



**Figure 1.14** Calculated breakdown of costs of the construction of a PV central plant based on two anticipated technologies. Above, CIS flat module cells; below, Fresnel lens concentrator with Si cells operating at 500 suns. (Data from Whisnant *et al.* in Chapter 21)

We present in Figure 1.15 a calculation of costs of different types of modules in an advanced manufacturing process calculated with the same procedure. Again, the origin of this is Chapter 21, devoted to cost calculations. Although cost calculations for the  $\text{Cu(InGa)Se}_2$  technology is not available, their costs are not expected to be too different to those of a-Si. Indeed, the cost model in Chapter 21 includes many more parameters and assumptions and the results depend on such choices. Nevertheless, according to the model, the common c-Si Cz module (with efficiency of about 14 to 15%) is clearly more expensive than any one of the other options (provided they have a minimal efficiency of 5 to 7%). Dendritic web technology refers to one form of Si ribbon technology that is starting to find a place in the market.

Using again the cost model in Chapter 21 we can calculate the cost of the electricity generated. Table 1.4 shows the difference of electric output of the two equally rated plants.<sup>2</sup> Obviously, the yearly efficiency (referred to as the *module aperture area*) is different. Furthermore, they both present different capacity factors as defined by the ratio of the produced energy (in kWh or MWh) to the rated power (in kWp or MWp) times the total number of hours in a year ( $365 \times 24$ ). To calculate the electricity cost (in \$/kWh), one term is the financial cost of all the expenditures and another much smaller one is the operation and maintenance costs (very small as stated at the beginning). The price per kWh must be compared to the typical average price of \$0.05/kWh for conventional

<sup>2</sup> Figure 1.15 and Table 1.4 present cost data scaled to 1985 or 1990 equivalent dollars, as does discussion and results in Chapter 21. Although quantitatively “out of date”, they are still quite useful for relative comparison.