

# **Rooftop Grid-Connected Solar Photovoltaic system**

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**Installation Site: Renewable Energy Research Centre, University of Dhaka**

## *Background of study*

**Residential rooftop grid connected photovoltaic power systems are gradually becoming popular as an important source of electric power in many countries of the world.**

**Many works have been done in different laboratories in this direction all over the world but no successful efforts yet been reported within Bangladesh to date.**

**In the present energy crisis situation the grid connected photovoltaic system could be an eco friendly and fuel free alternative power source for the country to minimize the power shortage.**

# Objectives

This system design and investigation would also cover the following aspects

Realizing the significant potential of this technology a model 1.1 kW capacity rooftop grid connected photovoltaic system have been designed, developed and successfully commissioned at the rooftop of Renewable Energy Research Centre (RERC), University of Dhaka.

- Performance of various component parts,
- Grid interfacing circuitry matching,
- Effects of voltage fluctuation, Resonance,
- Over current flow, Power failure,
- Power conditioning, flickering,
- Stability, Harmonic distortion,
- Safety, Bi-directional metering for power tariff,
- Option for stand alone system,
- Installation cost and time requirement,
- Proper operation monitoring,
- Reliability and maintenance,
- Life cycle cost as viable alternative power source etc.

# The Photovoltaic (PV) System

The solar Photovoltaic cell (PV cells) convert the incident solar light energy directly to electrical energy in DC form. A single cell has rated voltage of about 0.5V and rated power of about 0.3W.

## There are two types of PV systems

Actual power delivered varies with intensity of sunlight and the load resistance. When exposed to sunlight, the solar cell acts like a tiny DC generator. **1. Standalone PV system** connected in series, parallel, series-parallel configuration to get the desired voltage.

## 2. Grid connected PV system

Several solar cells are connected in series to form a string, several strings are connected in series, parallel, series-parallel configuration to form an Array. The Arrays installed on the structure to form a solar PV collector.

