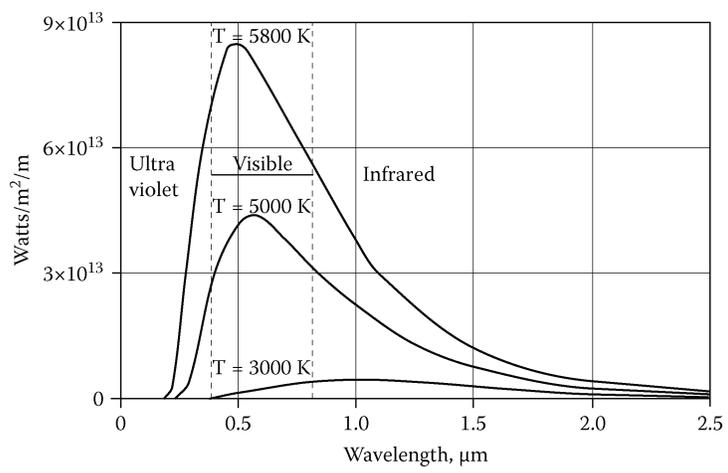


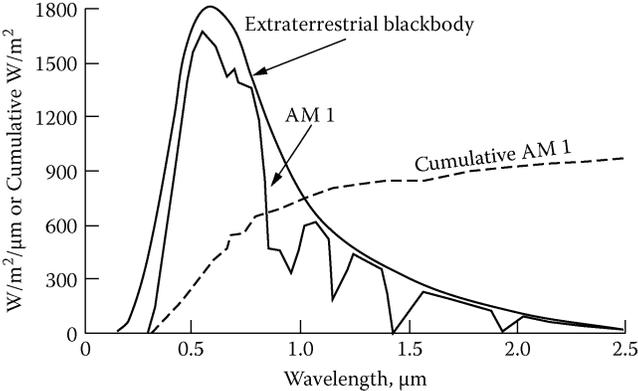
**FIGURE 2.1**

Blackbody radiation spectra for temperatures of 3000, 5000, and 5800 K.



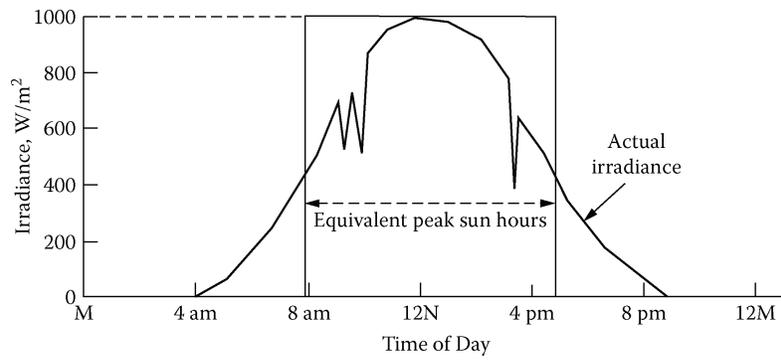
**FIGURE 2.2**

AM 1 solar spectrum after atmospheric absorption effects, including plots of extraterrestrial blackbody spectrum plus cumulative incident energy versus wavelength.



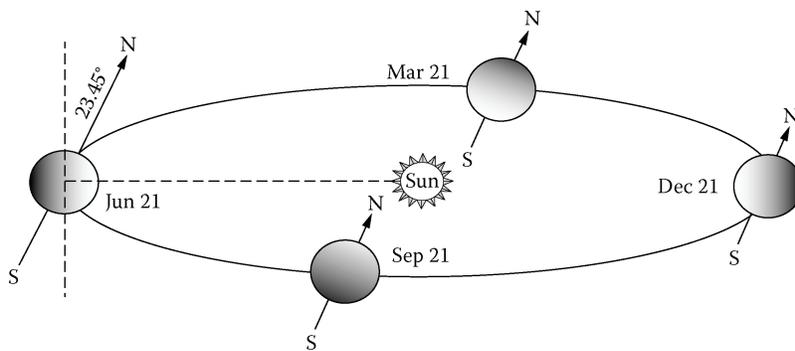
**FIGURE 2.3**

Determination of peak sun hours (irradiation) through integration of irradiance.



