

CHAPTER 1

INTRODUCTION

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Most of the energy sources widely used now, such as coal, gas, oil etc. is not inexhaustible in nature. Only the inexhaustible energy is the renewable energy-solar, wind, hydro, biomass and biogas.

Of all of the forms of energy we have - renewable or nonrenewable - solar has the greatest potential for providing clean, safe, and reliable power. The supply is inexhaustible and the cost, which has fallen dramatically in the past few years, should be competitive with fossil fuels within the decade. Unlike fissile fuels however, solar energy does not do not increasing global warming, nor does it leave us dependent on foreign supplies, disposal of radioactive wastes or danger that nuclear materials will fall into the wrong hands.

Solar energy can provide both electricity and heat, and thus can be used for virtually all energy needs in our country. Passive-solar home heating system, solar water heaters, large scale solar-thermal electric system (which generate electricity directly) have all met with some commercial success. In the long term, solar energy may be used for transportation to run electricity or hydrogen powered automobiles.

Certain forecasts exist which predict the energy consumption will be doubled by 2050. Electricity directly generated by solar energy may become an important factor in the future, especially in countries with plenty of sunshine and high current price level of energy. Satellites, lighthouses and weather observation posts are some of the places where solar cells are found today, i.e. locations that lack connection with a distribution grid. In developing countries they may also be employed to power TV and radio sets. In addition, they may be used in toys and wireless electronics, thus replacing battery power. Today the global production of solar energy cells is growing by some 50 percent a year.

Bangladesh is an energy deficit country and its fuel import bill occupies a significant portion of the total amount of export earnings. Load-shedding and suspension of production of electric power is a daily occurrence. Access to electricity in Bangladesh is one of the lowest in the world. Around 30 percent of the total population has electricity coverage. However, in

the rural areas where nearly 80 percent of the total population lives only have about 10% coverage. But a satisfactory portion of energy demand can be obtained from solar system.

While the price of electricity generated by solar energy is not yet as low as that from coal-fired plants, some technologies are already cheaper than nuclear-generated electricity. Solar energy is especially well suited to generating daytime peak power, which is more expensive than base load (continuous) power. And the cost is coming down steadily; by the end of the decade solar energy should be providing electricity at fully competitive rates.

Solar energy can be converted into electricity through five ways. One way is through the use of solar heated upper layer and the cold layer depths of the ocean to operate low temperature differential heat engines. Another method is using solar driven wind to power a wind turbine, which in turn drives a generator, to produce electricity. A third way is the use of the solar energy through photosynthesis is to grow trees, plants that can be used as combustible fuel in place of coal after suitable process (drying, chipping, grinding). A fourth way is the use of cogenerating –type collectors to heat fluids that can be used to operate heat engines, which in turn drive generators to produce electricity. A final way is by direct conversion of the sun's rays to electricity through the use of photovoltaic or solar cells.

Direct conversion of sunlight to electrical energy has been technologically feasible for many years. However, as yet, the economics of the conversion processes have not allowed them to be cost competitive with processes that convert fossil-fuel energy to electrical energy. The two major problems with the sun as a source of electrical energy, both stem from its lack of availability for constant use. One problem is caused by the day-night cycle of the sun. Depending on the latitude and season of the year, sunlight is normally available only for less than half of the 24-hour day. The other problem is that, even during the time of day when the sun is in a position to deliver energy, it may be obscured by cloud cover and thus rendered useless as a source of direct energy.

Solar cell modules are the basic building blocks of the solar electric power systems. A photovoltaic array is composed of many sub arrays, panels, modules and cells in various series-parallel combinations to deliver power at a desired voltage. Based on application and load requirements the terminals of the array are connected to various “power conditioning” equipment. This power conditioning equipment is designed to convert the direct current produced by the array to a more suitable type and various duty cycle of power.

The figure shows the basic components of the photovoltaic (PV) system. The power conditioner can be divided into two sections. They are:

- ❖ Maximum power point tracker(MPPT)
- ❖ Power flow controller.

The MPPT matches the dynamic impedance of the PV array with the variable load. The power flow controller delivers the power obtained from the MPPT to either the load or to the storage battery, depending on the load element and solar insolation. This system is regulated to maintain system voltage and adequate battery storage continuously.

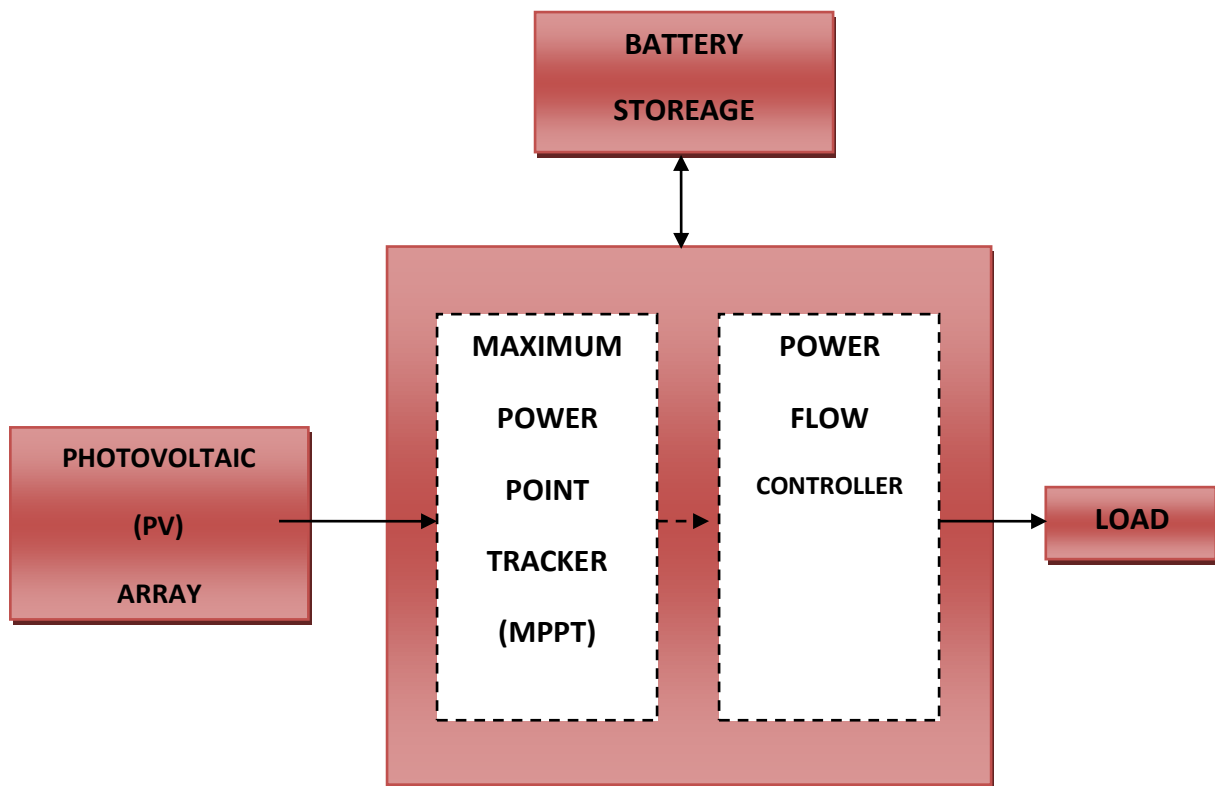


Figure: The basic components of photovoltaic (PV) system