

via a cable and plugged to the permanently mounted solar generator for charging. In the evening it can be used as a portable light inside or outside the dwelling and can be carried and positioned wherever it is most needed. A solar generator with 4 W_p (module size 20 × 20 cm²) is sufficient for a daily lighting period of 3 to 5.5 h (depending on the solar radiation). At the same time, the solar-powered light with a luminous flux of about 80 lm is three times as bright as a petroleum lamp.

17.2.1.4 Solar home systems

The designation “Solar Home System” has become a well-defined concept [6–8]. A 50-W photovoltaic module (size about 50 × 100 cm²) typically supplies power for three lamps and a black-and-white television set in a single household (Figures 17.6 and 17.7). A lead-acid battery with a charge controller stores the energy from the day for the night and can run alone for two to three overcast days. Depending on the size of the local market, customs duties, taxes and the share of locally manufactured components, the cost of a Solar Home System is between US\$500 and US\$1500.

In many situations, Solar Home Systems (SHS) offer cost advantages over the classic alternative for electrification, which is the extension of electricity grids into sparsely populated regions and connection of power lines to all rural households [9]. The World Bank assesses the average cost worldwide of grid extension to be US\$900 per household. In unfavourable cases, with long distances, difficult terrain and low population density, a power line for one household can cost many tens of thousands of dollars.

The investment needed for this cannot be financed via the low energy consumption of rural households, which ranges between fractions of kilowatt hours and a few kilowatt hours per day. Political decisions to electrify rural areas despite this imbalance have contributed to electricity utilities going into debt in developing and threshold countries, so that necessary investments to modernise distribution grids and power stations cannot be financed. The result is the poor quality of the electric power supply, which can be observed in many regions around the world. Increased privatisation of the power supply is intended to provide a remedy to the described situation [10, 11].

The situation described above is the main reason small diesel generators in the power range of some kilowatts are installed in many remote locations. Because of their low investment costs, they appear economically attractive. However, calculating the lifetime costs shows that the expenses for repair and maintenance of the motor generator and the fuel costs add up to considerably high costs, leading to a situation in which photovoltaics are very often cost-competitive.

Decentralised electrification with privately financed Solar Home Systems fits in perfectly with the aim of sustainable and cost-effective rural electrification. Light that allows information and communication for private users and that lengthens the working time into the evening in farms and shops, schools and community centres cannot be underestimated in its importance. It is therefore actively supported by the energy planning authorities of various countries and by multilateral organisations such as the World Bank [12].