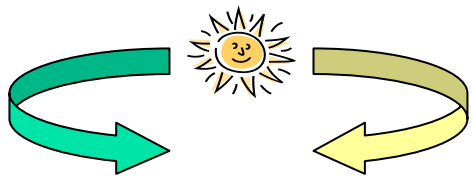
SOLAR ENERGY AND ITS COMPONENTS



Solar Photovoltaic conversion
(Generates Electricity, DC Power)

Uses Semiconductors & its Hybrids:
Silicon, Germanium to convert photon energy into DC electricity
(Solar Cells / Modules)

DC or AC electricity – based applications

Solar Thermal conversion
(Generates Heat)

Uses Metals: Steel, Copper, Aluminum to convert photon Energy into Heat
(Solar Collectors)

Air, water, oil heating and power generation applications

WHY SOLAR ENERGY

- Abundant Solar Radiation, most parts of India receive 4 - 7 kWh radiation per sqm per day.
- 250 - 300 sunny days in a year.
- Systems are modular in nature, can be expanded and used anywhere in the country for small to large applications.
- No running cost, as solar radiation is free.
- Generates energy without noise, pollution free.
- Systems have long life (10-25 years), no maintenance except for Battery and electronics.

COMPONENTS

Photovoltaic components:	Thermal Components:
1. Solar Cells / Modules 2. Tubular Battery (Lead-Acid) 3. Charge Controller & Inverters 4. BOS (hardware) 5. Interconnecting Cables 6. Shadow free area, 1kW per 12-15 Sqm 7. Modules must face South direction at an angle from horizontal equal to latitude of the place	1. Flat plate/evacuated tube Solar Collectors 2. Insulated water storage tank 3. Connecting pipes 4. Conventional heating element with controls 5. Shadow free area, 40 liter per Sqm 6. Collectors must face South direction at fixed angle

PRODUCTS AND APPLICATIONS

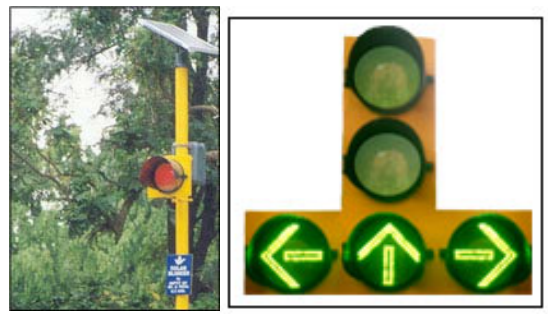
- **Solar Lantern:**
  - Portable Lighting systems with 5 W or 7 W CFL or LED base
  - Meant to provide light for 3 – 4 hr per daily
  - Designed to have 3 – days autonomy

- **Solar Home Lighting:**
  - Stand alone home lighting systems
  - Several options available with one, two or four 9 W CFL, DC Fan and DC Television.
  - Meant to provide light for 3 – 4 hr per daily
  - Designed to have 3 – days autonomy
  - Most popular system in rural and remote areas
  - LED Base lighting can reduce SPV and Battery size.

PRODUCTS AND APPLICATIONS

- **Solar Street Lighting:**
  - Stand alone outdoor lightings used for illuminating street or open area.
  - System available with 11W CFL luminaries with dusk to dawn operation cycle. Designed to have 3 – days autonomy
  - Most popular system in rural and remote areas for street lighting and community centers.

- **Solar Powered Traffic Signal Systems:**
  - Stand alone system can replace conventional systems
  - Use LED and work during power failure
  - Less power consumption, longer life of LED reduces running maintenance cost.
  - Systems components: SPV Array 1- 2 kW, Battery Bank and electronics controller.



PRODUCTS AND APPLICATIONS

- **Solar Based information display systems:**
  - Stand alone outdoor display, may use for information pertaining to population, road safety, AIDS etc.
  - LED based information display systems. Size of 1 X 2 M display consume about 300 watts of energy.
  - For 2 Sqm, an array of about 2 kW is required to operate all the night.
  - Battery bank size would depend on desired autonomy.

- **Hybrid power plant, for form houses, GSM towers:**
  - Capacity varies from 1 kW to 10 kW, even higher.
  - Used where conventional grid supply is not available, or irregular
  - If conventional supply is erratic, it works like UPS.
  - Systems components: SPV Array, Battery Bank, Charge controller and Inverter.

PRODUCTS AND APPLICATIONS

- **Solar Generators:**
  - Stand alone systems designed to supply power to limited loads for a 2-3 hrs in case of load shedding.
  - Capacities may vary from 150 W to 700 W, meant to replace the petrol based generators used in urban areas by shops, clinics etc.
  - Systems components: SPV Array, Battery Bank, Charge controller and Inverter.
- **Stand-alone power packs:**
  - Stand alone systems can be designed for Petrol pumps, Rural banks, financial institutes, schools, Rural Health and community centers
  - Capacities may vary from 500 W to 10 kW
  - Systems components: SPV Array, Battery Bank, Charge controller and Inverter.