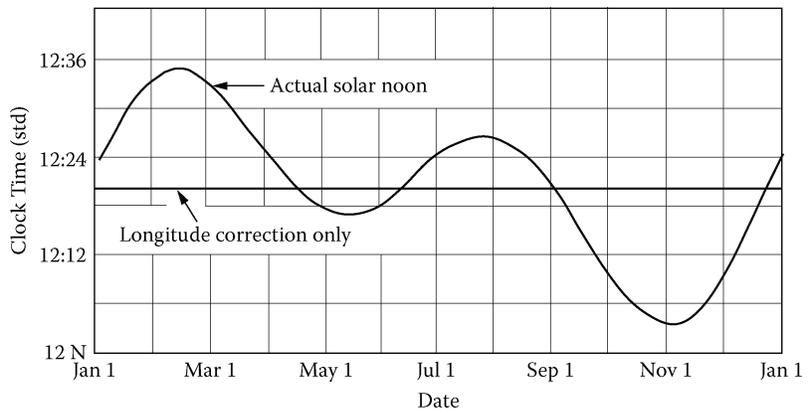
**FIGURE 2.4**

The orbit of the earth and the declination at different times of the year.



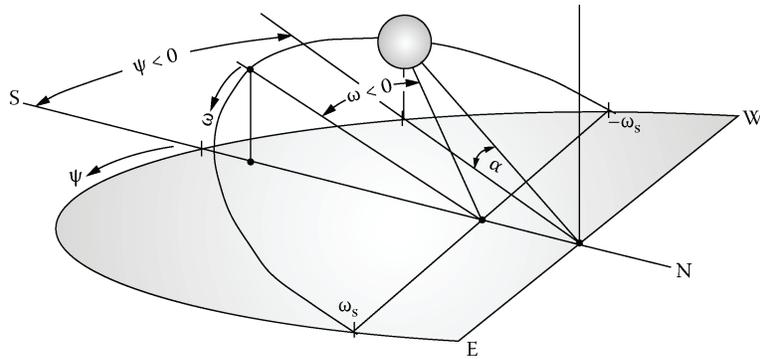
**FIGURE 2.5**

Daily variation of solar noon versus clock time in Boca Raton, Florida.



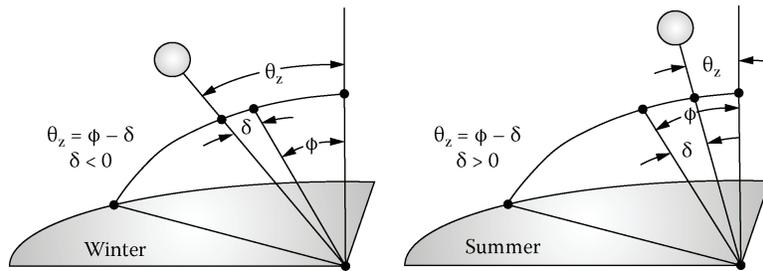
**FIGURE 2.6**

Sun angles, showing altitude, azimuth, and hour angle.



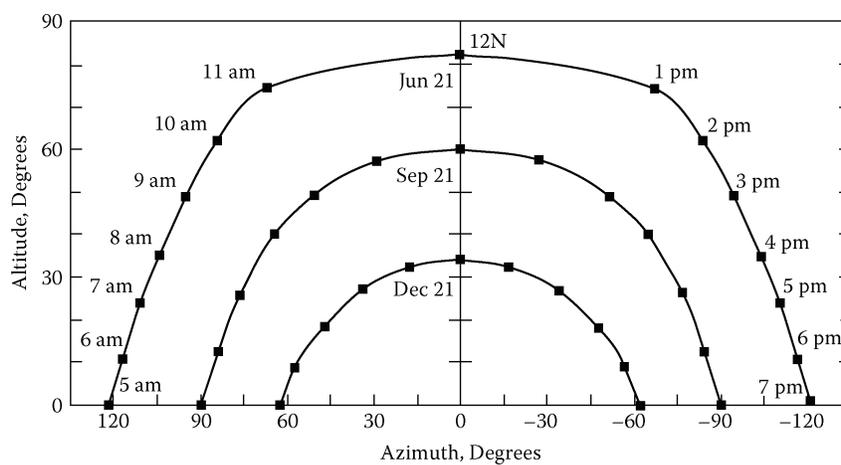
**FIGURE 2.7**

Relationships among zenith angle, latitude, and declination at solar noon in winter and summer.



