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Analysis of the Solar Energy Calculation In the Draft SAP 2005 (March)

Introduction

The Standard Assessment Procedure (SAP) calculation is an important guide to house builders choosing the right balance of carbon-reducing measures. At the present time, the SAP is under revision, including a review of its calculation of the energy contribution from solar panels.

In a meeting held with solar industry representatives on March 9th 2005, it was agreed that the SAP solar calculation would be modified to include a performance measure for the solar panel. This would replace an earlier proposal for a categorisation based on the solar panel technology.

It was also decided that the annual energy yield should follow BS 5918, which showed good agreement with the results from a DTI trial (DTI, 2001).

Viridian has repeated earlier analyses for the latest draft of the SAP calculation, and these are presented below.

Agreement of SAP 2005 with Other Estimates

Viridian has developed an in-house model to predict the energy performance of solar hot water systems. It is an hour-by-hour model of a typical year, a more detailed description is given in Appendix 1.

Viridian has performed a comparison of the March draft of the SAP with:

- Viridian's in house simulation
- British Standard 5918 (based upon Kenna, 1983)
- Results from a field trial of eight solar hot water systems (DTI, 2001)
- The SAP 2001 calculation

Three scenarios have been considered, with the first being chosen to match with the orientation and water draw off used in the DTI trial.

Two commonly used types of collector were considered, using an average performance for each. The average was arrived at through the analysis of published test results of more than 200 commercially available solar collectors:

	η_0 (%)	a_1 (W/m^2K)
Flat Plate Collector	80.2	4.5
Vacuum Tube Collector	73.5	1.8

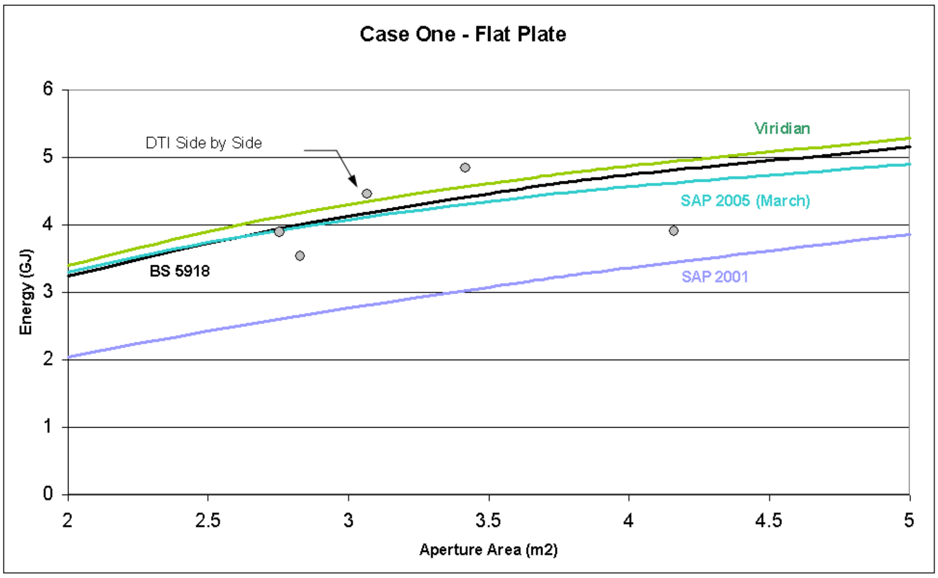
For each of the three scenarios, the annual energy generated by the solar hot water system is calculated for different areas of collector and plotted.

As a further analysis, the collector area was fixed, and the performance parameters varied, using scenario one demand patterns and orientation.

