Construction of a solar PV System

Under the guidance

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DECLARATION

We hereby declare that the thesis titled "DESIGN and Simulation of a Solar PV System" for "Daffodil International University" submitted to the Department of Electrical and Electronics, Dhaka, in partial fulfillment of the Bachelor of Science in Electrical and Electronics Engineering is our original work and was not submitted elsewhere for the award of any other Degree or Diploma or any other Publication.

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Index

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History of pv cells

The first conventional photovoltaic cells were produced in the late 1950s, and throughout the 1960s were principally used to provide electrical power for earth-orbiting satellites. In the 1970s, improvements in manufacturing, performance and quality of PV modules helped to reduce costs and opened up a number of opportunities for powering remote terrestrial applications, including battery charging for navigational aids, signals, telecommunications equipment and other critical, low-power needs.

In the 1980s, photovoltaics became a popular power source for consumer electronic devices, including calculators, watches, radios, lanterns and other small battery-charging applications. Following the energy crises of the 1970s, significant efforts also began to develop PV power systems for residential and commercial uses, both for stand-alone, remote power as well as for utility-connected applications. During the same period, international applications for PV systems to power rural health clinics, refrigeration, water pumping, telecommunications, and off-grid households increased dramatically, and remain a major portion of the present world market for PV products. Today, the industry's production of PV modules is growing at approximately 25 percent annually, and major programs in the U.S., Japan and Europe are rapidly accelerating the implementation of PV systems on buildings and interconnection to utility networks.

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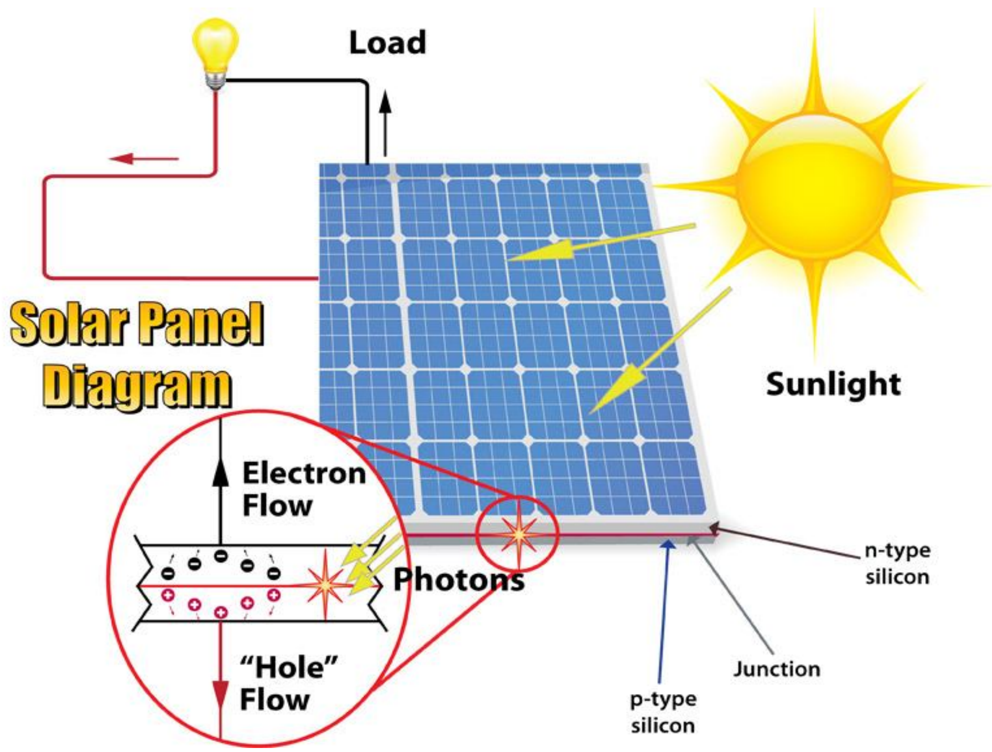
How pv cells made