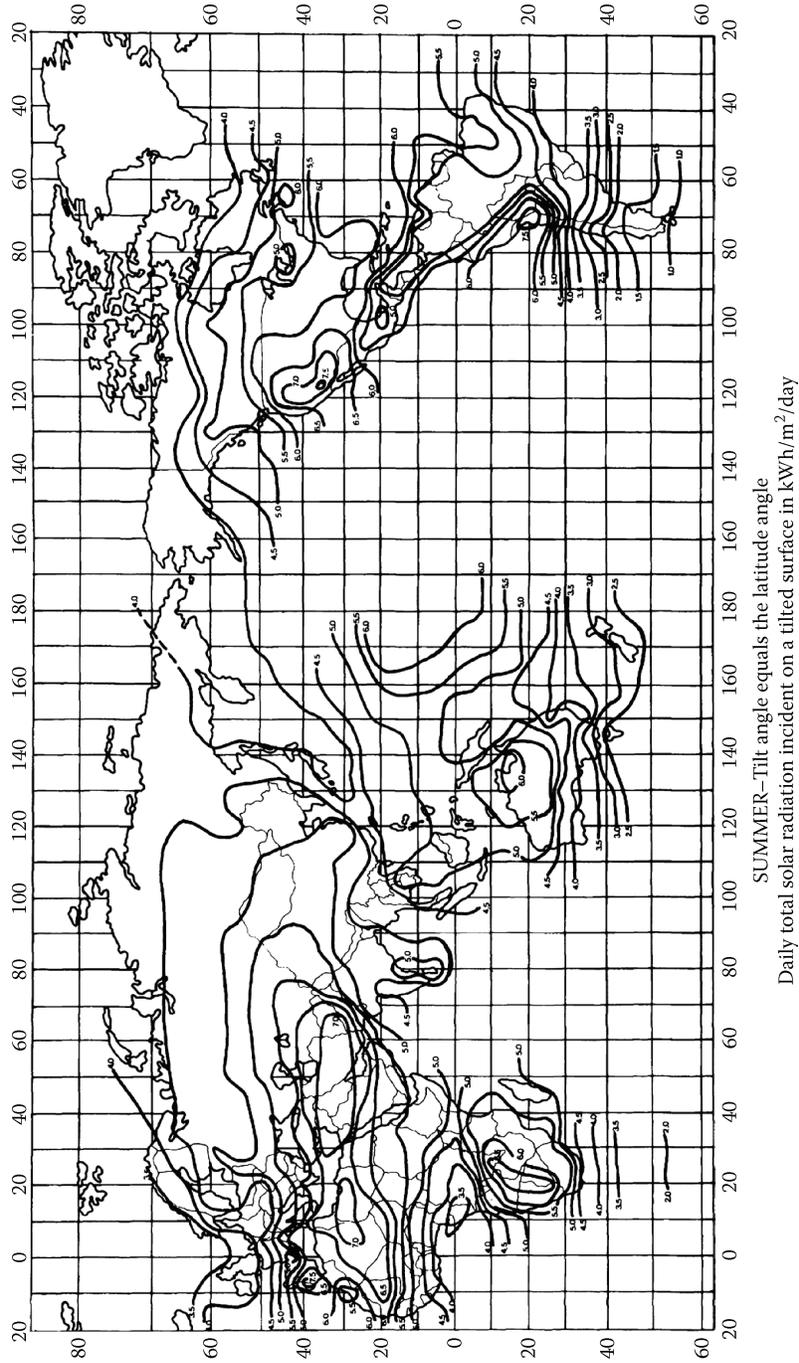
**FIGURE 2.8**

Plot of solar altitude versus azimuth for different months of the year at a latitude of 30° N.