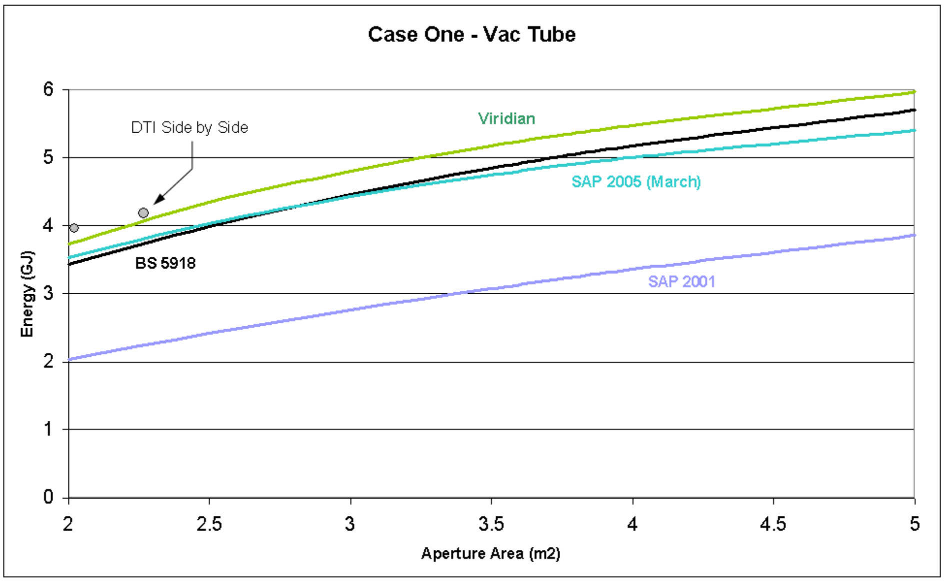
Case One

Solar Tank	150 litres, 45mm insulation	Orientation	S
Demand	9.5 GJ/year (water plus distribution loss)	Inclination	45 degrees
SAP 2005			
Floor Area	112 m^2	Daily Draw off	124l
BS 5918			
Location	London	Daily Draw off	150l
Viridian			
Model	Pre-heat tank	Daily Draw off	150l at 55C After Kenna (1983)

Flat Plate



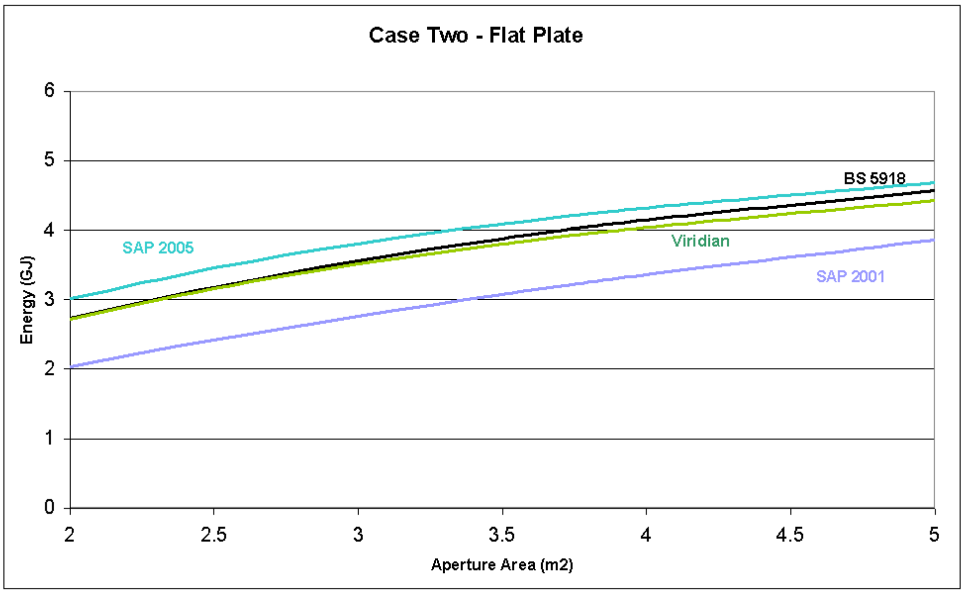
Evacuated Tube



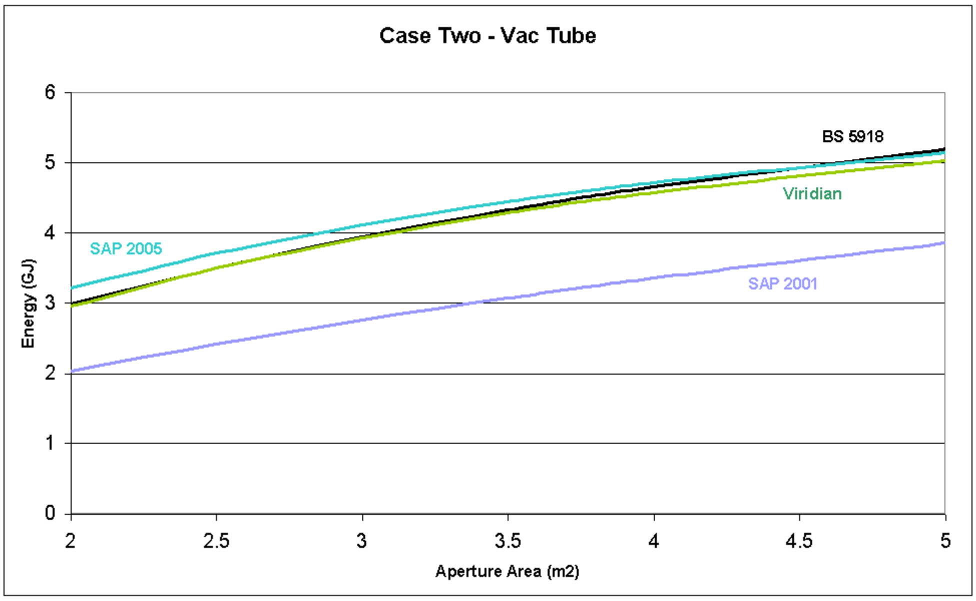
Case Two

Solar Tank	150 litres, 45mm insulation	Orientation	W
Demand	9.5 GJ/year (water plus distribution loss)	Inclination	30 degrees
SAP 2005			
Floor Area	112 m^2	Daily Draw off	124l
BS 5918			
Location	London	Daily Draw off	150l
Viridian			
Model	Pre-heat tank	Daily Draw off	150l at 55C After Kenna (1983)

