In sum, the PV industry must mobilize at least $25 billion in capital to support a 25% annual growth rate, and as much as $114 billion in capital to support a 50% growth rate, over the next 10 years.

24.3 FINANCIAL CHARACTERISTICS OF PV

This section addresses the characteristics of PV that are essential considerations in the financing of end-use applications, over and above standard lending issues like credit worthiness of the borrower.

Geographic location: The average amount of solar energy hitting the Earth is about 1 kW/m^2. The amount of solar insolation varies by latitude and by regional weather patterns. There is an approximate 2:1 variation in the amount of solar insolation across most of the inhabited world. A 1 kW PV system would generate a 900 to 1000 kWh per year in Germany, and as much as 1800 to 2000 kWh per year in desert locations like Arizona or South Africa. The amount of sunlight varies on an annual cycle, and also as much as +/−10% year to year due to atmospheric and weather conditions (see Reference [6]).

Facility design and cost: The cost of a PV system includes the cost of PV modules (typically 40 to 60% of the total), balance-of-system (BOS) equipment (such as batteries, controllers, inverters, switches, fuses, etc.), and services (design, architecture, engineering, procurement, construction, installation, and postinstallation O&M). PV system costs have come down steadily over the past 25 years, and are now typically $5 to $15 per installed watt. Financiers should be given evidence that the buyer has shopped for a quality system, from a qualified supplier, at a reasonable price.

System efficiency: System efficiency is the key operational characteristic of a PV system, measuring its conversion of solar insolation at the site to output DC or AC electricity. Most of the publicity about PV efficiencies refers to PV cell efficiencies, typically ranging from 5 to 10% for amorphous silicon, 8 to 12% for CIS and CdTe thin-film technologies, 12 to 18% for crystalline silicon, and 25% and higher for cells that are used in concentrator systems (see Reference [7]). The efficiencies of PV cells in research laboratories are even higher and they are improving steadily. But the key for financing is not the latest development in PV cell research; it is the typical, guaranteed output of an entire PV system in its end-use application. The conversion efficiency of the entire system is affected by the efficiency of the cell, reduced somewhat when placed in a module, then further reduced by losses in the wiring and BOS equipment. Thus, PV system efficiencies are about 60 to 80% of PV cell efficiencies (i.e. the efficiency of a system using 16% efficient cells is likely to be in the range of 10 to 13%).

Useful lifetime: The useful lifetime of a PV system is important because it determines the amount of time a financier can allow for repayment of a loan or lease. PV modules typically come with warranties of 10 to 25 years – assuring the owner of 80% to 90% of the module's rated output over the warranty period. From a lender's point of view this is a positive factor in financing. With such guarantees, the modules will have future value as collateral. The weak link in the financing of PV systems is, however, the fact that the useful life of BOS equipment is much shorter and less predictable. BOS equipment often comes with warranties of 90 days to one year, and useful lives