The process of fabricating conventional single- and polycrystalline silicon PV cells begins with very pure semiconductor-grade polysilicon - a material processed from quartz and used extensively throughout the electronics industry. The polysilicon is then heated to melting temperature, and trace amounts of boron are added to the melt to create a P-type



semiconductor material. Next, an ingot, or block of silicon is formed, commonly using one of two methods: 1) by growing a pure crystalline silicon ingot from a seed crystal drawn from the molten polysilicon or 2) by casting the molten polysilicon in a block, creating a polycrystalline silicon material. Individual wafers are then sliced from the ingots using wire saws and then subjected to a surface etching process. After the wafers are cleaned, they are placed in a phosphorus diffusion furnace, creating a thin N-type semiconductor layer around the entire outer

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surface of the cell. Next, an anti-reflective coating is applied to the top surface of the cell, and electrical contacts are imprinted on the top (negative) surface of the cell. An aluminized conductive material is deposited on the back (positive) surface of each cell, restoring the P-type properties of the back surface by displacing the diffused phosphorus layer. Each cell is then electrically tested, sorted based on current output, and electrically connected to other cells to form cell circuits for assembly in PV modules.

Basic idea of PV:

A photovoltaic system (informally, PV system) is an arrangement of components designed to supply usable electric power for a variety of purposes, using the Sun (or, less commonly, other light sources) as the power source.

Main Component of PV:

- PV Solar panel board (10 Watt)
- Solar cell (6 Volt)
- Switch (3 pics)
- LED Light
- Jack
- Fan

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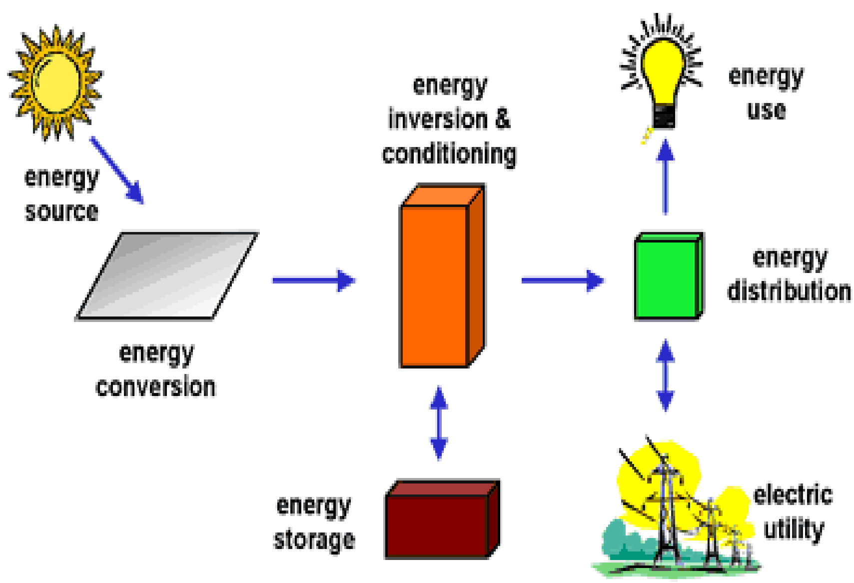
❖ Mobile Charger

❖ Connecting ware

PV systems may be built in various configurations:
Off-grid without battery (array-direct), Off-grid with battery storage for DC-only appliances, Off-grid with battery storage for AC and DC appliances, Grid-tie without battery,
Grid-tie with battery storage,

Working Procedure:

Simply put, PV systems are like any other electrical power generating systems, just the equipment used is different than that used for conventional electromechanical generating systems. However, the principles of operation and interfacing with other electrical systems remain the same, and are guided by a well-established body of electrical codes and standards.



Although a PV array produces power when exposed to sunlight, a number of other components are required to properly conduct, control, convert, distribute, and store the energy produced by the array.

