More efficient devices on solar cells due to energy matching

December 7 2006

Many wireless devices currently work on solar energy (photovoltaic = PV). Often the choice for PV cells seems merely to be based on the green image. Yet this technology can be used far more effectively if the elements from the energy chain are energetically matched in a more intelligent manner. Energy matching is the key word here, says Dutch researcher Sioe Yao Kan.

Kan limited his research to the PV cells and the energy storage media. In other words: the batteries and condensers in which the solar energy is stored. He developed the so-called ‘Figure of Matching’ algorithm to analyse and quantify the matching between these elements from the 'energy chain' at the interfaces between the elements.

In an 'interface' it is, for example, possible to match the interaction between a light source and a PV cell. With Kan's algorithm the best combination can be sought between the light source and the solar cell or the solar cell and the battery. For example a device that is only used indoors needs a different type of PV cell than one that is used outdoors in bright sunlight. In addition with correct energy matching devices can store more energy and the stored energy can be used more efficiently.

Thanks to Kan's research, industrial designers who want to produce wireless consumer products with solar cells, now have a better insight into how they can match different components from the energy chain for the best energetic result. In his PhD thesis Kan has stated the conditions under which they can apply his newly-developed Energy Matching

Model and the associated Figure of Matching when designing PV-powered products. With this he has provided the basis for design improvements of PV products and for design rules for sustainable PV-based product development. Consumers will benefit from this because the products they buy will work more efficiently and be better suited to their use.

Kan tested several PV-powered devices such as PV chargers and PDAs. His tests involved the use of simulations generated by the specially-developed computer program PowerQuest. The program calculates the PV capacity necessary for the use of specific devices. It can also do the opposite, namely, if the energy demand is known it can calculate the PV surface required. The program is now being made suitable for use by designers.

The doctoral research 'Energy Matching: Key towards the design of Sustainable PV powered products' was part of the programme Syn-Energy funded by the NWO/SenterNovem Stimulation Programme Energy research.

Source: NWO