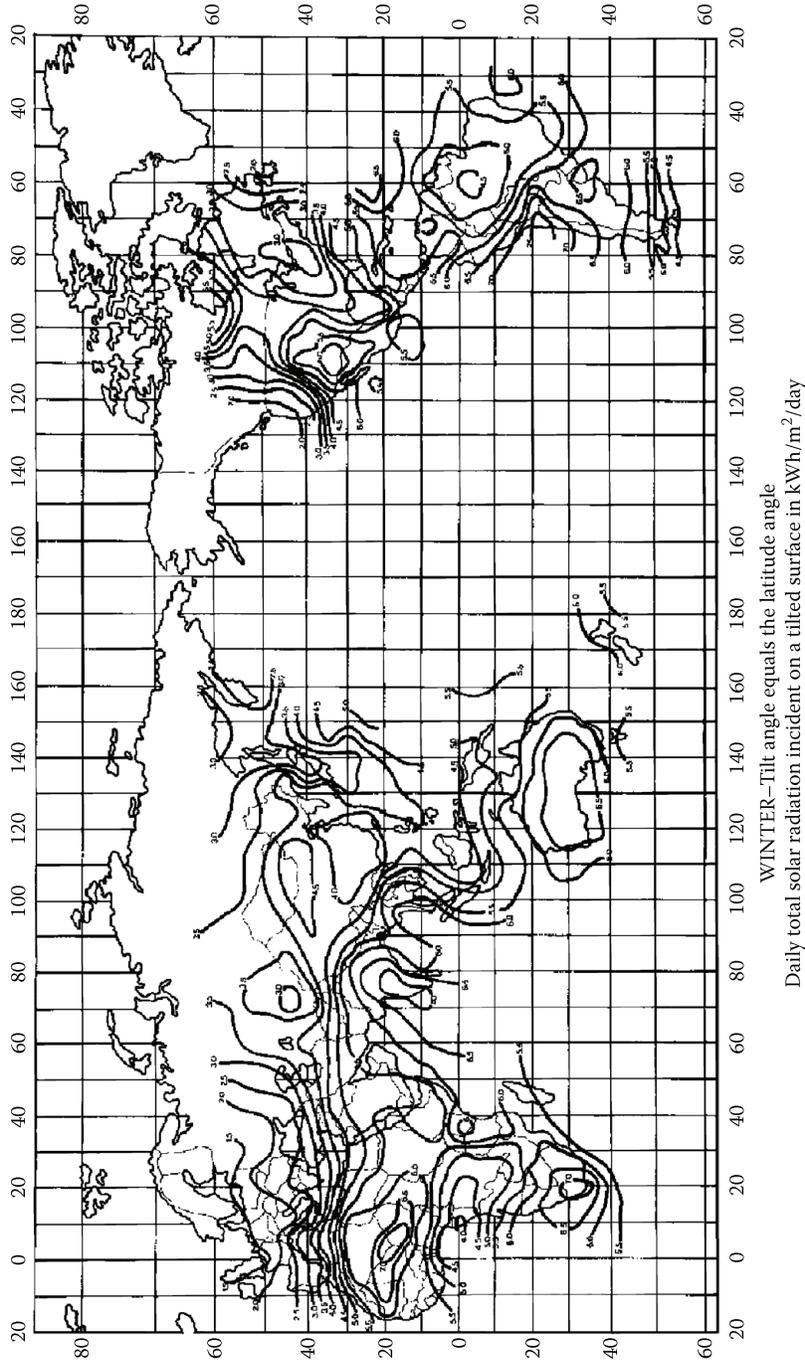
**FIGURE 2.9a**

Worldwide average daily irradiation ( $\text{kWh/m}^2$ ) for summer. (Courtesy National Renewable Energy Laboratory, 30-Year Average of Monthly Solar Radiation, 1961–1990, Spreadsheet Portable Data Files. [http://rredc.nrel.gov/solar/old\\_data/nsrdb/redbook/sum2/](http://rredc.nrel.gov/solar/old_data/nsrdb/redbook/sum2/) )



