SAP was based on a set of data which included homes with electric showers (and therefore had no hot water use for showering). STA successfully argued for a modifier to be applied to the hot water demand for homes without electric showers to increase their hot water use. This was done late in the day and consequently was only implemented in the SHW appendix and not the main calculation. In SAP2012 energy use to heat cold water in an electric shower is considered 'appliance' and so doesn't count towards the carbon dioxide emissions.

The proposal for SAP2016 is to more accurately calculate the water use for the house based on whether it has electric showers, vented or unvented hot water system and whether a bath is present. The calculation is described in Appendix J

For showers, the method described effectively works out a weighted average flow rate for showers present in the house and then applies assumptions about the length of time for each shower and the temperature of the mixed water in the shower.

We believe that the description of the shower calculation could be made much clearer.

Currently the method is described as calculating the volume of warm water per shower event, the monthly warm water use per shower event, the monthly warm water consumption and the monthly hot water consumption *for every outlet in the house*.

It would be much clearer and simpler if the weighted average warm water volume per shower event was calculated first, then this single value is used in the latter parts of the calculation.

As a result of the changes, it becomes clear that the assumed temperature of the cold water feed is now impacting the hot water use in two ways:

- The warmer the cold feed, the less hot water is mixed in to reach the required warm water (shower, bath) temperature
- The warmer the cold feed, the less energy is needed to raise the cold water to the hot water (hot tap) temperature

It is more important than ever that the cold water feed temperature is accurate. Table J1 gives the values.

[Type text]

Table J1: Cold Water Temperatures (C)											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
11.1	10.8	11.8	14.7	16.1	18.2	21.3	19.2	18.8	16.3	13.3	11.8

These temperatures seem high compared to what might be expected for a mains pressure fed system. We believe that they are derived from an EST study of 2008, and so represent an average of houses with mains pressure fed systems, header tank fed systems and homes with electric showers.

A system fed from a header tank will have very warm temperatures in summer (loft temperatures), whereas a mains pressure fed system will have a cooler temperature all year – closer to ground temperature. The table below shows ground temperatures at 30cm depth. (We believe water mains are usually laid between 750mm and 1350mm deep – ground temperatures for this depth were not accessible to the public, but may be available to BRE).

Ground Temperatures (MET Office 30cm soil temp 1981-2010)											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4	4	6	8	11	15	17	17	15	10	8	5

The trend in hot water systems is very much away from header tanks and towards either mains pressure cylinders or combi boilers. Using weighted average temperatures from 2008, where more vented cylinders were in use is understates real hot water use as the weighting moves more and more to mains pressure fed systems.

Homes with electric showers are likely to have a greatly reduced number of large volume draw-offs of hot water, water from the heating system being predominantly for low volume draw-offs such as hand washing and washing dishes. Short draw offs are likely to be met in large part by water that has been standing in pipework inside the heated envelope of the building, so the electric shower properties in the original data set would have had the effect of increasing the average measured inlet temperature to the heating system.

The more accurate calculation methodology should take into account the different inlet temperatures of different systems, as well as their flow rates. STA strongly requests that the water temperature table J1 include two rows – for both mains pressure fed hot water systems and those where the cold water feed is from a header tank.

The data in the underlying EST trials upon which the cold water inlet temperature is based should be categorised and homes with electric showers removed from the data used to calculate the cold water inlet temperatures for homes without electric showers.

SAP 2012 included a provision to

"Reduce Vd,m by 5% if the dwelling is designed to achieve a water use target of not more than 125 litres per person per day (all water use, hot and cold)"

This has been left in place in SAP 2016, but the following has also been added.

"The flow rate of shower outlets should take account of any flow restrictors present, subject to a minimum flow of 6 l/min. If a lower flow rate has been recorded use 6 l/min."
It seems unlikely that a home designed to achieve a water use target would NOT include a flow restrictor, so the benefit is being double counted. The new, realistic water use calculation renders the 5% adjustment unnecessary.

STA recommends that the 5% reduction to hot water use is removed.

The significant water reductions possible in the calculation through the inclusion of flow limiters raises concerns. These are a low-cost feature that are easily removed later –even if it does require the use of a hand tool - by unhappy residents who want to get wet when they shower.