Flat Plate



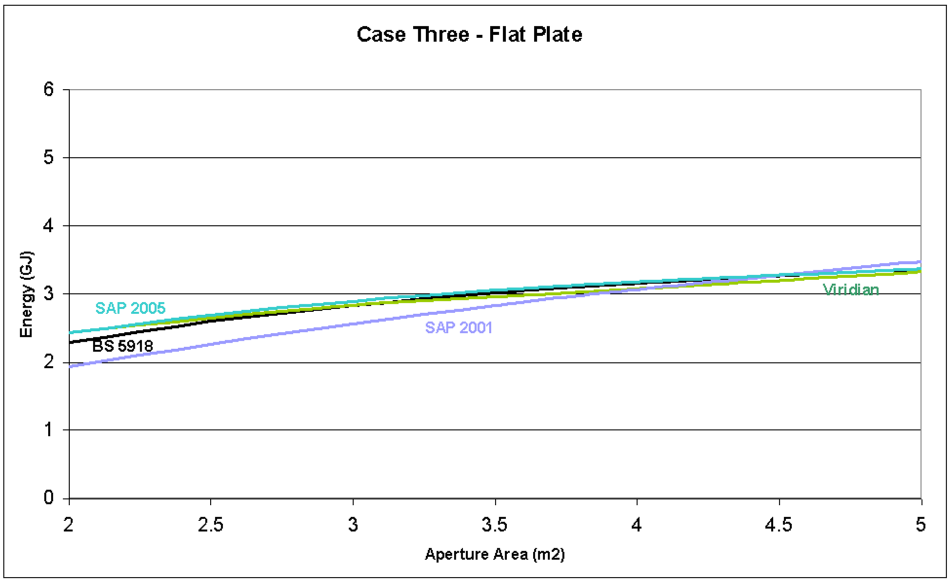
Evacuated Tube



Case Three

Solar Tank	40 litres, 45mm insulation	Orientation	S
Demand	7.5 GJ/year (water plus distribution loss)	Inclination	45 degrees
SAP 2005			
Floor Area	75 m^2	Daily Draw off	116l
BS 5918			
Location	London	Daily Draw off	119l
Viridian			
Model	Pre-heat tank	Daily Draw off	119l at 55C After Kenna (1983)

Flat Plate



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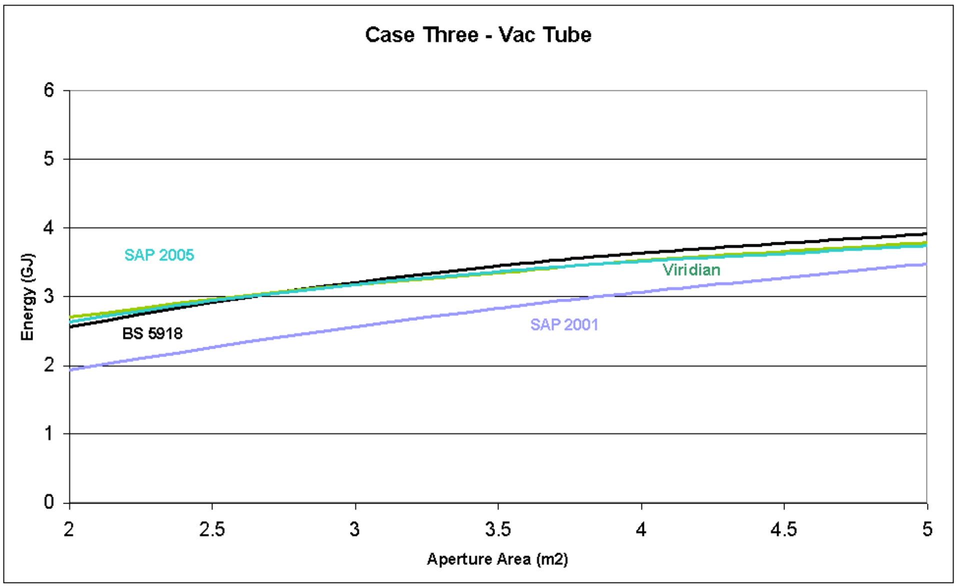
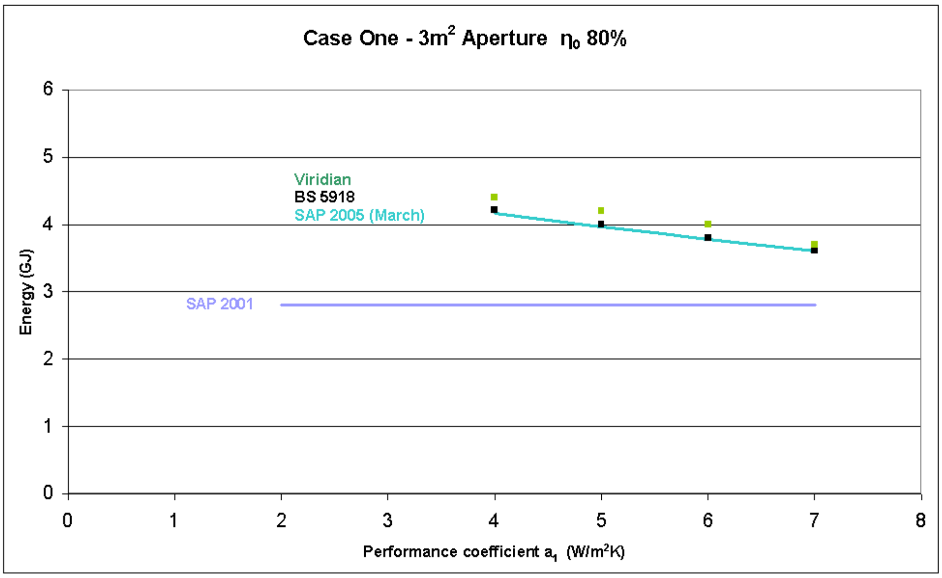


