

21.1 BACKGROUND

A rational decision to develop, supply, or utilize PV systems calls for consideration of many factors in an organized manner so as to address the broad issue of whether photovoltaics is a good choice for the person or institution making the decision. Electric energy today can be provided from many sources that are both nonrenewable (including coal, oil, natural gas, nuclear) and renewable (such as wind, biomass, hydro, PV). PV systems compete, in the broadest sense of the word, against the other sources. The competition encompasses financial, reliability, environmental, and performance considerations, and the weight given to these factors will depend on the decision maker's priorities. The values of the parameters in the decision process are defined by well-developed and widely available energy-supply technologies. Economic analysis in the developed world usually focuses on which supply technology best meets the well-defined economic criteria for a given application or class of applications. The preponderance of the use of electric energy in the developed world is available from an electric supply grid, and the competitiveness of PV systems is often evaluated in that context. There are some off-grid demands that can be supplied by PV systems, and for which they are technically well qualified. In the United States, such applications include remote vacation homes or public buildings, navigation buoy signals, communications repeaters, outdoor signage, and irrigation pumping.

In less-developed areas of the world, which for the present discussion mean areas without electric-power grids, the context of the decision process is different. PV systems in such areas are often termed *remote* or *village* systems. They may be deployed in individual homes, small businesses, or may serve a community with local distribution of energy. The competition faced by PV systems in these settings is usually from diesel oil-powered generators (nonrenewable source) or from small renewable sources (such as wind, hydro, biomass). The factors in the decision to deploy PV systems may include factors common to developed regions, though there may be fewer energy alternatives, and generally the individual system capacities are much smaller than in developed regions. However, in less-developed regions of the world, certain other factors may assume greater importance. The viability of the systems is a serious issue if the infrastructure for their installation and maintenance is lacking. Conversely, the provision of that infrastructure to provide installation and maintenance may be a more significant concern than in developed regions. It may also vary among energy technologies, and to that extent it is a competitive factor. For example, diesel generators must be supplied with fuel on a periodic basis, and they have moving parts that must periodically be repaired or replaced. PV systems do not require fuel supply and have no moving parts to repair. However, this does not mean that they would never need repair or replacement.

The financial considerations in a decision to deploy PV can be quite different in developed regions than in the undeveloped regions. In a developed country, the economic units (e.g. individuals, families, businesses, government operations) have a cash flow and well-defined energy needs. The question that they must answer periodically is what source of energy will they choose from among competing alternatives that are highly developed and more or less readily available. The question can be addressed in a quantitative fashion, at varying levels of sophistication, and the resources are available to implement the choice. In undeveloped regions, the situation is more likely that the economic units are individuals or very small businesses with little or no cash flow. The question for these regions is whether any electric energy is at all affordable and where do the resources to pay for