We request that the benefit of flow restrictors is adjusted by a factor to take into account the proportion of these that are removed by residents within the first five years after occupation."

Proposed Amendment 9 – Summer temperatures assessment (Appendix P)

Consultation Question

9. Do you agree with the proposals to change the questions in the assessment of internal temperature in summer (Appendix P)?

Answer: The GHA support the view of the "The Buildings Hub", as below:

1. ***BEIS statement: "Recent evidence has indicated that the Appendix P assessments may be under-reporting the risk of high internal temperatures, so there is a need to review the methodology or consider other options, such as its removal."***

2. BEIS is essentially separating out two questions:

    a. Short-term - What simple changes should be made to the Appendix P data entry and methodology (SAP 2012) to improve the assessment?

    b. Long-term – Should Appendix P continue to be included in SAP in the long-term, and if not, what should replace it and how would this be delivered?

3. The current consultation focuses primarily on Point a, but we imagine you are also interested in views on the longer-term position.

4. On Point a (short-term changes to the methodology), as the consultation makes clear, anecdotal evidence from developers and modellers during the ZCH's programme suggests that, although Appendix P is a useful "check" on the potential for high internal temperatures in dwellings, it is currently too easy to input values into Appendix P which are unrealistic – such as assuming windows are open 100% of the time. The result is that properties may be inappropriately rated as low risk. The implications of this are not insignificant should a developer rely on assessment, only to find the property subsequently overheats.

5. **Therefore, overall, we support proposals intended to make the data entry better able to match likely occupant behavior and to take better account the real-world context of buildings.**

6. On Point b (longer-term options), at present, Appendix P is one of the only official "requirements' in place to trigger the consideration of the likelihood of high internal temperatures in new buildings (although, technically developers are not required to use Appendix P to demonstrate compliance with Criterion 3 in ADL1A). Although no model is perfect, we <u>strongly recommend that BEIS does not to remove Appendix P unless</u>

alternative official assessment methodologies and tools have been fully developed and road-tested.

7. ***BEIS statement - The risk assessment currently does not undertake an hourly calculation and is not specific to any particular parts of a dwelling (in common with the rest of the SAP methodology). Such calculations are beyond the current capability of SAP. If stakeholders consider that more complex assessments are required to demonstrate that they have properly considered the issue, then they would have to be derived using industry-provided simulation software or some other more complex estimation of the overheating potential in the dwelling.***

8. At present the majority of developers/designers/modellers are either assessing overheating risk:

    a. Using dynamic simulation modelling to test designs against CIBSE's overheating assessment criteria in Guide A: Environment Design. CIBSE's guidance is considered best practice, and is increasingly being referenced in official documents such as by the GLA when assessing planning applications for major new developments in London. Or

    b. Using SAP Appendix P only.

9. It is clear that Appendix P is not intended to be a design tool. As BEIS states Appendix P "was not conceived as a comprehensive 'overheating assessment' and therefore should not be relied upon by designers as a means to ensure thermal comfort." In addition, it is not, in its present form, capable of being used to verify compliance with any future "overheating standard". In the first instance, the legal vires sitting behind SAP may prevent its use for such a purpose – although there is an interesting question about whether this would change once the UK exits the EU. Secondly, from a practical point of view, the averaging out of temperatures across day and night and across the whole house would not give a meaningful answer on whether any future more nuanced standard is met. For example, if there were to be a requirement that the design of a property should result in rooms being capable of being maintained at a certain temperature, then Appendix P could not be used to demonstrate this, but DSM tools clearly could.

    If an overheating standard is created (which many in the industry have argued is needed), this would in theory apply to all new housing developments – large or small, and regardless of the house type. If Appendix P couldn't be used to show compliance, then at present, all new developments would need to go through a detailed modelling exercise. The key question for overheating policymakers is whether this would be a reasonable or proportionate thing to require. Indicative costs to carry out detailed housetype DSM might be in the range of £2000 for the 1st type and £300 for each additional house-type of same/similar construction

10. For this reason, the ZCH suggested in their "Next Steps in Defining Overheating" paper in 2016 that if an overheating standard were developed, this should include a whole-house risk assessment, using an "appropriate" methodology (and tool). Appropriateness would be decided based on the characteristics of the design and the building's location. For example, a design for a large new scheme in central London with large areas of south-west facing glazing and limited opportunities for purge ventilation should sensibly benefit from a detailed risk assessment and consideration of how to reduce the potential for overheating. For a four-bed, detached house in Inverness it may be reasonable to require only a "lighter-touch assessment" as the risk of it overheating is inherently lower.