Depending on the functional and operational requirements of the system, the specific components required may include major components such as a DC-AC power inverter, battery bank, system and battery controller, auxiliary energy sources and sometimes the specified electrical load (appliances). In addition, an assortment of balance of system (BOS) hardware, including wiring, over current, surge protection and disconnect devices, and other power processing equipment. Figure 3 show a basic diagram of a photovoltaic system and the relationship of individual components.

Batteries are often used in PV systems for the purpose of storing energy produced by the PV array during the day, and to supply it to electrical loads as needed (during the night and periods of cloudy weather). Batteries are often used in PV systems for the purpose of storing energy produced by the PV array during the day, and to supply it to electrical loads as needed (during the night and periods of cloudy weather). Other reasons batteries are used in PV systems are to operate the PV array near its maximum

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power point, to power electrical loads at stable voltages, and to supply surge currents to electrical loads and inverters. In most cases, a battery charge controller is used in these systems to protect the battery from overcharge and over discharge.

Why Use Solar Power:

The main sources of world`s energy gereration are the fossil fuels and nuclear power plants. Due to the usage of fossil fuels, green house gases (CFC, CH4, O3 but mainly CO2) emit into the atmosphere. From the nuclear power plant, carbon is released in a small anount (90 grams equivalent of carbon dioxide per kilowatt hour).

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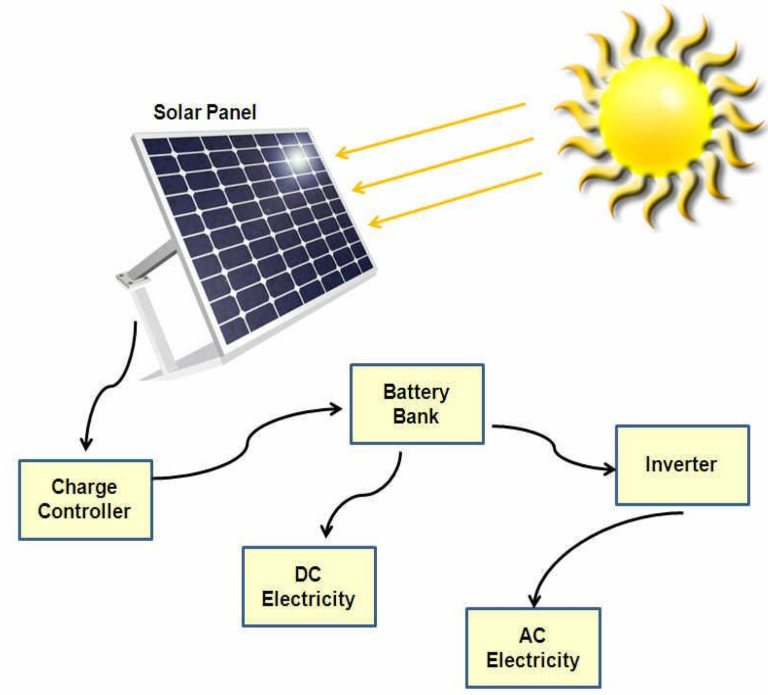
How do solar panels (PV) cells work?

PV cells are made from layers of semi-conducting material, usually silicon.



When light shines on the cell it creates an electric field across the layers. The stronger the sunshine, the more electricity is produced. Groups of cells are mounted together in panels or modules that can be mounted on your roof.The power of a PV cell is measured in kilowatts peak (kWp). That's the rate at which it generates energy at peak performance in full direct sunlight during the summer. PV cells come in a variety of shapes and sizes. Most PV systems are made up of panels that fit on top of an existing roof, but you can also fit solar tiles.

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Advantages of solar PV:

- PV panels provide clean – green energy. During electricity generation with PV panels there is no harmful greenhouse gas emissions thus solar PV is environmentally friendly.
- Solar energy is energy supplied by nature – it is thus free and abundant!
- Solar energy can be made available almost anywhere there is sunlight.
- Photovoltaic panels, through photoelectric phenomenon, produce electricity in a direct electricity generation way.
- Operating and maintenance costs for PV panels are considered to be low, almost negligible, compared to costs of other renewable energy systems.

