Unit 2:- Solar Energy

Lecture 4

- 3rd Generation SPV Plant
- Grid connected SPV working
- Islanding
- 4th Generation SPV Plant
- Micro Grid Application
- Solar Home Appliances
- Solar Street light Applications
- 1st Generation Solar Pumps
- Grid Connected Solar Pumps
- Solar Mobility Applications
- Solar Impulse / Solar Trains
- Solar cell Technologies

3rd Generation Grid Connected Solar Plant

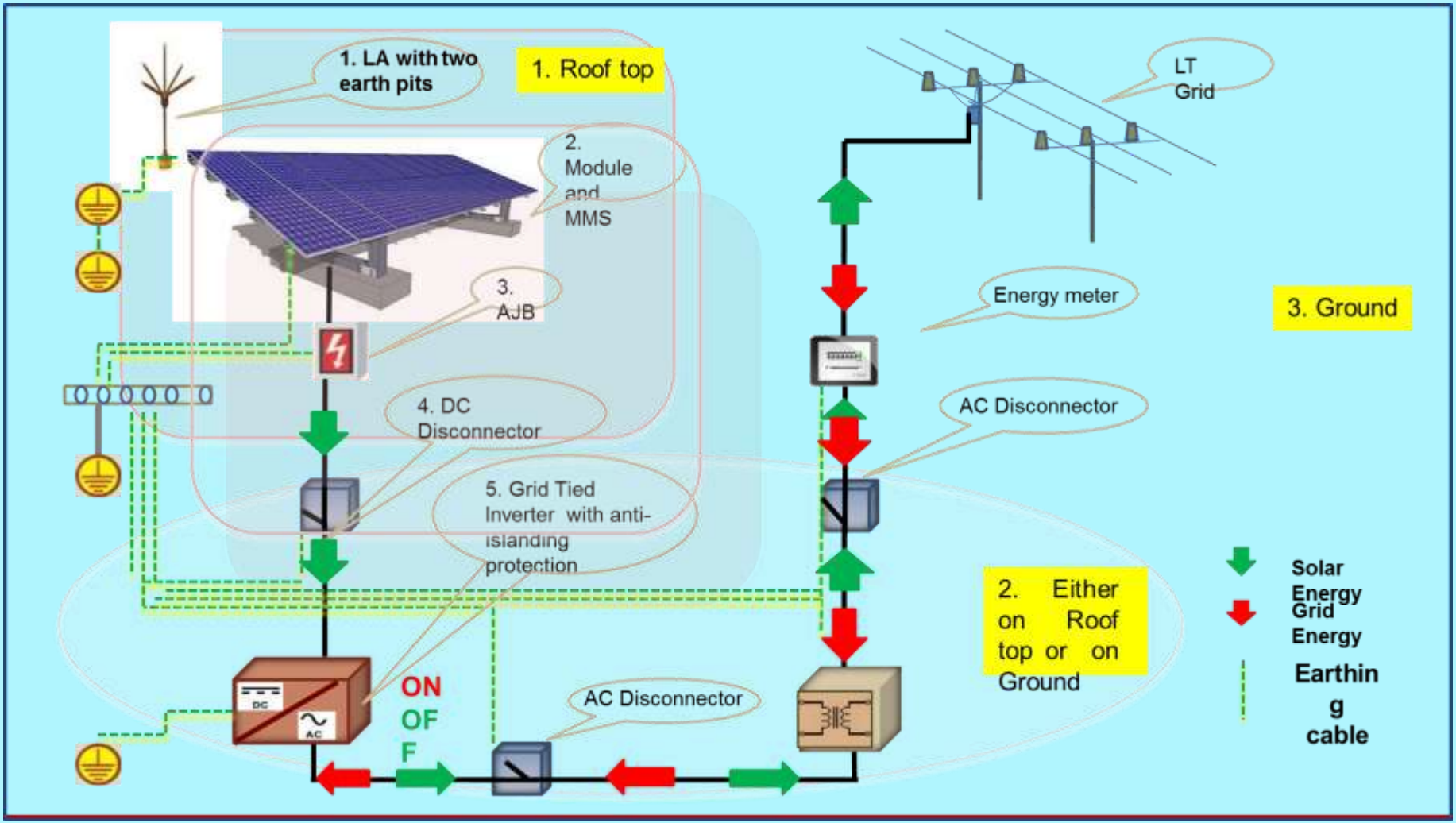
1. Solar Panels
2. Solar inverter
3. Solar meter
4. Connected Load
5. Net meter
6. Grid Synchronization