11. If such a light-touch assessment where permitted in certain defined circumstances, then a new, official methodology/tool would be needed to perform this. For the reasons given above, the current SAP Appendix P could not be used. If such a tool were created, perhaps drawing on aspects of CIBSE's methodology, and on the existing Appendix P methodology, only then would it make sense to remove the current Appendix P from SAP, in our view.

12. However, there is the separate question of whether it still makes sense to keep any future light-touch overheating assessment in SAP as developers will already be using this method for energy performance calculations. If the UK is not bound by the EPBD in the future, does the legal vires issue resolve itself?

> *"The successful implementation of the "light-touch" risk assessment option would therefore be reliant on either developing a re-purposed Appendix P-type methodology, or creating a new simple "steady-state" methodology/tool. Discussions on the practicalities of doing this suggest that the adaptation of existing models or the creation of a new tool, if needed, would not be difficult to do." Extract from Next Steps in Defining Overheating 2016.*

13. We also think that if the purpose of any new methodology and tool were to enable developers to demonstrate compliance with a government-led standard, then government would need to have ownership of the method it, as it does with SAP, even if the method is developed by industry.

14. Lastly, for the sake of clarity, the ZCH has repeatedly highlighted that modelling alone is unlikely to be enough to judge whether a design is sound, from a climate resilience/thermal comfort perspective. Future frameworks must also recognise that design teams and their advisors also need to use their skill and judgement to look at the reality of the site context and to think about how the building will be used by people.

15. BEIS Statement – "It will be more likely that a calculation gives a higher overheating risk".

16. The information provided on page 10 of the technical paper on how the new proposals would affect the risk rating in a certain type of property is very useful.

17. The example is given of a house in the Thames region where, using the currently methodology, the risk of high internal temperatures would be assessed as "not significant". With the proposed new methodology, the risk rating becomes "medium". If window opening were then judged not to be possible and therefore the "trickle vents only" option is selected, the rating changes to "high". Indeed, the threshold temperature is found to be extremely hot at 31°C. In order to make the example above "pass", the paper notes that a mechanical ventilation system would need to supply an additional 1.5 air changes to reduce the resulting risk level to medium.

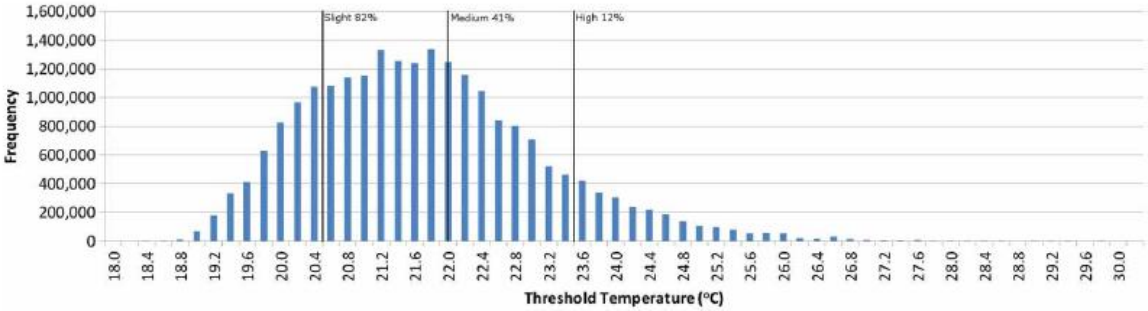
18. In short, for properties assumed to have no window-opening options and no mechanical ventilation, located in the south of the country, the risk of high internal temperatures is likely to be assessed as "high" by the new Appendix P. It is also noteworthy that the example is of a detached house, so one might assume the threshold temperature would be even higher in an apartment block with a smaller floor area?

19. Our question is whether an analysis of the probable impact of the proposals across the stock as a whole has been, or should be, carried out? For instance, should modelling a range of detached housing specifications show that a very high number, such as 60% or 70% are being classed as "high risk", even in northerly locations, then we would know that the combined effect of the new proposals is making the Appendix P test very tough to pass and is perhaps unrepresentative of the stock. A similar analysis could be done on the range of house types, e.g. apartments, semi-detached etc.