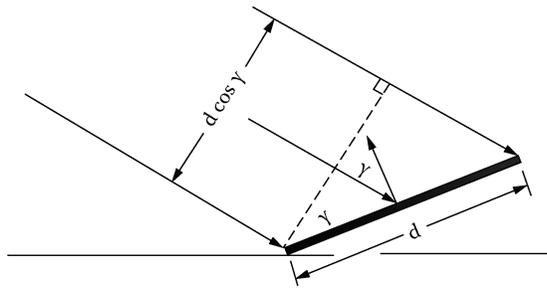
**FIGURE 2.9b**

Worldwide average daily irradiation ( $\text{kWh}/\text{m}^2$ ) for winter. (Courtesy National Renewable Energy Laboratory, 30-Year Average of Monthly Solar Radiation, 1961–1990, Spreadsheet Portable Data Files. [http://rredc.nrel.gov/solar/old\\_data/nsrdb/redbook/sum2/](http://rredc.nrel.gov/solar/old_data/nsrdb/redbook/sum2/))



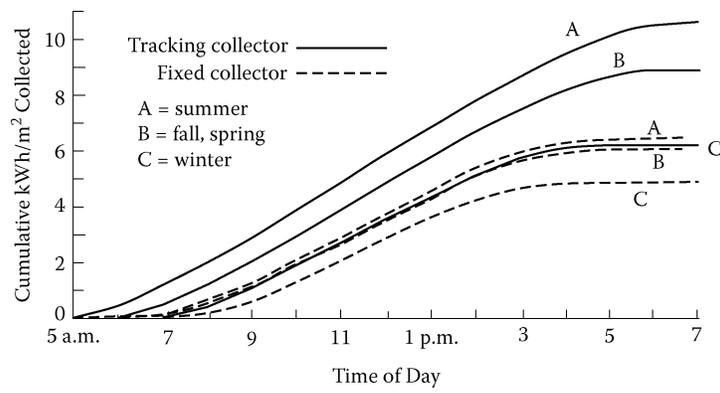
**FIGURE 2.10**

Two-dimensional illustration of effect of collector tilt on effective area presented to beam component of radiation.



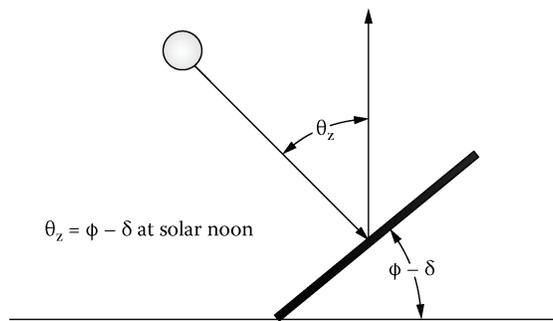
**FIGURE 2.11**

Cumulative daily irradiation received by fixed and tracking collectors for different seasons: direct beam contribution only.



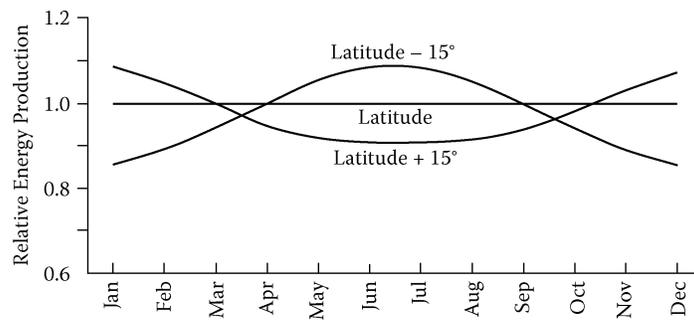
**FIGURE 2.12**

Optimizing the mounting angle of a fixed collector.