V, f, Phase sequence & wave form

Completely battery less system

to minimize the cost of RTSPV & to connect in load sharing mode

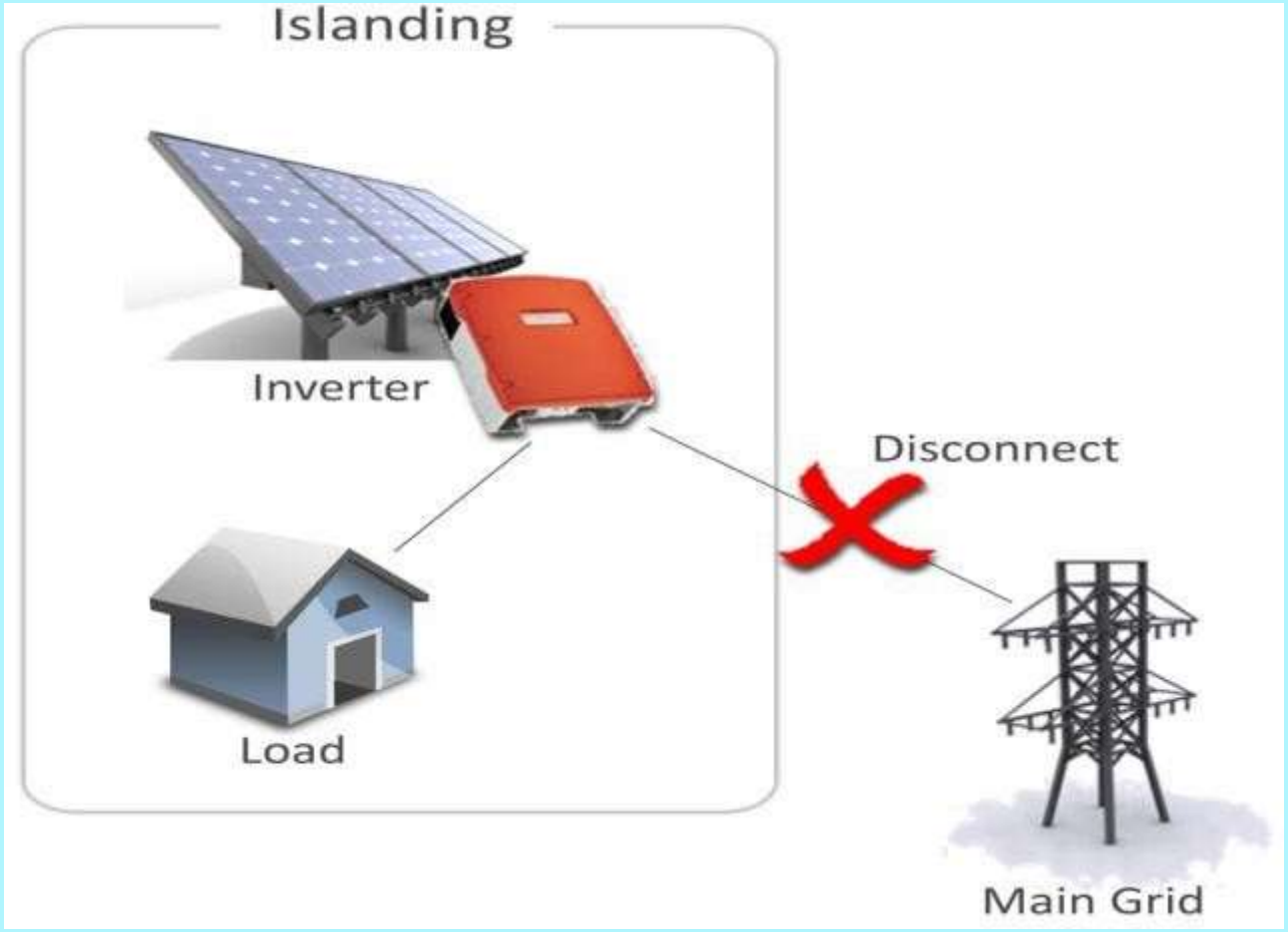
Grid Connected Solar Plant Working

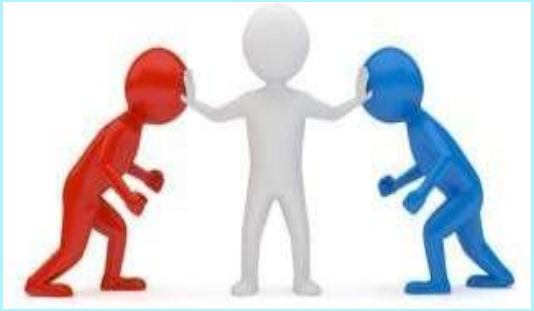


Grid Connected Solar Plant Working

- On-grid plants needs **reference voltage (AC power)** from Grid
- It gets **synchronized with the grid usually in 1 min** with the grid
- Afterwards start converting DC power coming from SPV in to AC
- The **AC voltage** generated by the **solar inverter is slightly higher then Grid voltage** Due to this solar power will get the first priority for connected loads
- On-grid plant is **connected in parallel** hence it is a **load independent system**
- On-grid plant act as a **load sharing device in the electric circuit**
- **It has inbuilt Anti islanding feature, which provide immediate (0.2 seconds) isolation** from the grid and **complete isolation in 2 seconds** when there is loss of reference from the grid