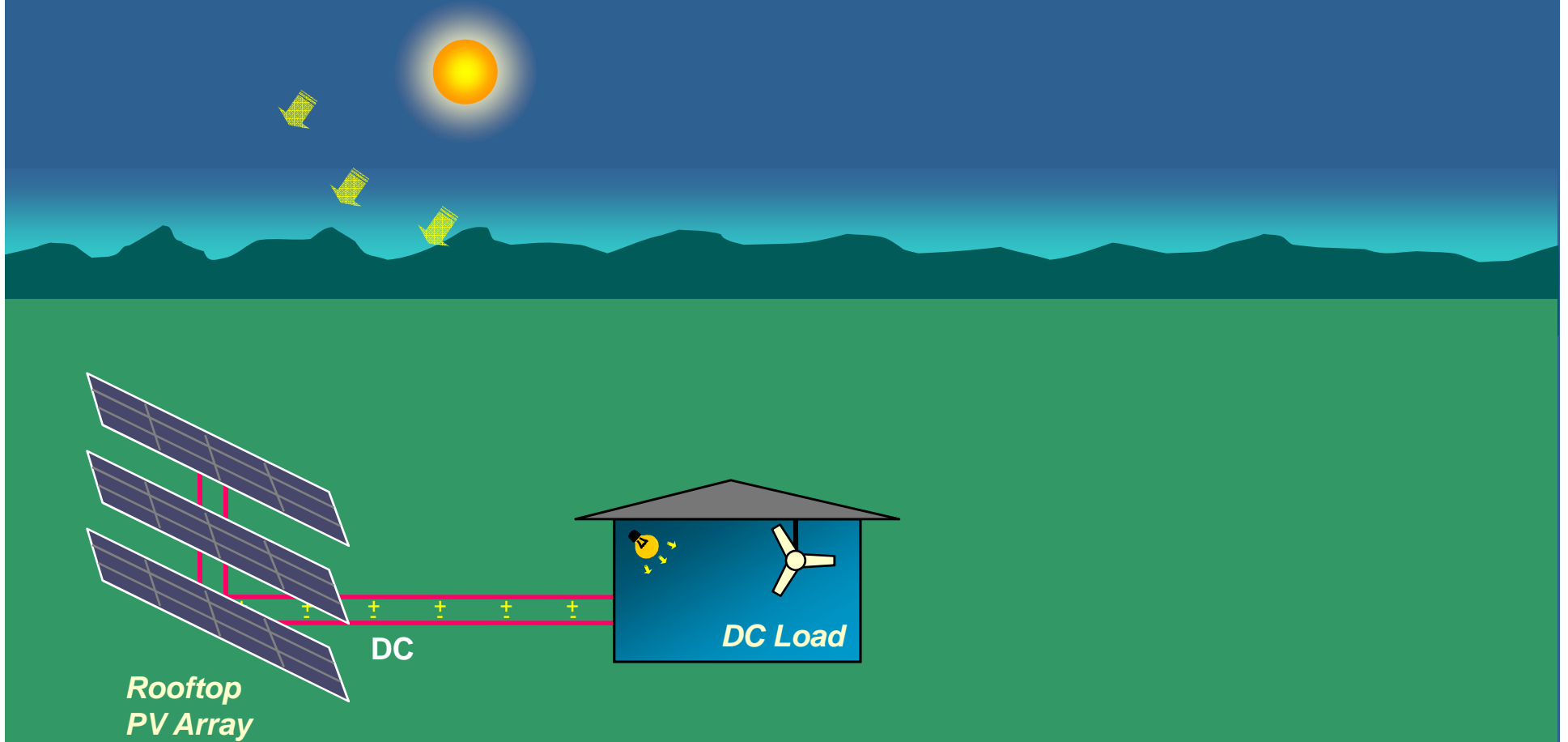
# Stand-alone PV system

**There are three different types of stand-alone PV system**

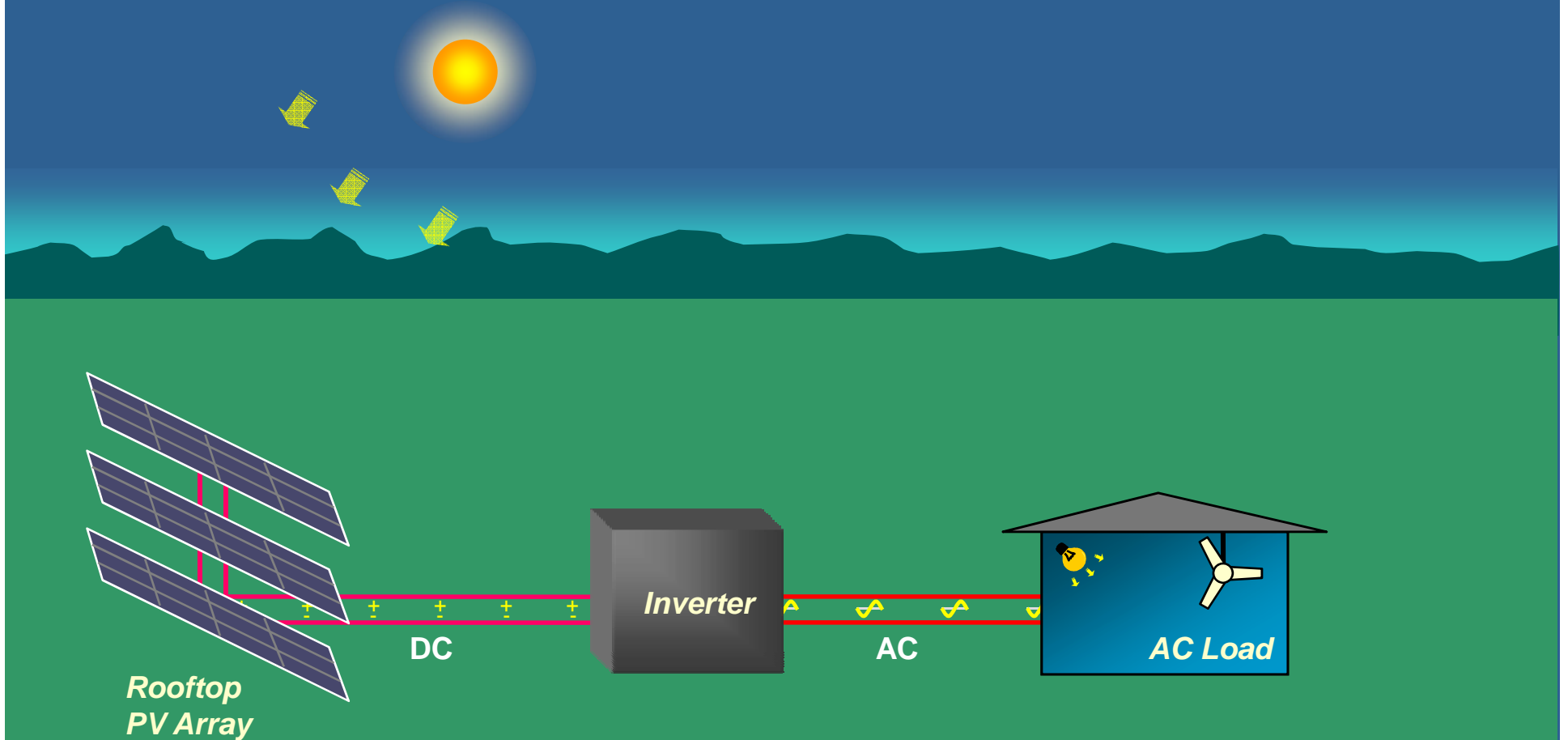
**The PV system that alone supplies power to the load is known as stand alone PV system.**