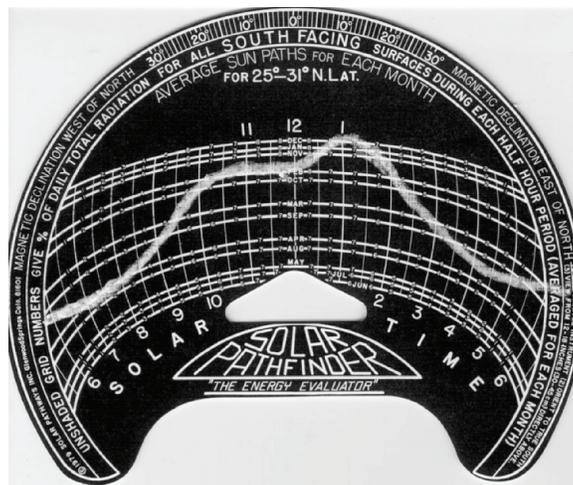
**FIGURE 2.13**

Monthly collector performance as a function of collector tilt angle.



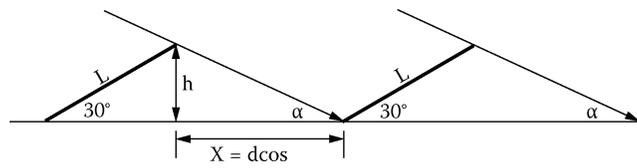
**FIGURE 2.14**

Solar Pathfinder showing region of shading. Shading occurs at points above the white line on the pattern. (Florida Solar Energy Center Photo.)



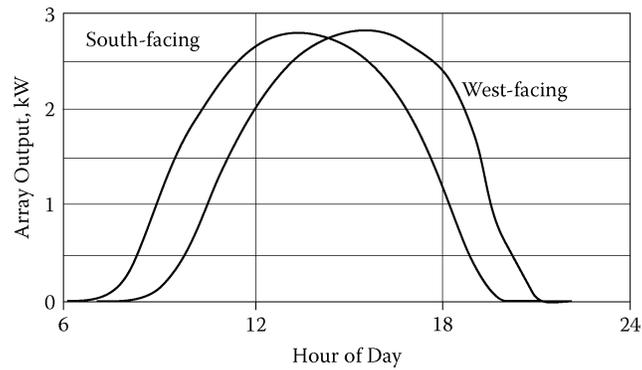
**FIGURE 2.15**

Determining the spacing between rows of PV modules.



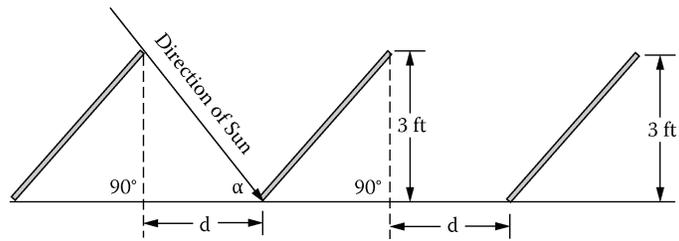
**FIGURE 2.16**

Comparison of power and energy output for south-facing and west-facing PV systems in Sacramento, California, in summer. The south-facing system produced 22,417 Wh and the west-facing system produced 22,192 Wh. (Courtesy of Collier, Photovoltaics in the Sacramento Municipal Utility District, Interconnecting Small Photovoltaic Systems to Florida's Utility Grid, A Technical Workshop for Florida's Utilities, Cocoa, FL, October 22, 1998.)



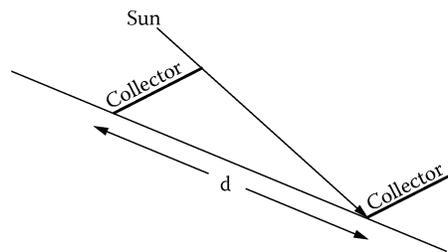
**FIGURE P2.1**

Rows of rack-mounted modules.



**FIGURE P2.2**

Rows of rack-mounted modules on a sloped roof.



**FIGURE P2.3**

Roof layout for Problem 2.22.