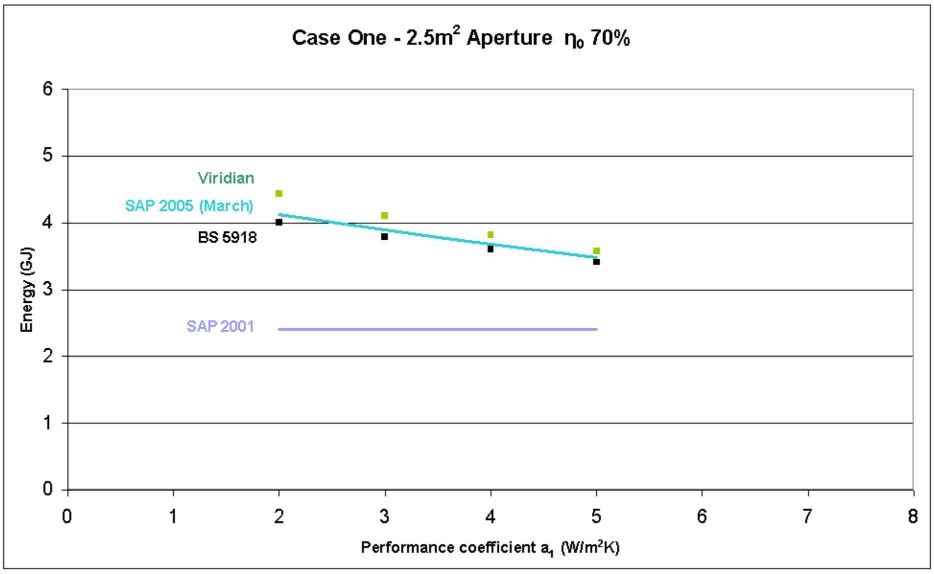
Variation of Performance Characteristic (Based on Case One)

Solar Tank	150 litres, 45mm insulation	Orientation	S
Demand	9.5 GJ/year (water plus distribution loss)	Inclination	45 degrees
SAP 2005			
Floor Area	112 m^2	Daily Draw off	124l
BS 5918			
Location	London	Daily Draw off	150l
Viridian			
Model	Pre-heat tank	Daily Draw off	150l at 55C After Kenna (1983)

Representative of Flat Plate



Representative of Evacuated Tube



Conclusion

The plots demonstrate that the new draft of the SAP is in excellent agreement with both BS 5918 and Viridian's in house simulation across a wide range of parameters. Case One shows good agreement with real data from systems tested on behalf of the DTI.

The new solar calculation is an immense improvement over the 2001 method. The UK solar thermal industry should welcome the SAP 2005 for providing a more realistic assessment of the contribution that solar panels can make to the energy performance of dwellings, without adding unduly to the complexity of the calculation.

References

Kenna, J.P. *A Parametric Study of Open Loop Solar Heating Systems I*, Solar Energy Vol 32, pp.687-705. 1984

DTI *Side by Side Testing of Eight Solar Water Heating Systems*, ETSU S/P3/00275/REP/2, 2001

FOR FURTHER INFORMATION

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