20. Without this information it is difficult to judge whether the proposals are having the intended impact. It might be the case that we would expect to see the majority of homes in the "slight risk rating category", some in the "medium" category, and less than 20%[1] in the "high" risk category.

21. For example, Tillson et all (2013)[2] at UCL used English Housing Survey data to create a SAP Appendix P profile for the stock. They then used this information to show the effect on the risk rating of raising external temperatures by 1.4°C, to simulate climate change. However, for this purpose, the "control" or currently profile might be useful. It shows 12% of housing in the high risk category (SAP 2009). With the new proposals, we might expect the curve to move to the right, just not too far to the right!

[1] Drawing on monitoring studies such as Beizaiee et al (2013).
[2] Assessing Impacts of Summertime Overheatng (2013).



The figure shows English housing stock vulnerability to overheating in the current climate. Threshold temperatures predicted by the Standard Assessment Procedure (SAP) indicate the likelihood of the housing stock to overheat in the current climate. The vertical lines show the threshold temperatures that indicate a slight, medium and high risk of overheating, according to SAP 2009, and the cumulative percentages are also shown.

Answer: In light of this, we support the proposals to tighten up data entry provided it is possible to show that the risk profile for the housing stock as a whole does not inappropriately swing too far towards the high risk end of the spectrum so that it is virtually impossible to get a low risk rating.

Detailed proposals

Window opening is often not practical when in the presence of noise, or in a position of security risk. There are no checks on this under the current procedure but they could and possibly should feature. Therefore we propose that the determination of effective air change rate should be remodelled as a series of questions to reflect more closely what the potential is for natural purge ventilation.	Support
Noise - The assessor is required to either 1) refer to any Noise Policy Statements used in planning to judge the potential for noise issues or 2) judge whether the property is in close proximity to nuisance noise e.g. a railway. If there is likely to be nuisance noise, then **the "trickle vents" only option must be selected.**	Support
Security - Householders need to be confident they can use natural ventilation without it posing a security risk when they are present or not present. If the property is single storey and ground floor **then 'trickle vents only' should be selected.** If the property has two storeys, then one of the 'single storey dwelling' rows should be chosen to reflect reduced ventilation due to ground floor windows being closed. However, if **suitably certified security grilles are fitted** to all such windows, these may be left open when the occupier is not present and there may not be constraints from a security point of view.	Support
Extent - It is unlikely that all windows in a dwelling can be kept wide open 100% of the time (24 hours a day) under any circumstances. It is therefore proposed to remove this option, revising the upper limit to windows **fully open 50% of the time** as a realistic maximum for the monthly	We support this proposal. It is unrealistic that an occupant would have their windows fully open 100% of the time.

calculation. The options available are therefore: fully open 50% of the time, 50mm open 100% of the time, and ventilation through trickle vents only. These airflow figures are consistent with those in the existing categories.	
Blinds - Blinds and curtains can currently be assumed by assessors to be closed for 100% of daylight hours. This has been questioned as unrealistic by industry in the ZCH consultation Assuming averages of the morning afternoon and evening figures for both weekdays and weekends in Table 2, the blinds would be approximately 50% closed, 30% half closed and 20% open. Area weighting the figures would give an overall blind closing proportion of **65% and it is proposed that this figure is used for Appendix P** calculations in future as a more conservative and likely figure.	We support this proposal.
Mechanical ventilation - Evidence for air flow rate will need to be substantiated with manufacturer literature, and relates to a whole house ventilation rate that can be maintained continuously during hot weather. For some 'problem locations' where security and noise or pollution issues are present the only option to pass the internal temperature criterion will be to install dedicated purge ventilation, as background ventilation and high purge ventilation rates can have contradictory requirements for ductwork sizing.	Can purge vent rates at levels high enough to remove large quantities of hot air be maintained?

