where N is the number of days for which the simulation is carried out, and E_{LACK} is the daily energy deficit, given by

$$E_{\mathrm{LACK}}j = \max\left\{\frac{1}{C_{\mathrm{S}}} - SOC_j; 0\right\} \tag{20.83}$$

This equation implies that an energy deficit occurs only when the stored energy at the end of the day $SOC_j \cdot C_{\mathrm{S}} \cdot L$ does not suffice to cover the daily load L. Note that $SOC_j \cdot C_{\mathrm{S}} \cdot L < L \Rightarrow (1/C_{\mathrm{S}} - SOC_j) > 0$.

Because information on the daily irradiation used to be expressed in terms of mean monthly values, a different value of C_{A} may be worked out for each month. In what follows, we shall use for C_{A} just the value corresponding to the worst month. Thus,

$$\overline{G_{\mathrm{d}}} = \min\{G_{\mathrm{dm}}(\beta, \alpha)\}; (\mathrm{m} = 1, \ldots, 12) \tag{20.84}$$

Computed results can be arranged and presented graphically. Figure 20.23 presents some examples of the so-called “reliability maps”.

The shape of such curves prompts the thought that it should be possible to describe them in an analytical form. Several attempts at proposing analytical methods based on this idea have been made [64, 70–76] allowing sizing of PV systems by means of straightforward, simple calculations. For example, at the IES-UPM we have concluded [76] that all these curves conform to the relationship

$$C_{\mathrm{A}} = f \cdot C_{\mathrm{S}}^{-u} \tag{20.85}$$

where f and u are two parameters that depend on the value of LLP and on the location. These parameters do not have particular physical meaning, and their determination previously requires a lot of simulations to be carried out. However, they allow a large number of simulated results to be condensed into just a few sizing parameters. Advanced simulation software tools have also been developed and are being marketed today [42, 43].

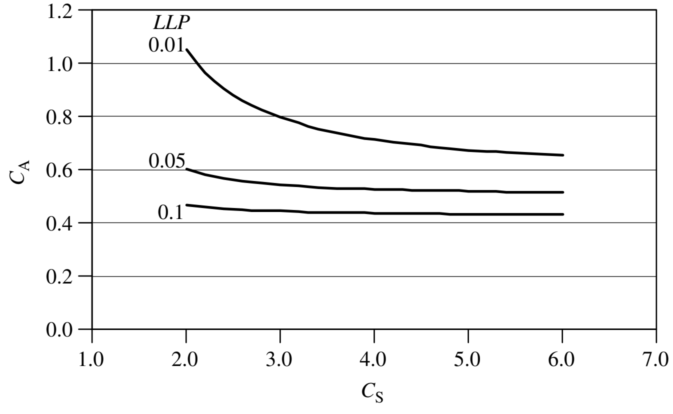

Figure 20.23 Reliability maps: Generator capacity C_{A} versus storage capacity C_{S} with the reliability LLP as parameter