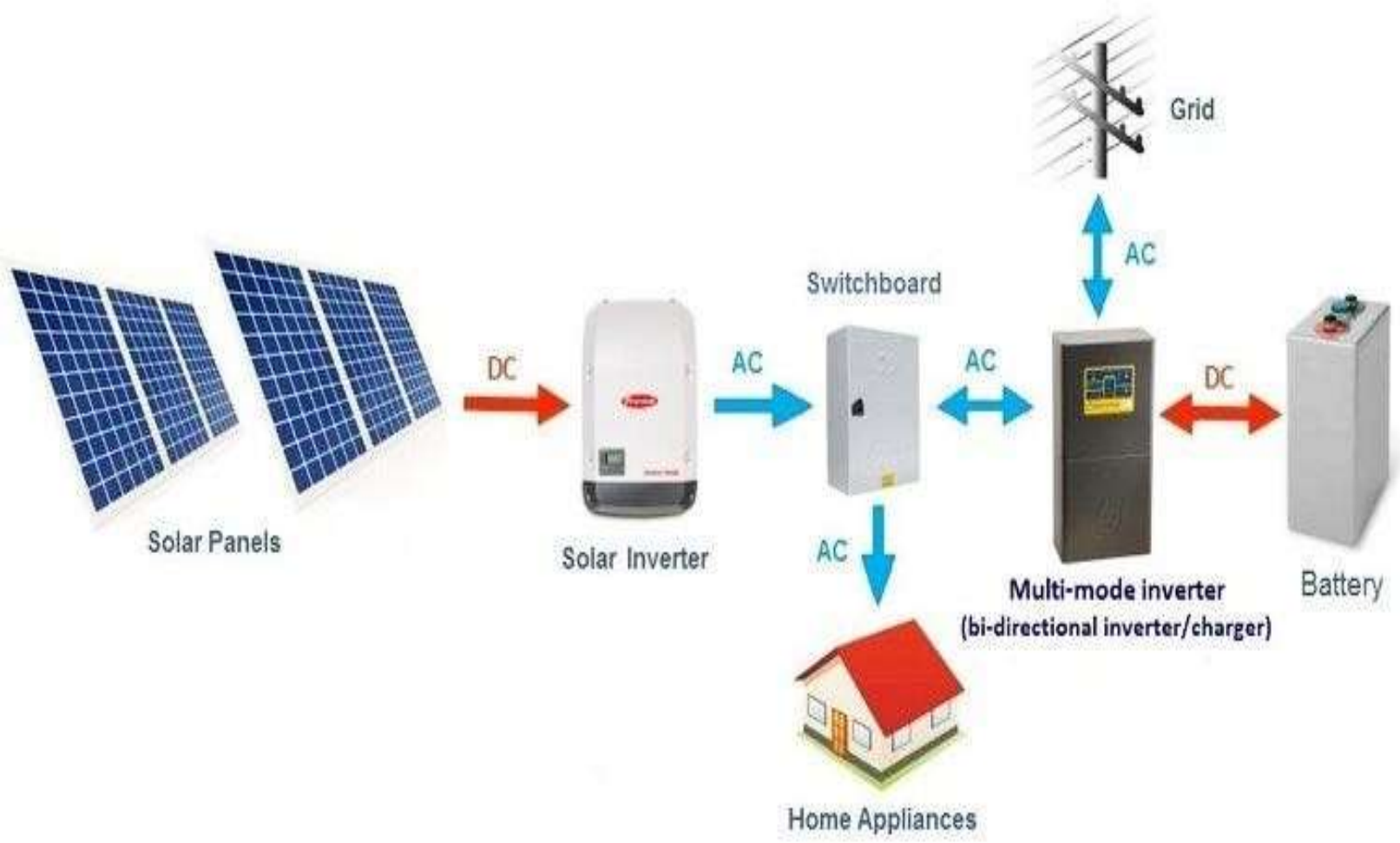
Grid Connected Solar Plant Working





No grid power No AC electricity from inverter

4th Generation Solar Plant



Grid Connected Solar Plant with Battery Bank

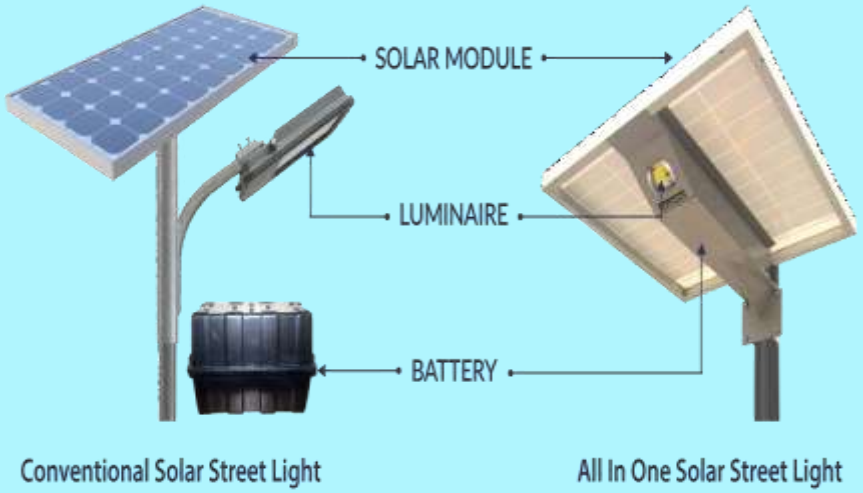
Micro - Grid Applications

- Usually micro grids constructed, where the grid availability is not economically viable
- In India many remote location are best suited for this type of solutions
- It may use more then one source of the electricity
- The power generation can be increase or decrease as per the requirement of the village.

Solar Home Applications

Complete solution for household electrical appliances and also can provide battery back up for critical load

Solar Street light Applications



Solar street lights comprise of the SPV module, which absorb the solar energy during daytime & convert solar energy into electrical energy, which is stored in the battery. At the night time the lamp starts automatically and it consumes the electricity already stored in the battery. During the day time the battery gets recharged and the process keeps on repeating every day