PRODUCTS AND APPLICATIONS

- **SPV Water pumping system:**
  - Water pump can be DC or AC, surface-mounted or submersible or floating that runs on power from SPV array.
  - Systems consist of PV array of 0.9 – 3 kW capacity with manual tracking.
  - Normal pumping heads can be in the range of 10 to 100 M, depending of pump type and PV array capacity.
  - 2 HP SPV pump can irrigate about 2-3 hectares of land.

PRODUCTS AND APPLICATIONS

- **Building Integrated PV (BIPV) systems:**
  - PV panels are integrated into roof or façade of a building.
  - It provides weather protection, structural, aesthetic, electricity generating.
  - Electricity generated during the daytime is used to meet a part load of the building. Provision can be made to supply excess power to grid.
  - GOI gives 50% cost of modules installed in BIPV projects on government and semi-government buildings.

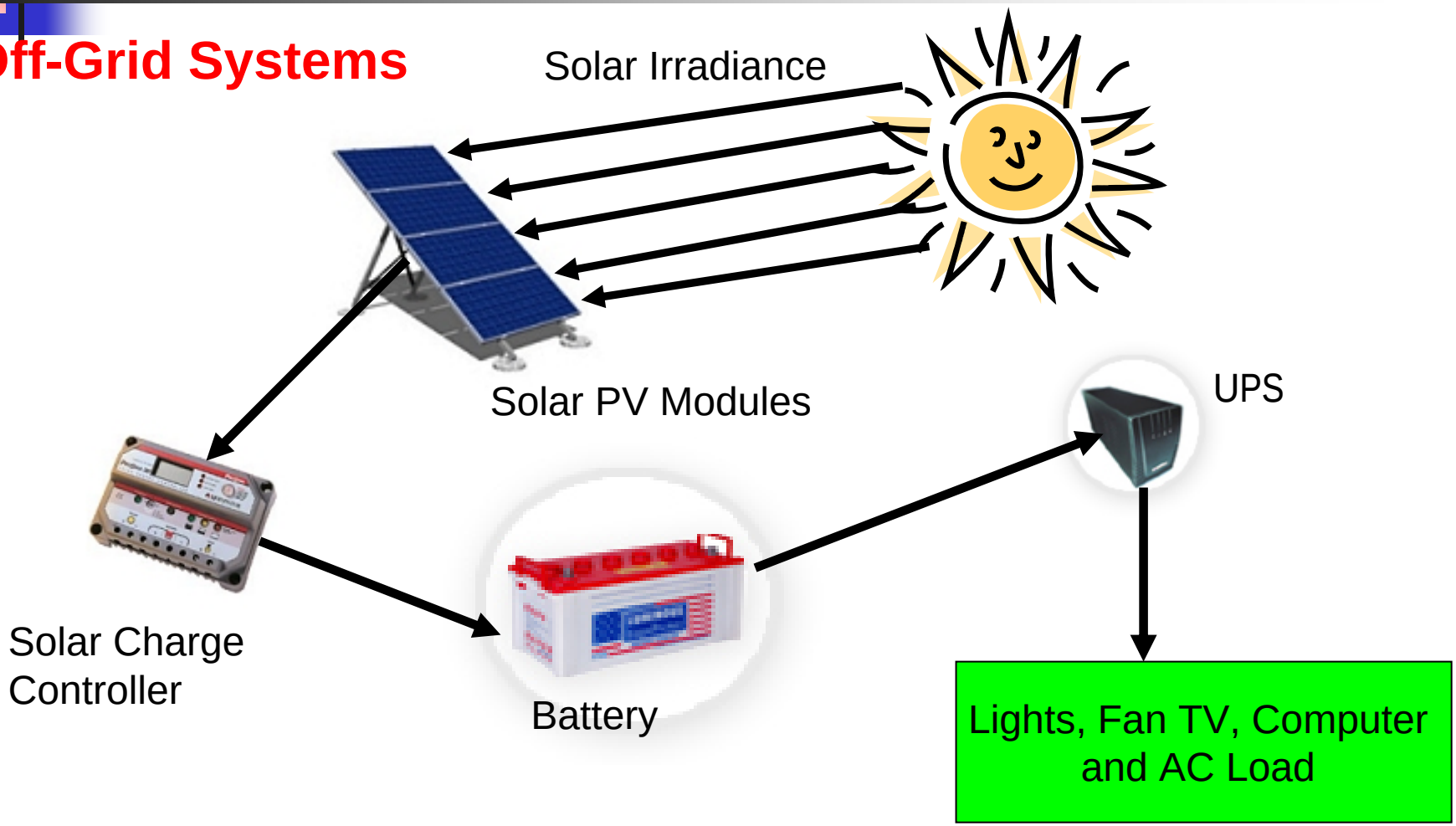
PRODUCTS AND APPLICATIONS

- **SPV Water Heating (SWH) system:**
  - 100 liter/day capacity SWH can save up to 1500 kWh/year.
  - Components: Solar collectors, Insulated storage tanks and pipes.
  - Installed on roof or open space, collectors facing sun and connected with continuous water supply.
  - Hot water can be used at home and for variety of industrial applications.