Proposed Amendment 10 – Mechanical Ventilation Systems

Consultation Question

10. Do you agree with the proposal to amend the treatment of Mechanical Ventilation Systems in SAP?

GHA Answer: Yes

Proposed Amendment 11 – Chimneys

Consultation Question:

11. Do you agree with the proposal to change the assumed air flow rate for chimneys and flues in SAP?

GHA Answer: Yes

Proposed Amendment 12 – Secondary Fraction from Storage Heating

Consultation Question

12. Do you agree with the proposal not to alter assumptions on storage heating secondary fractions in SAP?

GHA Answer: Yes

Proposal Amendment 13 – Solid fuel heating efficiencies

Consultation Question:

13. Do you agree with the amendments proposed to solid fuel heating efficiencies?

GHA Answer: Yes

Proposed Amendment 14 – Solar PV systems and overshading

Consultation Question:

14. Do you agree with the proposal to amend the procedure for determining overshading of solar PV installations?

GHA Answer: No and we support the STA response as below on this and Landlord's supply:

"Solar PV is non-linearly affected by shading. Shade on one cell can affect the output of all cells on the same by-pass diode. With string inverters, shade on one module can affect the power output of the whole string of modules. Alternatives to string inverters such as micro-inverters or voltage optimisers can ameliorate this non-linear shading response and are becoming more common.

In previous versions of SAP, the treatment of shading was identical for solar thermal and solar PV.

In SAP 2016 there are three significant changes proposed

- Design SAP calculation is based only on a new (more punitive) far shading factor and subject to a best shading factor of 0.8
- As built SAP calculation is based on either the MCS shading factor (where available) or a re-assessment of the far shading factor multiplied by near shading factor

The near shading factor is multiplicative, so if there are two obstructions you mulitply their overshading factors together to get a final shading factor.

STA understands that this proposal has been brought forward based on **no empirical evidence** that solar PV systems are under-performing SAP estimates in real life, rather a belief by BRE consultants that the SAP shading treatment is over-simplistic and over-generous for solar PV.

However, independent assessment of the performance of PV panels by Sheffield University showed that 98% of installed systems worked according to their specifications[i].

In fact, due to the previous MCS calculation so significantly underestimating solar PV yields when it was based on SAP, it was changed to use higher irradiation levels than SAP does. MCS estimates now produce a solar energy yield that is nearly 20% higher than SAP with all other factors being equal.

For example for Zone 2, 35 degrees pitch, south facing, no shading

SAP 2012 gives 963kWh/kWp

MCS gives 1,127 kWh/kWp (+17%)

STA welcomes a dedicated shading calculation for solar PV, but if changes are going to be made to shading to more closely match MCS, then the irradiation levels should also match MCS.

[Type text]

However, the most alarming aspect of this proposal, and the reason that STA is strongly opposed to it in its current form is that the housing developer applying solar to their homes will not know until after the home is built whether the carbon emissions of that home are compliant with Part L. This is an almost unacceptable position for a developer to put themselves in. By this time in the build, the opportunities to make further efficiency improvements are extremely expensive.

This will make solar PV **highly unattractive** to developers and could put the technology at a significant disadvantage compared to other technologies which developers could use with certainty.

The imposition of a maximum value on Zpv_{far} of 0.8 at design stage means that systems that end up with none or very little shading and no roof clutter are penalised by 20% of their annual output at the design stage.

The consultation technical paper contends that the near-shading is difficult to assess at the design stage and that this can only be done once the building is complete. STA believes that this is not the case. In this age of BIM and detailed CAD modelling, potential shade from soil vent pipes, chimneys and other roof clutter are available in the house design. Solar installation companies will often locate solar panels to avoid such shading or work with the housebuilder to relocate objects in the design long before getting on site. If anything, it is far shading that can be more often difficult to assess if the site plan does not include details of the surroundings.

The associated technical paper makes reference on numerous occasions that the MCS shading calculation is a requirement of the certification and seems to assume that going forward most solar installations would have an MCS certificate. There are reasons to believe that this is not a safe assumption. Recent changes to the EPC qualification requirements of the Feed in Tariff (FIT) scheme have ensured that occupiers of new homes are most likely to qualify only for the lowest level of the FIT generation tariff, leaving some housing developers to conclude that MCS registration is a cost without a benefit. The future of the MCS scheme itself is somewhat in doubt, since the latest drop in the FIT rates have caused domestic retrofit PV installation to drop by 80% cutting income to the scheme significantly.

Uncertainty over whether an MCS shading figure might be available means that the SAP calculation should absolutely avoid setting punitive values for the default shading approach, as it does in other areas to encourage the use of more accurate type approval values.