Solar Street light Applications

1. solar panel

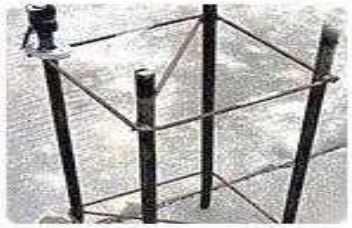
2. Battery with maintenance free

3. Solar Controller

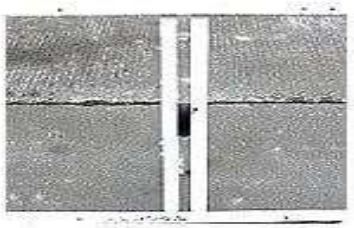
4. LED Lamp

5.Battery Case

6.Premium Lamp-Post

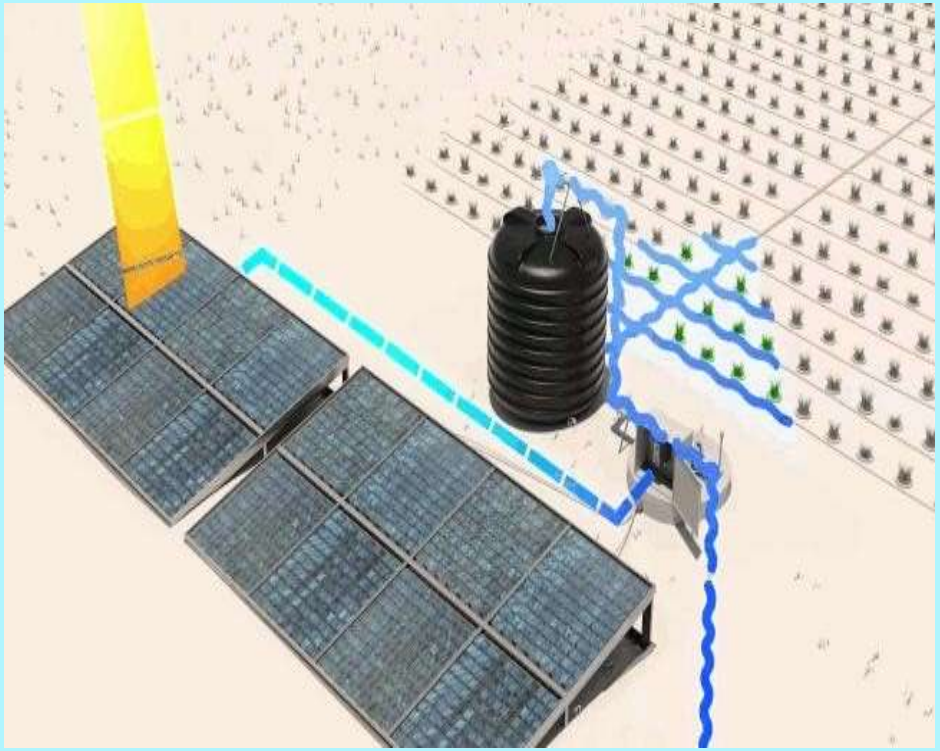