  - Most domestic SWH are provided with electrical back-up. Electrical heating elements are usually placed in storage tank and can be switched on during cloudy days.
  - Domestic SWH are available in the capacity range of 100 to 500 liters per day with 24 hrs Hot water availability.
  - SWH pays back in 3 - 5 years and last for 15-20 years and require only simple maintenance like periodical tube and tank cleaning.
  - Most of state governments in India give subsidy for using SWH

HOW DOES SOLAR PACK WORK?

Off-Grid Systems



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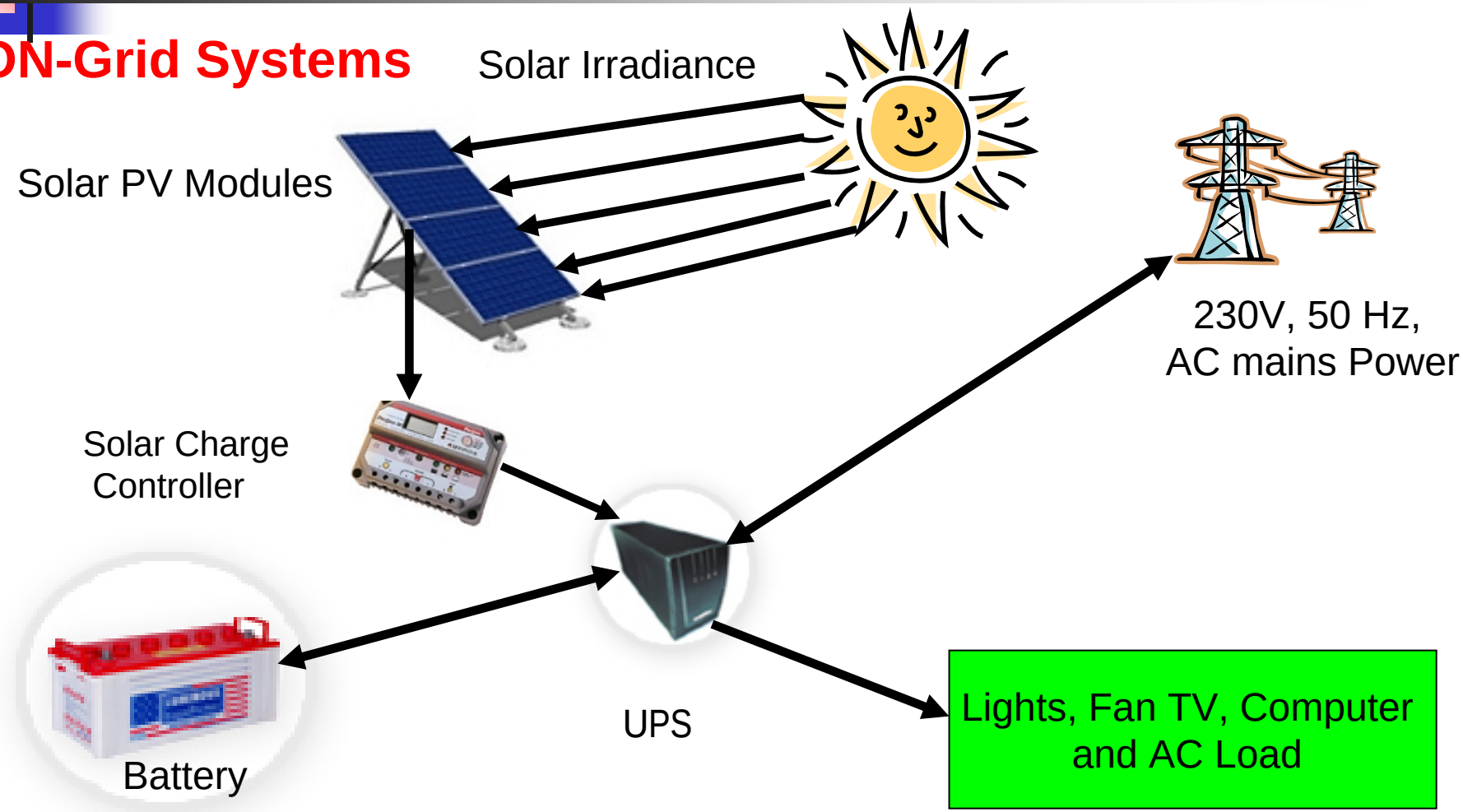

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