STA calls for the proposed two-step approach to solar shading in SAP to be dropped and replaced with a single method used at both design and completion stages.

Discussion with the Chair of the MCS PV working group reveals that the primary purpose of the MCS shading methodology was to deter poor installations and mis-selling. It should not be held up as a gold standard for accuracy.

For example, diffuse irradiation represents a significant proportion of the irradiance of a tilted surface, especially with cloudy weather conditions in the UK. This can be seen by the fact that a north facing panel tilted at 60 degrees (and so in shade all year) still enjoys nearly 50% of the irradiation of a panel

tilted due south at 35 degrees. Yet using the MCS methodology, it is possible to occlude 92 segments and get a shading factor of 0.08.

SAP Region 2

		S (orient, p,m)												S
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Orientation	Angle	(W/m2)	(W/m2)	(W/m2)	(W/m2)	(W/m2)	(W/m2)	(W/m2)	(W/m2)	(W/m2)	(W/m2)	(W/m2)	(W/m2)	(kWh/m2)
North	60	17	28	48	85	114	133	122	95	63	36	21	14	567
South	35	52	84	127	183	208	225	213	189	154	104	64	42	1,203

(Table calculated based on methodology in SAP2012)

The MCS method also penalises an array if it has far shade behind the array which cannot possibly cast a shadow and have a detrimental affect over and above the reduced irradiance level assumed (e.g. a West Facing array penalised for far shade in the East.)

Far shading is more likely to diminish the general light levels and is unlikely to cast a sharp shadow across a solar array, so the non-linear response of solar PV to shading is not an issue for this aspect.

We recommend that the solar PV far shading factor for SAP be identical to the current solar thermal shading table H2, which deals fairly with the contribution from diffuse radiation.

The derivation of the shading factor for near shading (Table M2) causes problems. The tall and short obstructions are categorised as either to the south, SE/SW and E/W, but this seems to assume that all solar panels are installed facing due south, when they clearly are not.

If a panel array faces East, it is already penalised for being out of the direct sun for much of the day (with a lower irradiation level). An obstruction to the south does not throw shade onto the array, but in the proposed method could remove a further 80% of the energy yield. A system should not be penalised for shade that is cast behind it!

What actually matters here is where the obstruction lies *relative* to the orientation of the array, not it's absolute position.

For example, an array facing east should have the highest shading penalty when the obstruction is to the east, not the south.

Also the impact of near shading will vary depending on which direction the panels face. The same obstruction in front of a west-facing array will cast a longer shadow on the panels (because the sun is higher in the sky for the south facing panels and the shade cast is shorter). However, diffuse irradiation also changes over the course of the day being generally highest when the sun is lower in the sky.

Near shading is an extremely complex topic. The proposed treatment in the consultation is flawed. STA offers to assemble a group of experts to work with BRE to develop a better approach than that proposed in the consultation."

Good Homes Alliance

Amendment 14b. Landlord's Supply

The consultation also suggests a change to the treatment of solar in apartment blocks. Developers attaching solar to the Landlord's supply rather than (more expensively) wiring direct to each apartment will not get any benefit on the carbon compliance of the apartments.

This change seems prejudicial to solar.

STA understands that the change is to prevent a double benefit from solar, as apartment blocks need to comply with both SAP (for individual properties) and BREEAM (for communal spaces). Previously, the developer could apply PV to the communal spaces and count the carbon benefits twice – once for the communal areas and again in the SAP calculation.

However, a consequence of the proposal would be to limit the amount of solar that could be used to that sufficient to achieve the required BREEAM rating only. If a developer has enough solar to meet the BREEAM requirements for the communal spaces, they should be able to add more to the Landlords supply and offset carbon for the dwellings (without having to wire to individual apartments). The logic of SAP elsewhere is that a unit of electricity offsets the same carbon whether it is exported or used on-site.

"STA proposes that the SAP calculation continues to allow solar capacity that is attached to the landlords supply to count towards the carbon compliance of the apartments, but only any part of the solar installation that has not already been used in the compliance calculation for the communal spaces."

