Consultation Paper: CONSP:17

Treatment of PV diverters

Issue 1.0

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1. INTRODUCTION

This paper considers how a new class of products usually known as ‘PV diverters’ could be treated in SAP.

SAP 2012 assumes that electricity generated by PV which is not used within the dwelling at the time of generation will be exported to the electricity grid. The exported energy is assumed to be useful to someone else on the electricity network, thereby reducing CO2 emissions to the same extent as if it had been used in the original dwelling. A Feed In Tariff (FIT) payment is made to the householder on the assumption that 50% of electricity generated according to SAP will be exported.

However, a new type of device is now being sold and appears to be gaining popularity[i] which avoids exporting any power to the grid by diverting any surplus electricity generated to an electric immersion heater in the dwelling’s hot water cylinder. By heating the cylinder, assuming the water temperature is thermostatically controlled, this will reduce the need for heat from the usual water heating device (e.g. a boiler), reducing fuel use.

This makes sense from the perspective of the householder because they are paid a flat rate for the amount of electricity deemed to be exported, regardless of whether they do in fact export any. Thus electricity diverted in this way provides them with a financial gain. However, since the dominant water heating fuel in the UK is gas, offsetting a unit of water heating fuel in the dwelling, rather than offsetting a unit of electricity in someone else’s dwelling, has a less beneficial outcome for the UK CO2 emissions because the CO2 intensity of electricity is more than double that of gas.

The remainder of this paper proposes some simple adjustments to SAP to account for the adjusted energy flows associated with the use of use of PV diverters.

[i] We have not found any sales data, so this is largely anecdotal. However, there are several companies making and selling devices.

2. PROPOSED AMENDMENTS

2.1 Identification

Firstly it must be established by the SAP assessor whether a PV diverter is used within the dwelling. This should be easy to establish in assessments of new dwellings, but Domestic Energy Assessors assessing existing homes will need to find and identify them. Different types of units are available, but all need to monitor power use via a physical device at the point of the electricity meter (a 'clamp' around one of the meter tails measuring current). This means that there should always be evidence of their existence at the location of the electricity meter. There will also need to be a physical link to the immersion heater so it is likely a controller unit will be present at the location of the cylinder. With the help of guidance issued by their accreditation scheme it is therefore reasonable to expect assessors to be able to identify PV diverters. And of course this will only be necessary where PV is present.

In future, if PV diverters become well-established, it may be worth adding them as a category in the Product Characteristics Database requiring that they are suitably labelled to improve accurate identification.

Having established the presence of a PV diverter, adjustments to the calculation can then be applied as discussed below.

2.2 Calculation adjustments

2.2.1 Delivered energy consumption

It is likely that not all of the PV energy diverted to the hot water cylinder will be 'useful' for two reasons:

- It may be provided when the water in the cylinder is already at the required temperature, leading to over-heating of the water, which would not otherwise have taken place.
- Some will be provided at a time of day that is not when the household would normally choose to heat their water, increasing the average time between when the water is heated and when it is used, leading to greater system losses.

However, it is likely that a significant proportion of the extra heat provided to the cylinder will offset energy which would otherwise have to be generated by the main water heating system, thus reducing fuel use. The level of utilisation is very difficult to estimate in the absence of field data. Provisionally, it is proposed apply to the diverted electricity an estimate of the utilisation factor of 0.9 (i.e. assuming 90% the energy diverted is useful). The resulting energy figure would then be subtracted from the energy required for water heating. However, data from field trials would be needed before we could have much confidence in this level of utilisation.

Where a PV diverter is present:

Contribution of PV diverter to water heating = (1-β) * 0.9 * PV generation

where β is the fraction used within the dwelling for normal electricity using activities, currently defined as 50% in SAP 2012.

An extra line will have to be added to the SAP procedure for calculating the water heating requirement, subtracting the contribution made by the PV diverter.

Appendix M, section M1, item 3, will also need to be reworded such that, if a PV diverter is used:

Net PV generation [for box (233)] = (β x gross PV generation),

2.2.2 Fuel costs and CO2 emissions

By correctly accounting for the delivered energy consumption, as described above, the reduction in fuel costs and the increase in CO2 emissions will be calculated correctly without any need for changes to the existing procedures.

3. IMPACT OF PROPOSED CHANGES

The reduced water heating energy consumption due to a PV diverter being used will result in a reduction in the use of fuel by the main water heating system, giving lower predicted running costs. However, the reduction in the amount of electricity generated for export will often lead to a comparative increase in CO2 emissions. Thus a PV diverter will have a positive effect on the SAP rating, but a negative effect on DER and Environmental Impact rating.

The financial benefits of this product are based on the current FIT payment system, whereby payment is made to the household based on a deemed level of exported electricity. If this were to change such that the amount of electricity exported was metered[ii], or if a rule were to be introduced stating that the payment would be reduced or removed in the case of a PV diverter being used, the cost saving benefit could diminish or cease to exist. At that point the SAP procedure would need to be adjusted to reflect this.

4. CONCLUSIONS AND RECOMMENDATIONS

- PV diverters are already being used in UK homes and, anecdotally, appear to be gaining in popularity.
- It should be relatively easy for SAP assessors to identify them because of the physical connection required to the electricity meter.
- Their use has a significant impact on the benefits of PV generated electricity (some positive, some negative)

Giver the above, it would be possible to make the relatively simple changes to SAP required to correctly account for the adjusted energy flow, subject to the provision of field data to support the choice of a utilisation factor for the diverted energy. However, any significant changes to the FIT with respect to the flat rate payment system will need to be reflected in any future updates.

[ii] It is possible this will be one result of the roll out of ‘smart meters’.