annual volume of the final product and the workstation characteristics. The workstation is characterized by the nominal operating parameters of one of its machines, which are defined as long-term average values. The quantity of work done at each workstation is determined by the model from a process balance using as inputs the total annual product volume from the last workstation, and individual machine parameters including

- form conversion factor (input/output units),
- yield (number of good units out per unit time/ideal production rate),
- machine ideal production rate,
- machine availability.

The quantity of required materials is determined from the workstation-level, per-product-unit consumption factors and the workstation product quantity, and the quantity of labor of specified types is determined from per-machine labor requirements. Total materials, labor, utilities, and floor-space requirements are summed for the firm, and their costs are calculated using these quantities and unit costs input to a cost catalog. Unit costs of process equipment and facilities are used to compute the capital investment for the plant.

Using the calculated production costs, the model produces a corporate income statement and balance sheet. These reports are based on accepted accounting procedures. The income statement provides the revenue to calculate the product cost. The data in both reports can be compared to the data for typical real businesses to assess the appropriateness of the modeling from a business point of view. On the manufacturing side, reports are provided that summarize the equipment, labor, materials, floor space, and utilities required in terms of both quantity and cost. Also reported are personnel and associated costs for administrative functions. The result is a complete picture of all aspects of the cost structure underlying the required product price. In the subsequent section, outputs from the model are shown to illustrate an economic assessment of a PV power plant.

Step 5: annual energy production. Within the assessment framework of Figure 21.2, the annual energy production for the system will be calculated from local solar data and the performance parameters of the system (as described elsewhere). For a private user, the energy considered here is the *useful* energy; that is, the energy actually consumed by the load plus any energy sold back to a utility. For a utility, all of the energy produced is useful.

Step 6: levelized energy cost (LEC). LEC is defined in equation (21.14) as a constant annual cost ($/kWh) over a specified period of years whose present worth is the same as that of the cost stream associated with its production. The cost stream was defined in equation (21.9). LEC incorporates the cost of capital and the annual energy production. LEC is typically computed by utilities, but could also be used by private PV system owners.

Step 7: economic assessment. The final step in this assessment methodology is to decide if the value of the economic measure computed is an acceptable value when compared to an economic criterion. Where LEC is the economic measure, it is compared with the cost of electricity (LEC′) from other sources calculated in the same manner. For a private user, the comparison value might be that of electricity from, for example, a diesel-electric generator or a fuel cell. For a utility, this comparison may entail the consideration of the