Proposed Amendment 15 – PV Diverters, Export Tariff and Solar Space Heating

Consultation Question:

15. Do you agree with the approach to adjust the carbon savings where solar PV electricity is used in the home to heat water or where it is put into battery or other storage? Do you have a view on the correct export tariff for PV electricity exported to the grid? Do you have ideas on how solar thermal space heating or storage of solar PV or hot water through a battery or other medium can be modelled?

GHA Answer: We support the view of the Solar Trade Association (copied below):

Power Diverters

The proposed treatment of water heating from diverters is logical, with the water heating load met by the principal heating system being decreased by the amount diverted and the impact on energy bills and carbon savings adjusted accordingly.

However, the proposed implementation in the calculation does not deal with the situation where the diverted electricity exceeds the hot water demand. This could become especially important for homes where the output of the PV system is large compared to the hot water use. We note that the new Feed in Tariff smallest installation band now runs from 0kWp to 10kWp.

The assumed diverted electricity each month should be compared to the hot water demand in that month and any generation in excess of water demand assumed exported to the grid (and therefore saving the carbon emissions from electricity export).

Export Tariff

SAP currently values export and self-consumed solar generated electricity (at the standard tariff) at 15.32p/kWh.

The consultation asks for suggestions how to amend the value of exported electricity going forward.

The export tariff is currently worth 4.91p/kWh, so at first glance crediting the exported electricity with a value of 15.32p/kWh seems generous. However there is also a generation tariff which is paid at 4.32p/kWh against the entire generation.

The current value of generation and export tariffs would therefore be equivalent to 13.55p/kWh of exported electricity (being 4.91p + 2 x 4.32p).

We support the suggestion to keeping the export tariff value the same as the standard tariff for electricity. We believe this is justified and should be reviewed at the next SAP review when post-Feed in Tariff arrangements become clear.

Solar Thermal Space Heating

NB STA has separately submitted a proposal to BRE based upon using the calculation in EN 15316-4-3 as a basis for space heating and looks forward to working with the team there to assess its suitability to the UK.

Proposed Amendment 15 – Technology Costs for RdSAP

The consultation asks for evidence on Technology costs for RdSAP, used for recommended measures on the EPC.

The costs for solar water heating are broadly in line with STA's understanding of the market.

We understand that the cost of the recommended PV system depends on the size of the roof of the house, split into systems of 1.5, 2.5 and 3.5 kWp depending on the ability of the building to accommodate the array. STA recommends that the EPC recommendation makes clear what size of system it is basing the cost upon.

Here are STA's up to date costs for systems of these sizes.

System size	**1.5kWp**	**2.5kWp**	**3.5kWp**	**4kWp**
Total install cost (£)*	4,000	5,000	5,500	6,000

**agreed at PV Rooftop Working Group 18.01.2017*

Proposed Amendment 16 – Boilers and seasonal efficiency in the Product Characteristics Database (PCDB) – including RdSAP

Consultation Question

16. Do you agree with the proposal to provide a series of seasonal efficiencies for boilers on the Product Characteristics Database dependent on the controls they use and the design flow temperature of the system? Do you agree with the proposed change to the Energy Balance Validation method?

GHA Answer: Yes and yes

Proposed Amendment 17 – Heat pump default values

Consultation Question:

17. Do you agree with the proposal to amend the default values for some heat pumps based on evidence from RHPP field trials?

GHA Answer: Yes

Proposed Amendment 18 – Technology costs in RdSAP

Consultation Question

18. Do you have any evidence on the technology costs used in RdSAP?

GHA Answer: No

Proposed Amendment 19 – Heating controls

Consultation Question

19. Do you have any evidence to update the assumptions that SAP makes about heating controls?

GHA Answer: No

Costs to Business

Consultation Question:

20. Can you provide any evidence on the cost and benefits to business of revisions to SAP independent of changes to any particular set of Buildings Regulations?

GHA Answer: We can comment as follows:

1 – The costs to a business/developer or an occupant of a building overheating could be significant, therefore any improvement to the overheating risk calculation in SAP should be seen as money well spent.

2 – EPCs are not reflective of the actual costs or environmental impact of a building, a more accurate EPC rating/predicted costs again should be seen as money well spent on improving the system/process. In the near future homeowners may be scrutinising EPCs and questioning their results which could be seen as a reputational risk to Developers. Therefore any improvement to accuracy is money well spent.