Disadvantages of Solar PV:

- As in all renewable energy sources, solar energy has intermittency issues; not shining at night but also during daytime there may be cloudy or rainy weather.
- Consequently, intermittency and unpredictability of solar energy makes solar energy panels less reliable a solution.

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- Solar energy panels require additional equipment (inverters) to convert direct electricity (DC) to alternating electricity (AC) in order to be used on the power network.
- Solar panels efficiency levels are relatively low (between 14%-25%) compared to the efficiency levels of other renewable energy systems.

Works on solar technologies around the world:

- There are huge works, research, thesis, implementation, design consideration and implementation and research on solar technologies is going on around the world as in our country. That is why we have more than 35 company doing business, implementation and research on solar technologies.

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Per hour major of energy

8am = 1.2w (P=VI. 6*.2)

9am =1.28w (6*.3)

10am =1.8w (6*)

11am =2.4w

12pm =3.10w

1pm = 3.60w

2pm =3.30w

3pm =3.0w

4pm =2.40w

5pm =1.45w

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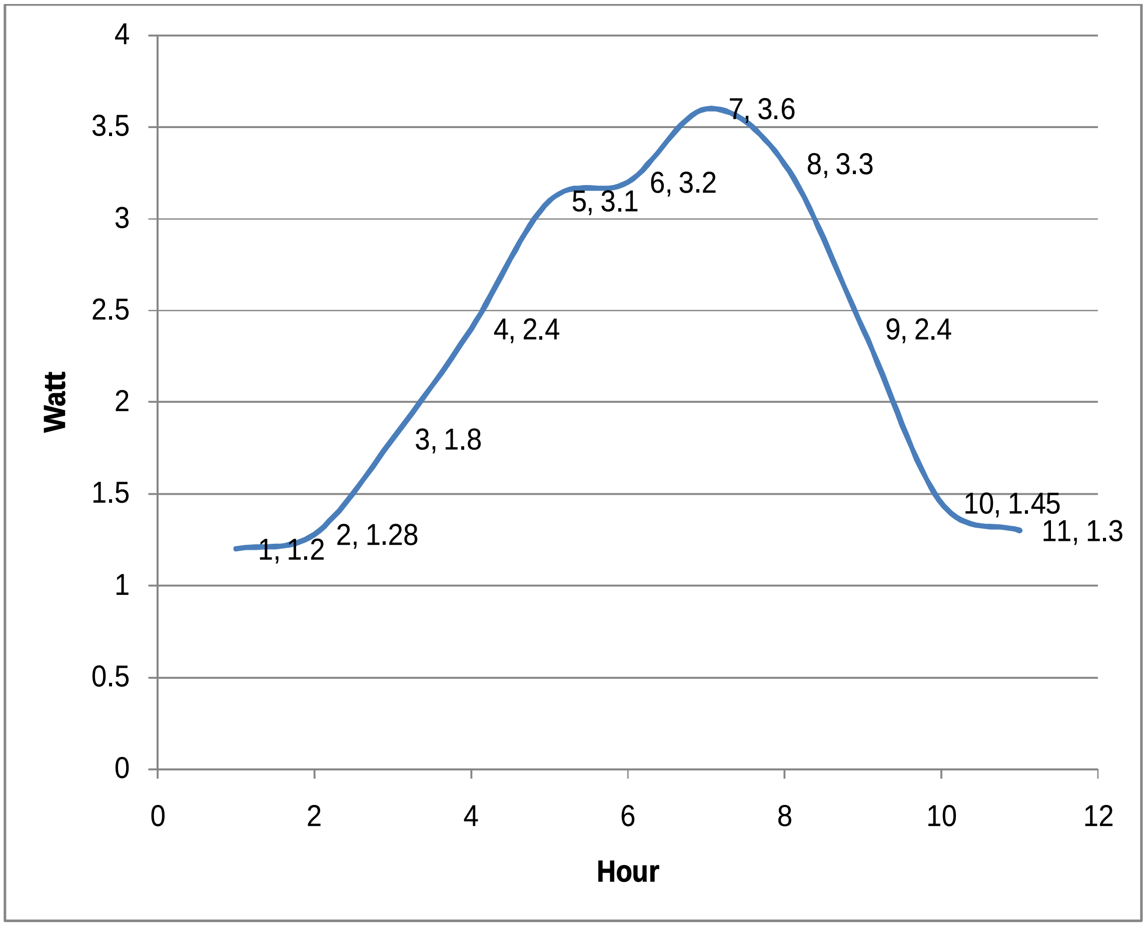

