

## CHAPTER 4

# Solar Fundamentals



Photovoltaic system installers typically do not have enough knowledge and experience to design a PV system from the ground up. Their main job focus is to take the various components of a PV system that was designed by someone else and install them in a safe and efficient manner. Learning how to design a PV system is something that installers learn how to do over time as their knowledge and experience levels increase. It is important for a PV system installer to have a good understanding of the fundamentals of solar radiation for both the design and installation of a PV system. In this chapter, solar energy fundamentals are introduced, as well as how to properly evaluate a site for a PV system installation.

### Glossary of Terms

- altitude** The sun's height above the horizon.
- azimuth** The sun's apparent location in the sky east or west of true south.
- azimuth angle** The angle, clockwise from true north, that the PV array faces.
- insolation** The solar irradiation received over a period of time, typically one day.
- irradiance** A measure of how much solar power is striking a specific location.
- irradiation** The term used for the measure of solar radiation striking the earth's surface at a particular time and place.
- latitude** The distance of a specific location north or south of the equator.
- magnetic declination** The deviation of magnetic south from true south.
- profile angle** The projection of the altitude angle onto an imaginary plane that is perpendicular to the surface of an obstruction; it is used to determine the length of a shadow at a certain time.
- solar constant** The amount of solar power moving through space from the sun to the earth; it is assumed to be approximately 1366 watts per square meter in space and 1000 watts per square meter at sea level at the equator at solar noon.
- solar noon** The time during the day when the sun is at its highest point on earth.
- solar radiation** The radiation coming from the sun in the form of waves and small particles.

### Objectives

Upon completion of this chapter, the student should be able to

- ▶ Demonstrate an understanding of solar radiation, solar irradiance, and solar irradiation.
- ▶ Demonstrate an understanding of magnetic declination, solar azimuth, and the solar window.
- ▶ Use sun charts to determine the sun's altitude for a specific location at different times of the year.
- ▶ Use knowledge of solar fundamentals to properly set up a PV system installation for maximum efficiency.
- ▶ Perform a proper site evaluation.