- 1. Stand alone PV system without battery for DC load**
- 2. Stand alone PV system without battery for AC load**
- 3. Stand alone PV system with battery for DC and AC load**

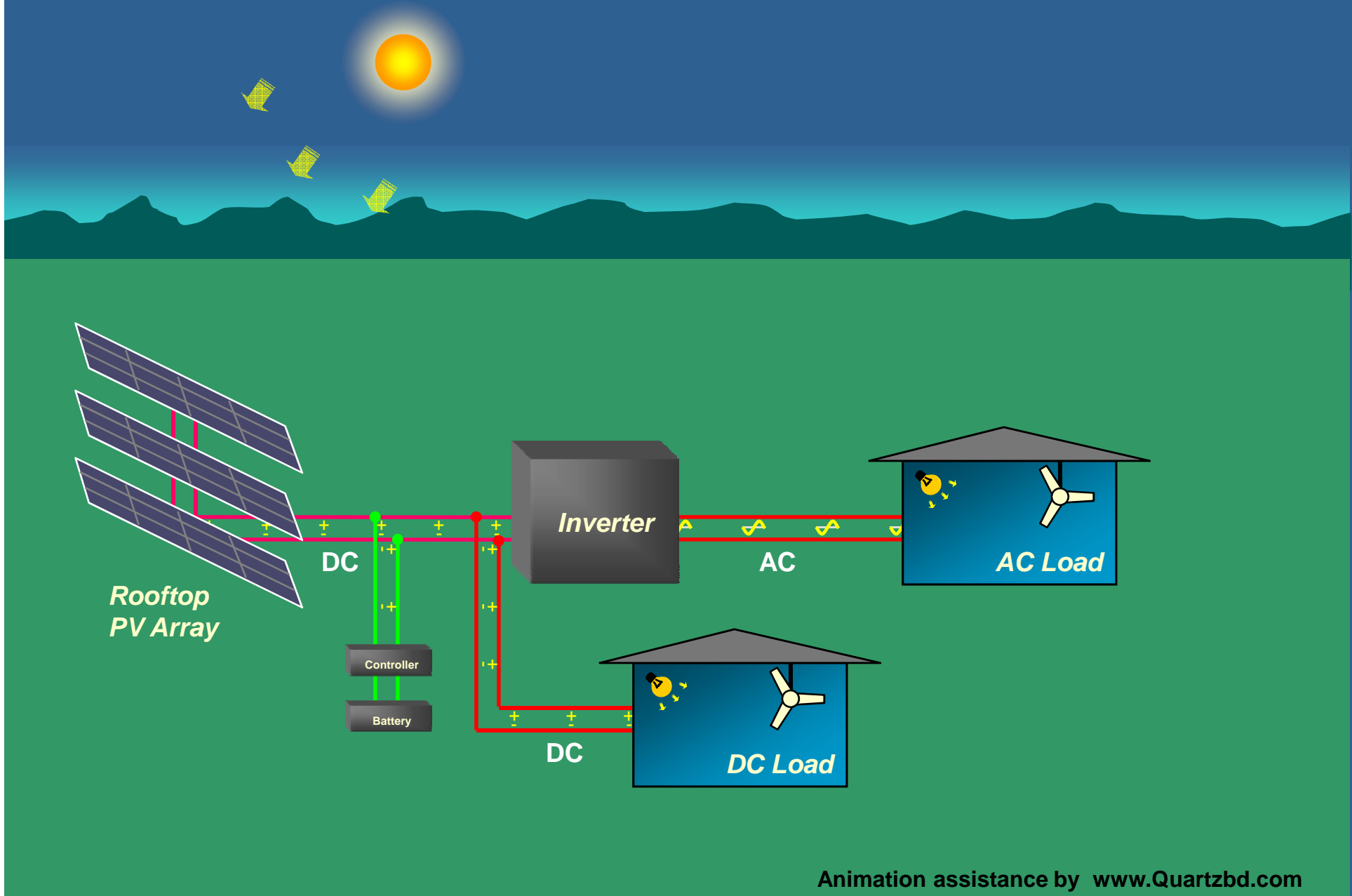
# Stand alone PV system without battery for DC load



# Stand alone PV system without battery for AC load



# Stand alone PV system with battery for DC and AC load



# Rooftop Grid Connected Solar PV system (Residential) without power back up

## The advantages are

- This system does not need any storage device
- No price for space is required as space on the rooftop for PV module is readily available
- No need for site preparation for the system
- No extra electrical wiring is required as electrical wiring for grid power supply already exists in the residence
- Transmission losses are much smaller because the load is on the same site as the supply

The PV modules are mounted on the rooftop of a residential building. During sunny days the DC power generated by the PV modules in the system is converted to AC by power conditioning unit (inverter) and fed into the power distribution system of the residence for supplying residence loads.

Any excess solar power is exported to the utility power, and any shortfall is made up with grid electricity.

During non-sun hours, residence loads are supplied by utility grid alone.