Per hour output current= 1.2Amp

" "current cost=0.125 Unit

Per Unit price =5.50 Tk "

hour current cost =0.022 taka

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SL no	Name of the Company	Capacity(Watt)	Price(TK)
1	**Toko**	8w	520
2	“	15w	975
3	“	25w	1625
4	“	50w	2900
5	“	60w	3480
6	“	100w	5800
7	“	120w	6920
8	“	150w	8250
9	“	175w	9625
10	“	200w	1100

Month	Watt	Reducing Price(TK)
January’ 2013	1w	65
February’ 2013	1w	65
March’ 2013	1w	60
April’2013	1w	58
May’2013	1w	62
June’2013	1w	68
July’2013	1w	70
August’2013	1w	60
Sep2013	1w	55
Oct’2013	1w	58
Nov’2013	1w	65
Dec’2013	1w	62

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SL no	Name of the company	Capacity(Watt)	Price(Tk.)
1	**Xenergeia International Ltd**	10w	1750
2	“	20w	3500
3	“	25w	4375
4	“	35w	6125
5	“	45w	7875
6	“	50w	8750
7	“	65w	11375
8	“	75w	13125
9	“	120w	21000
10	“	150w	26250

Month	Watt	Reducing Price
January’ 2013	1w	175
February’ 2013	1w	180
March’ 2013	1w	183

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April’2013	1w	188
May’2013	1w	190
June’2013	1w	195
July’2013	1w	220
August’2013	1w	250
Sep2013	1w	270
Oct’2013	1w	260
Nov’2013	1w	230
Dec’2013	1w	210

SL no	Name of the company	Capacity(Watt)	Price(Tk.)
1	**Grameenshakti**	10w	1800
2	“	20w	3600
3	“	25w	4500
4	“	35w	6300
5	“	45w	8100
6	“	50w	9000
7	“	65w	11700
8	“	75w	13500
9	“	120w	21000
10	“	150w	26250

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Month	Watt	Reducing Price
January’ 2013	1w	180
February’ 2013	1w	180
March’ 2013	1w	183
April’2013	1w	188
May’2013	1w	190
June’2013	1w	195
July’2013	1w	220
August’2013	1w	250
Sep2013	1w	270
Oct’2013	1w	260
Nov’2013	1w	230
Dec’2013	1w	230

SL no	Name of the Company	Capacity (Watt)	Price(TK)
1	**RAHIMA AFROOZ**	10w	1950
2	“	20	3900
3	“	25	4875

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4	“	30	5850
5	“	45	8775
6	“	50	9750
7	“	65	12675
8	“	75	14625
9	“	100	19500
10	“	150	27750

Month	Watt	Reducing Price(TK)
January’ 2013	1w	195
February’ 2013	1w	195
March’ 2013	1w	210
April’2013	1w	210
May’2013	1w	220
June’2013	1w	230
July’2013	1w	260
August’2013	1w	240
Sep2013	1W	230
Oct’2013	1w	250
Nov’2013	1w	220
Dec’2013	1w	220

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Project Cost:

Equipment	**Cost**
6v battery	600tk
Solar panel	800tk
Switch (3Pic)	60tk
Socket (3Pic)	80tk
Diode	10tk
LED light	200tk
Motor	70tk
Fan	30tk
LED Signal light	15tk
Wire	50tk
Resistance (2Pic)	30tk
Total	1950tk

END

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