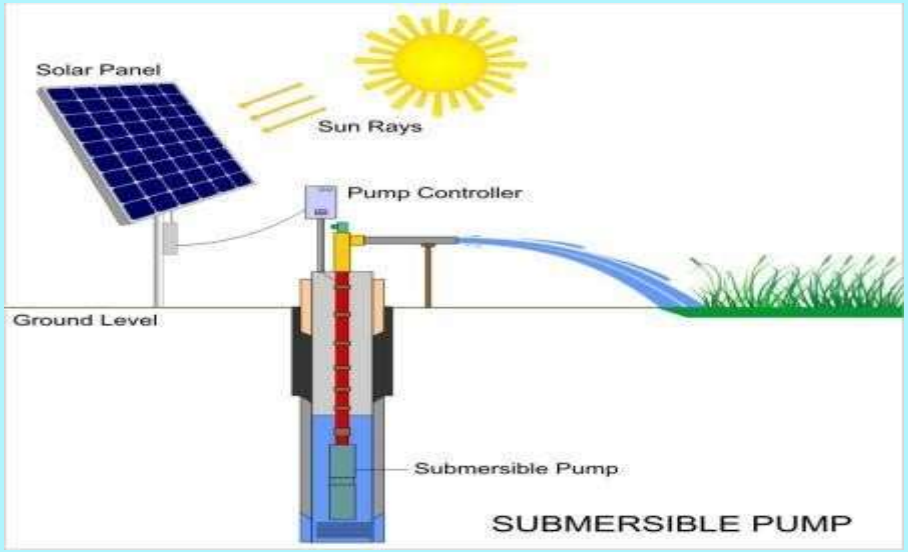
7.Land Foot Bracket

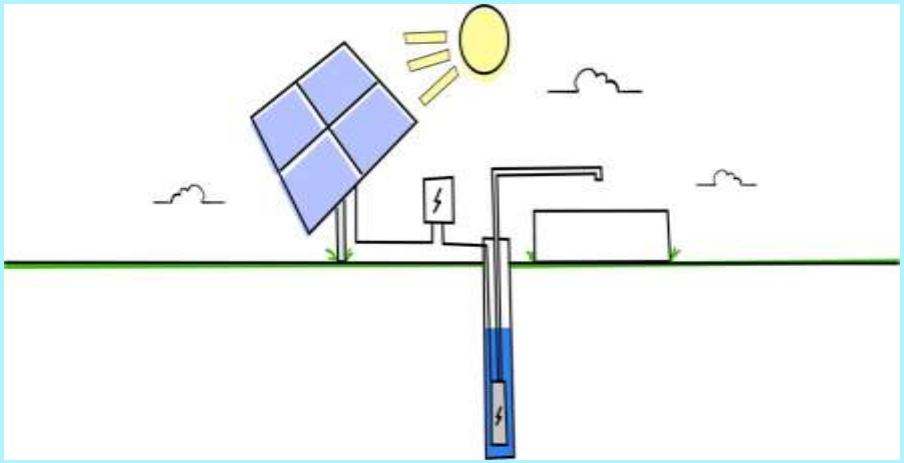


8. Bracket for solar panel

1st Generation Solar Pumps

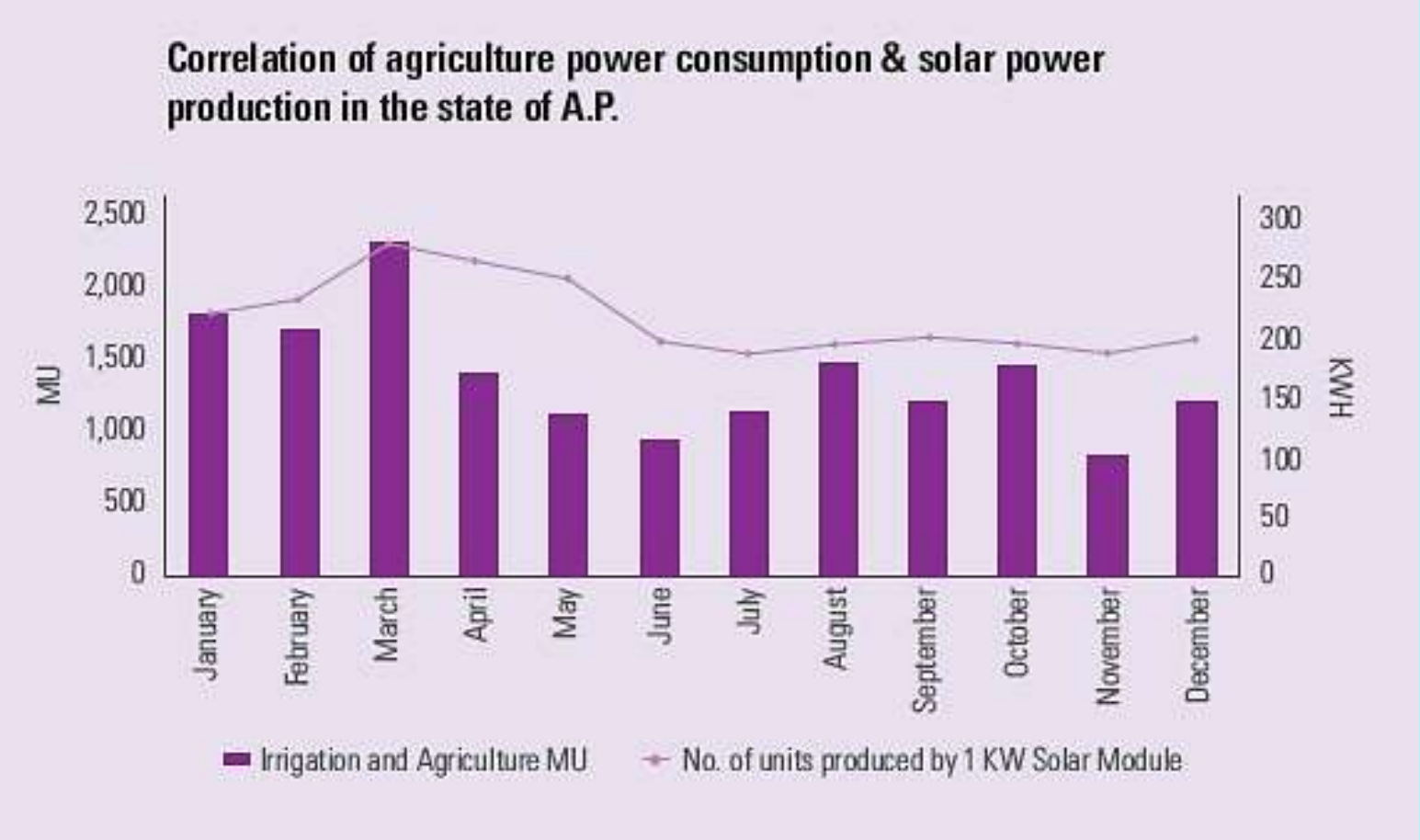






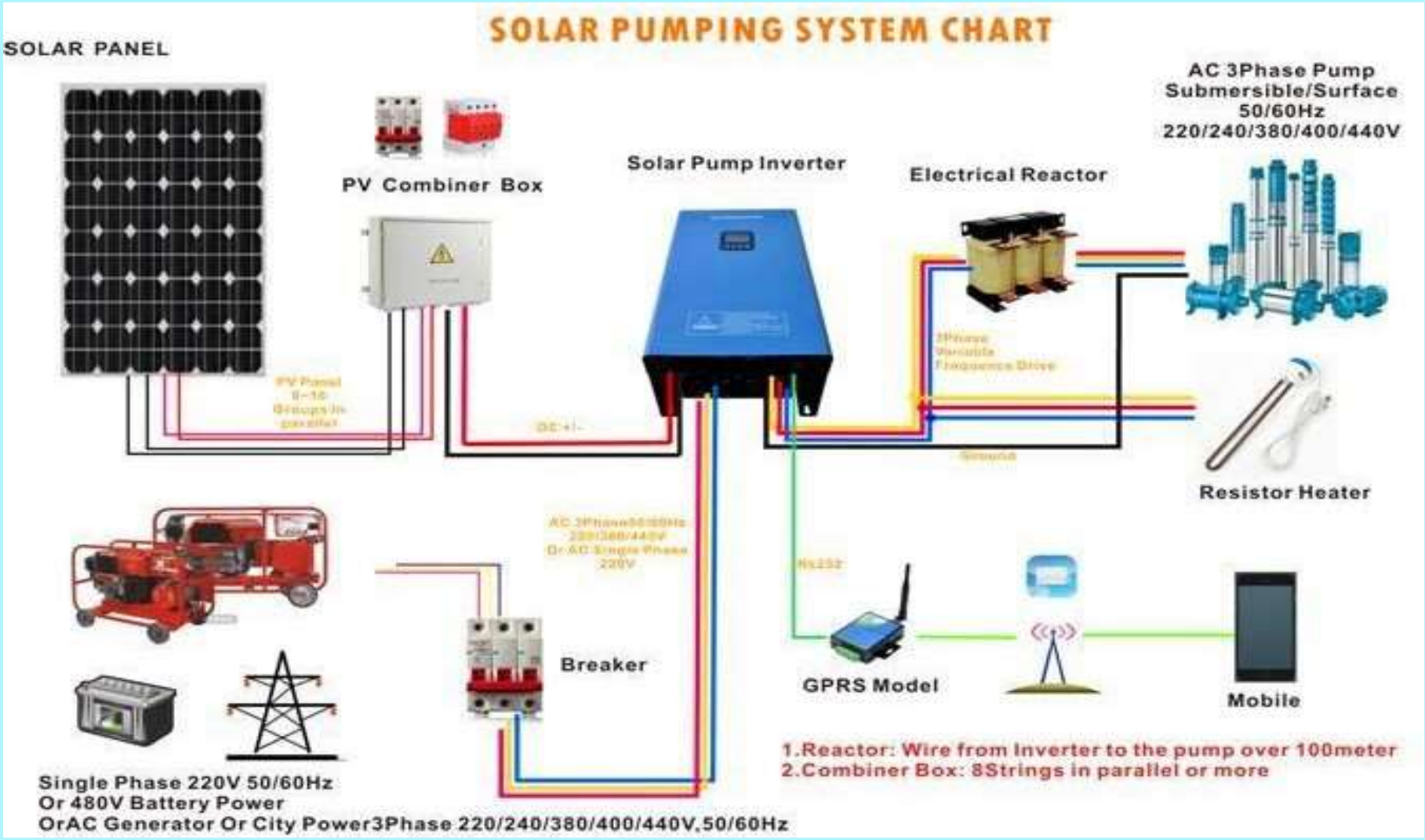
Can be Integrated with Drip Irrigation System

Why Solar Pumps?



In 2014, Government of India announced a target to install 1 million solar water Pumps, a INR 415 Crore package equivalent to approximately 3,000 MW, for irrigation and drinking water by 2021

Grid Connected Solar Pumps



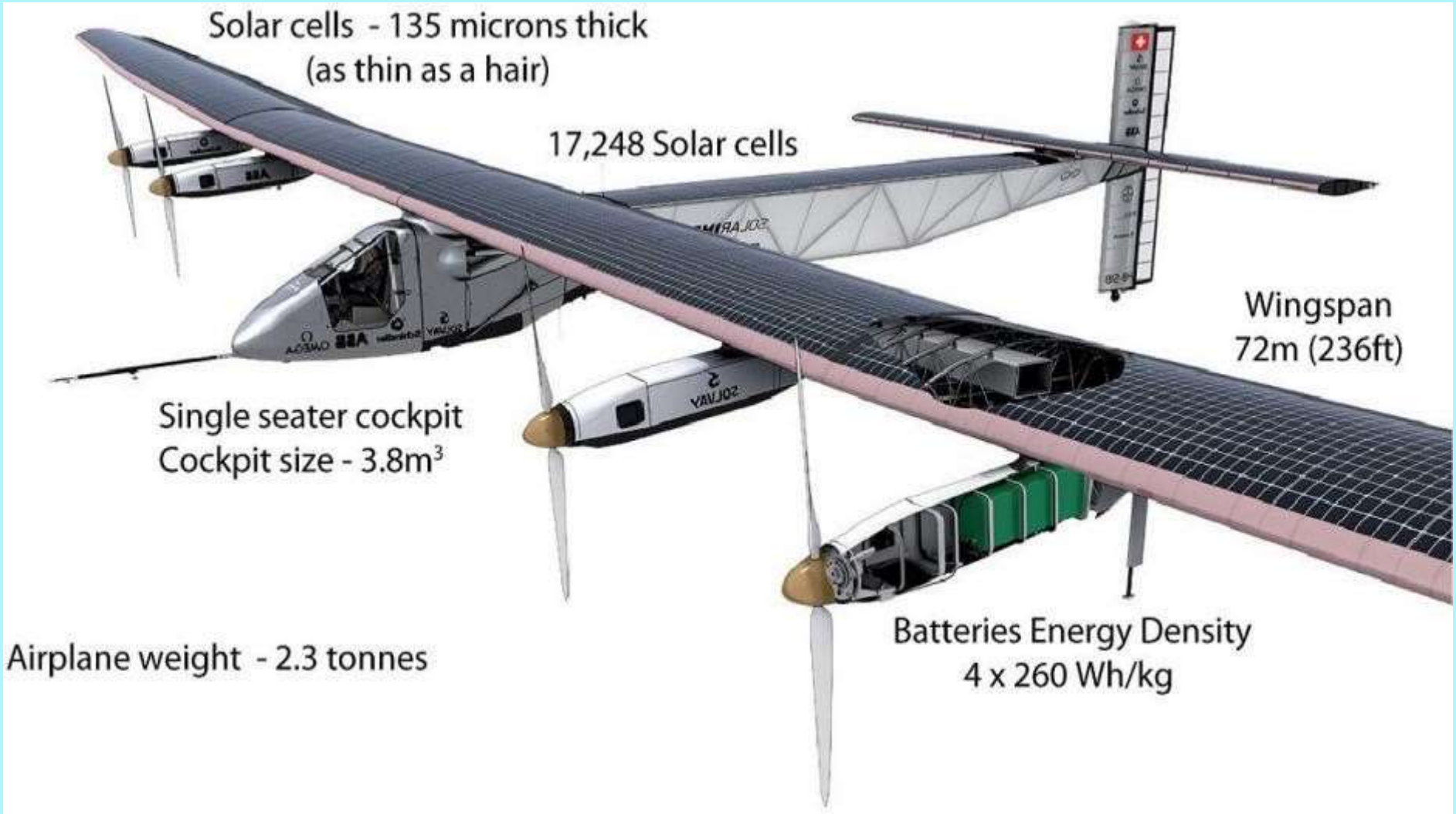
Off Grid Solar Mobility Applications

Solar PV technology - Off-grid mobility applications






Solar Impulse



Solar Impulse

Solar Impulse is a Swiss long-range experimental solar-powered aircraft project, and also the name of the project's two operational aircraft. Wikipedia

Top speed: 140 km/h

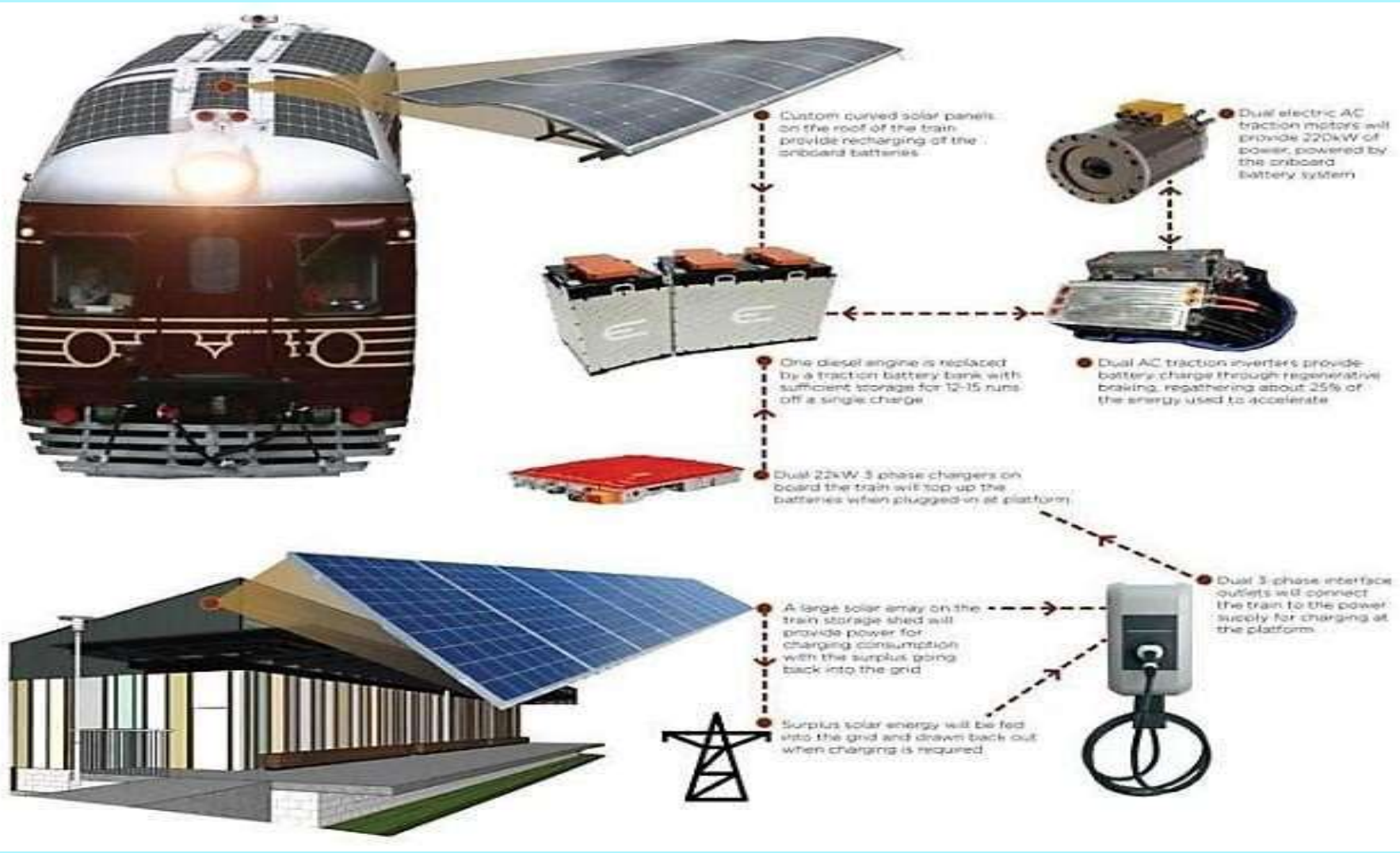
Introduced: 26 June 2009

First flight: 3 December 2009

Manufacturer: Swiss Federal Institute of Technology Lausanne

Engine type: Electric motor

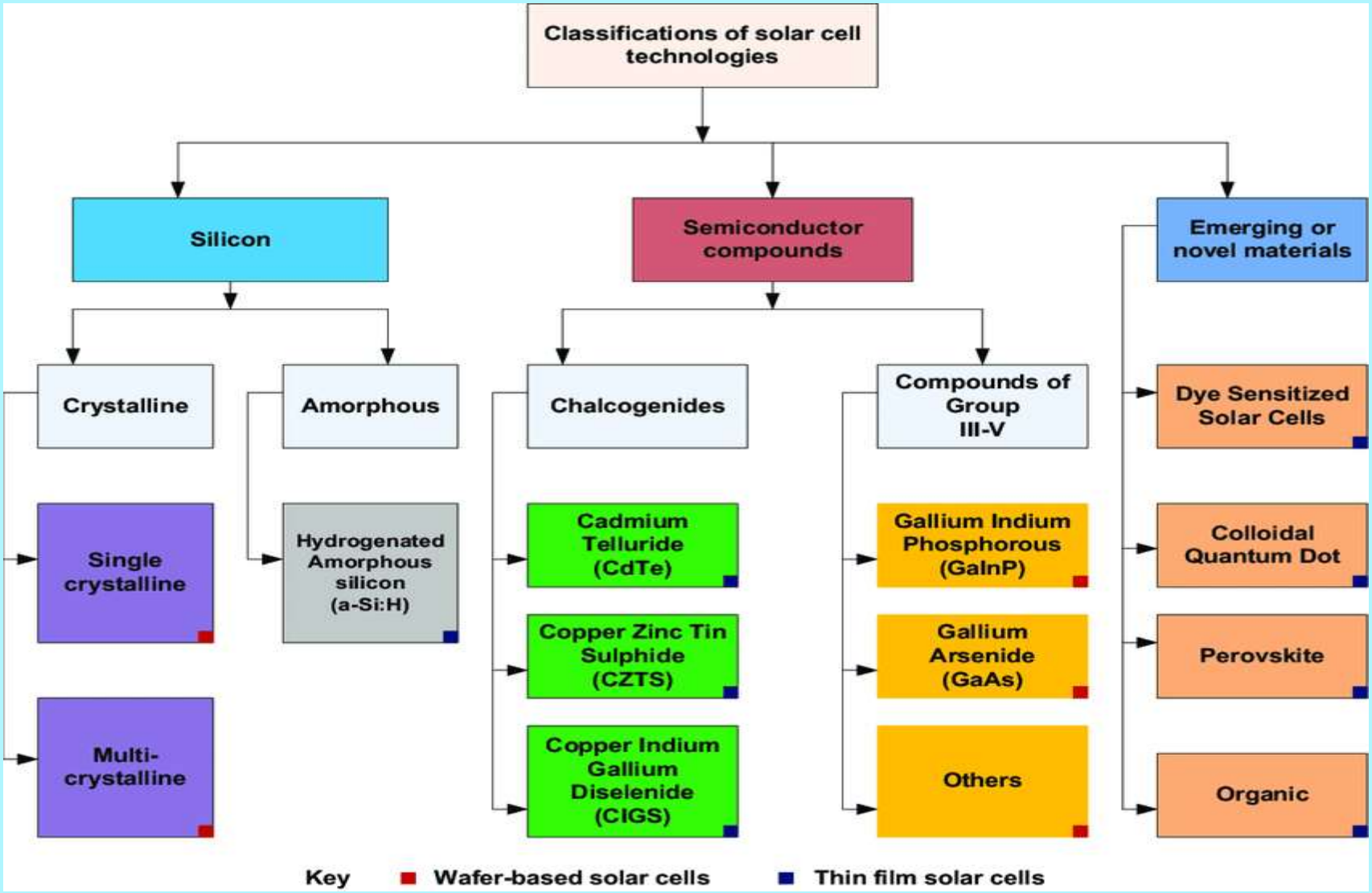
Solar Train


Custom curved solar panels on the roof of the train provide recharging of the onboard batteries
Dual electric AC traction motors will provide 220kW of power, powered by the onboard battery system
One diesel engine is replaced by a traction battery bank with sufficient storage for 12-15 runs off a single charge
Dual AC traction inverters provide battery charge through regenerative braking, regathering about 25% of the energy used to accelerate
