A significant disadvantage of combustion motors is their need for regular maintenance. Car manufacturers recommend for diesel motors a change of the lubricant at least every 10 000 km. If we assume an average speed of 50 km/h, this means that after 200 h of operation a complete service is necessary. Keeping in mind that a back-up generator in a stand-alone system is working in optimised systems at least for 2 h and in conventional systems for about 6 to 8 h a day, this means that in optimised systems every 3 months and in conventional systems every 30 days a complete maintenance service has to be calculated. Together with the high costs for fuel transport, this is the main reason for the low attractiveness of combustion motors in off-grid electrification.

17.3.5 System Sizing

In addition to the quality of the system components and the construction of the system, the sizing of the solar generator and the storage battery plays an important role in the operating reliability of a photovoltaic power supply. The dimensions of the solar generator and the storage battery determine what proportion of the consumer's energy demand can be met by the photovoltaically generated electricity. A photovoltaic system should be sized in accordance with the other planning steps:

1. Determination of the energy demand and optimisation of the consumption: This step includes determining the energy demand of the intended consumers as exactly as possible and investigating possibilities for saving energy by reducing the power consumption of the appliances or systems used.
2. Development of the concept: Setting the voltage level (in many cases this is determined by the user) and thus the type of photovoltaic system (DC, AC, combined DC and AC, grid-connected, stand-alone, with or without a back-up generator).
3. Choice and dimensioning of the system components for power conditioning: Converters to match the power generation and consumption sides are chosen according to the system type. The efficiency values of these components often have a decisive influence on the system energy balance and thus must be taken into account when sizing (step 4). This applies particularly to inverters used to supply power to conventional 230-V appliances.
4. Sizing the solar generator and the storage battery.
5. Dimensioning the solar charge controller.
6. Dimensioning the cables: The voltage drops occurring in cables should not be ignored, particularly in larger systems operating at a low voltage level.

It may be necessary to iterate steps 1 to 4 several times. For example, the result obtained in the sizing step 4 may demand a further reduction in consumption or a change in the system concept (e.g. incorporation of an additional generator), for various reasons (insufficient area for the solar generator, system cost etc.).

Generally, several variants are considered during the planning stage, which differ in aspects such as supply reliability, cost, maintenance demand and electrical and structural configuration. The priority given to each aspect depends on the particular application intended for the photovoltaic power supply. For a system that is required to