



Daffodil international University
Department of Electrical & Electronic Engineering
Course Code: EEE 450
Course Title: Power Plant Engineering Lab

Experiment 07

Familiarization of various Solar (PV) system equipment

Objective: To be familiar with the various apparatus or equipment of Solar PV system.

1. Photovoltaic Module

A PV module consists of many PV cells wired in parallel to increase current and in series to produce a higher voltage. 36 cell modules are the industry standard for large power production.

The module is encapsulated with tempered glass (or some other transparent material) on the front surface, and with a protective and waterproof material on the back surface. The edges are sealed for weatherproofing, and there is often an aluminum frame holding everything together in a mountable unit. In the back of the module there is a junction box, or wire leads, providing electrical connections.

There are currently four commercial production technologies for PV Modules:

i. **Single Crystalline**

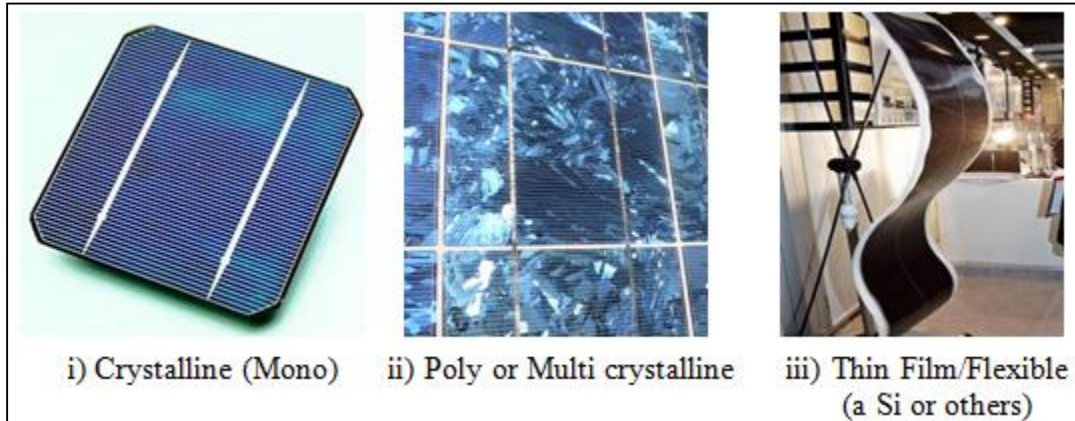
This is the oldest and more expensive production technique, but it's also the most efficient sunlight conversion technology available. Module efficiency averages about 16% to 17%.

ii. **Polycrystalline or Multicrystalline**

This has a slightly lower conversion efficiency compared to single crystalline but manufacturing costs are also lower. Module efficiency averages about 10% to 11%.

iii. **Amorphous or Thin Film**

Silicon material is vaporized and deposited on glass or stainless steel. The cost is lower than any other method. Module efficiency averages 5% to 7%.



Photovoltaic Array

A PV Array consists of a number of individual PV modules or panels that have been wired together in a series and/or parallel to deliver the voltage and amperage a particular system requires. An array can be as small as a single pair of modules, or large enough to cover acres.

12 volt module is the industry standard for battery charging. Systems processing up to about 2000 watt-hours should be fine at 12 volts. Systems processing 2000 - 7000 watt-hours will function better at 24 volt. Systems running more than 7000 watt-hours should probably be running at 48 volts.

2. Battery: Batteries accumulate excess energy created by PV system and store it to be used at night or when there is no other energy input. Batteries can discharge rapidly and yield more current than the charging source can produce by itself, so pumps or motors can be run intermittently. The battery's capacity for holding energy is rated in amp-hours: 1 amp delivered for 1 hour = 1-amp hour



Figure: Battery

3. Charge Controller: Solar charge controller is charge controller that is used in the solar application and also called solar battery charger. Its function is to regulate the voltage and current from the solar arrays to the battery in order to prevent overcharging and also over discharging. There are many technologies have been included into the design of solar charge controller. For example, MPPT charge controller included maximum power point tracking algorithm to optimize the production of PV cell or module



Figure: Charge Controller

4. Inverter: A solar inverter is one of the most important elements of the solar electric power system. It converts the variable direct current (DC) output of a photovoltaic (PV) solar panel into alternating 240V current (AC). This AC electricity then can be fed to the consumers.



Figure: Solar Inverter

Results/Observations: