engineering practice, and mainly good for academic discussion; and why the actual use of PV-sizing methodologies is mainly aimed at giving a pseudo-scientific appearance to commercial activities. Our own experiences at IES-UPM contain several cases of perplexed PV clients requesting our opinion on the big PV-system sizing differences among different PV contractor estimates that they have received for a given location and application. Obviously, simplistic relations like equation (20.86) do not help the PV professional to adopt rigorous sizing procedures. However, we still believe such rigorous procedures should play an important role in future. This is because a professional's credibility benefits from reliability quantification (the use of the Mean Time Between Failures concept in the conventional electricity sector is a good example of this); and also because the usefulness of such methods extends beyond pure sizing problems. Additional comments are given in the following section.

It must be mentioned that in the common case of PV arrays directly coupled to batteries, that is without maximum power-tracking devices, energy balance analysis can be done by means of simple ampere balances, initially supposing that the working voltage is always the nominal one, V_{NOM}, at which it equals the maximum power point voltage of the generator. Therefore,

$$L = V_{NOM} \cdot Q_L \text{ and } \eta_G \cdot A_G = \frac{V_{NOM} \cdot I_M^*}{G^*} \tag{20.87}$$

which leads to

$$C_A = \frac{I_M^* \cdot G_{dm}(\beta, \alpha)}{Q_L \cdot G^*} \text{ and } C_S = \frac{Q_B}{Q_L} \tag{20.88}$$

where Q_L is the amount of charge (expressed in ampere-hours) drawn daily by the load, that characterises the required PV array, and Q_B is the useful ampere-hour capacity of the battery, which is equal to the product of the nominal capacity by the maximum depth of discharge. This approximation, in spite of appearing oversimplified, gives very good results and simplifies the task of deducing the number of PV modules to be installed.

20.12 THE CASE OF SOLAR HOME SYSTEMS

Global market indicators [81, 82] lead to the estimate that about 1.3 million home systems for lighting, radio and television are currently in operation, totalling 40 MWp, and large rural electrification programmes comprising some thousands of SHSs are increasingly becoming a part of the rural market. Thus, SHS represent the most widespread PV application nowadays, and the trend is likely to continue.

Standardisation of equipment and its mass production represent efficient ways to obtain low prices and high technical quality. In consequence, SHS designers have to fix a single "standard" value of energy consumption for a large number of different families. It must be noted that such standardisation is a requirement imposed by the technology itself in order to reduce cost and guarantee quality, but it does not correspond well with the idea of needs at the individual level. PV history shows some interesting cases [83, 84]. For example, in Reference [83] it is stated that "... *an interesting aspect,*