Dual 22kW 3 phase chargers on board the train will top up the batteries when plugged in at platform
Dual 3 phase interface outlets will connect the train to the power supply for charging at the platform
A large solar array on the train storage shed will provide power for charging consumption with the surplus going back into the grid
Surplus solar energy will be fed into the grid and drawn back out when charging is required

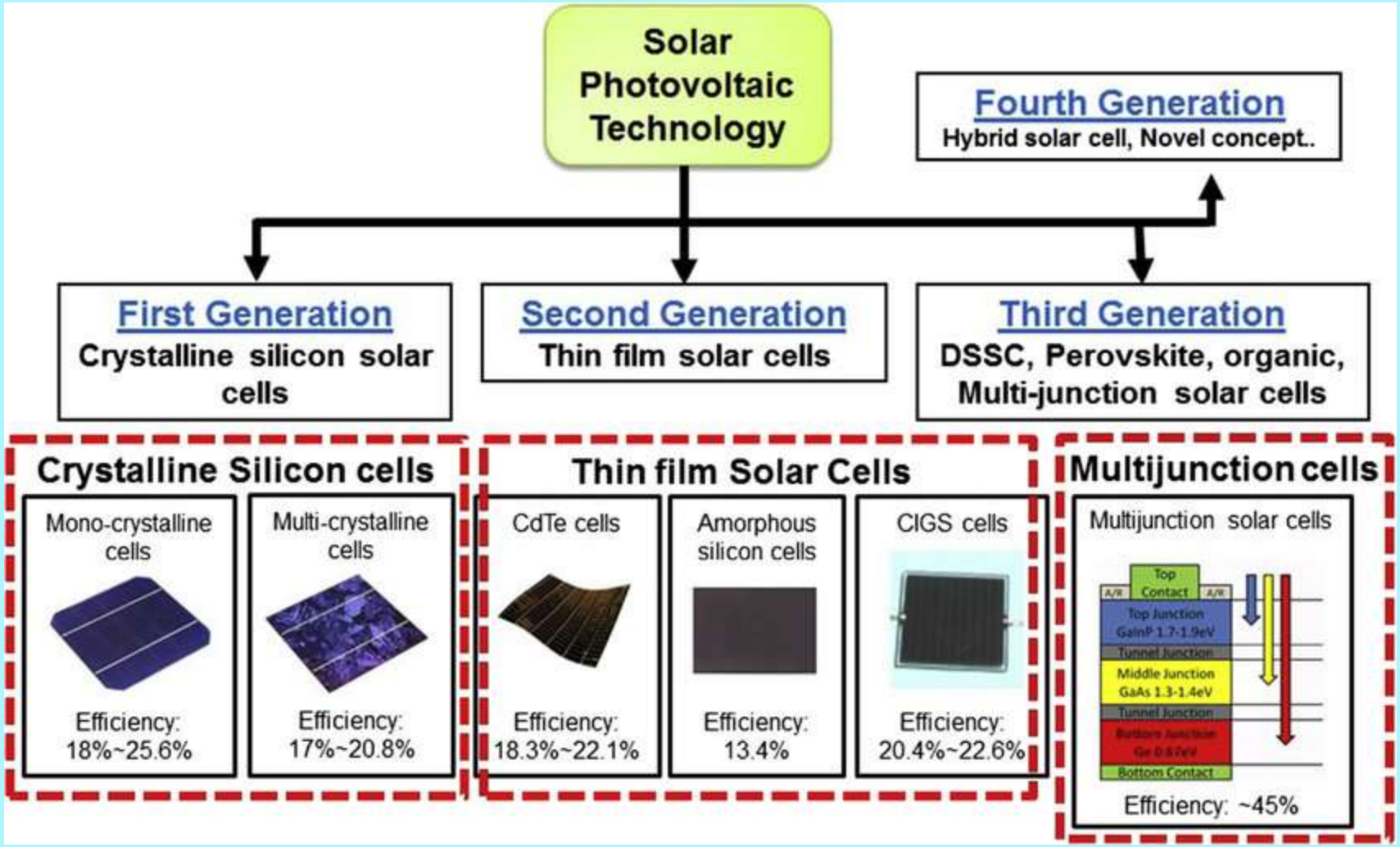
Solar Trains in India

Solar Fence in India

Solar Cell Technologies



Solar Cell Technologies



Solar Thermal Power