# Choosing a Domestic Micro-Generation Energy Management System

Around half of the energy generated by solar PV systems is exported to the grid; this is energy which could be worth £225 per year at today's prices. With the lower feed-in tariffs now on offer, the additional energy and cost savings obtained from installing a micro-generation energy management system are significant and could boost the overall return from a 4KW PV system by over 20%.

Energy management systems can be retrofitted to existing solar PV installations or provided with new installations but to get the most from such a system it is important to choose a product using effective monitoring and control techniques.

The only practical way to recover as many of those valuable export units as possible is by using an active energy management system. Such a system will accurately monitor micro-generation energy production together with household energy demand and then ensure that any excess energy that would have been exported is put to some useful purpose or stored for later use. Since every home requires hot water, and hot water stores energy, it makes a lot of sense to use the surplus energy to produce hot water. An *active energy management system* will capture surplus energy as it is generated which then stays stored in the form of hot water until we are ready to use it.

There are a number of systems on the market which claim to be able to utilise surplus energy from PV systems for water heating but it is important to be aware that unless such systems use the correct monitoring and control techniques their effectiveness will range from very minimal to actually importing energy during the day to produce hot water.

Some of the currently available energy management systems and their limitations are described below.

**Generated energy threshold switching systems.**

These systems are designed to switch on one or more appliances when the power generated reaches a certain threshold, however because they only take account of the power being generated and not the power demand from other appliances, this can frequently result in importing power rather than using locally generated power.

**Immersion heater switching systems.**

These systems do typically take account of household power demand as well as power generated and are able to turn on a water immersion heater when sufficient surplus power is available. However standard immersion heaters draw 3KW and therefore the PV system will need to be generating about 3.5KW, allowing for the house base load, before sufficient surplus power is available to run the immersion heater. The problem with this approach is that even with a 4KW PV installation the amount of time during the year when output power is at or above this level is only around 1-2% of the time, resulting in only a few percent of exported power units being recovered in practice.

**Average variable power immersion control systems.**

To overcome the above problems with simply switching the heating load on or off, a variable power system is used to control the amount of power going to the load so that it closely matches the available surplus power available from the inverter. By doing this it is not necessary to wait until 3KW or more surplus power is available.

**The Apollo GEM system is a true variable power system.**

In order to obtain the full benefits of a variable power system which can utilise the maximum amount of surplus power from the PV system whilst ensuring that no power is ever imported for water heating, a true variable power system such as the **Apollo GEM** must be used.

The Apollo GEM will adjust the power level delivered to the hot water store every 2 seconds to ensure that the power delivered exactly equals the surplus power available from the inverter and that no power is imported for water heating.

The Apollo GEM can also continuously display the actual power being imported or exported as well as the power being sent to the heating element and the hot water temperature.

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