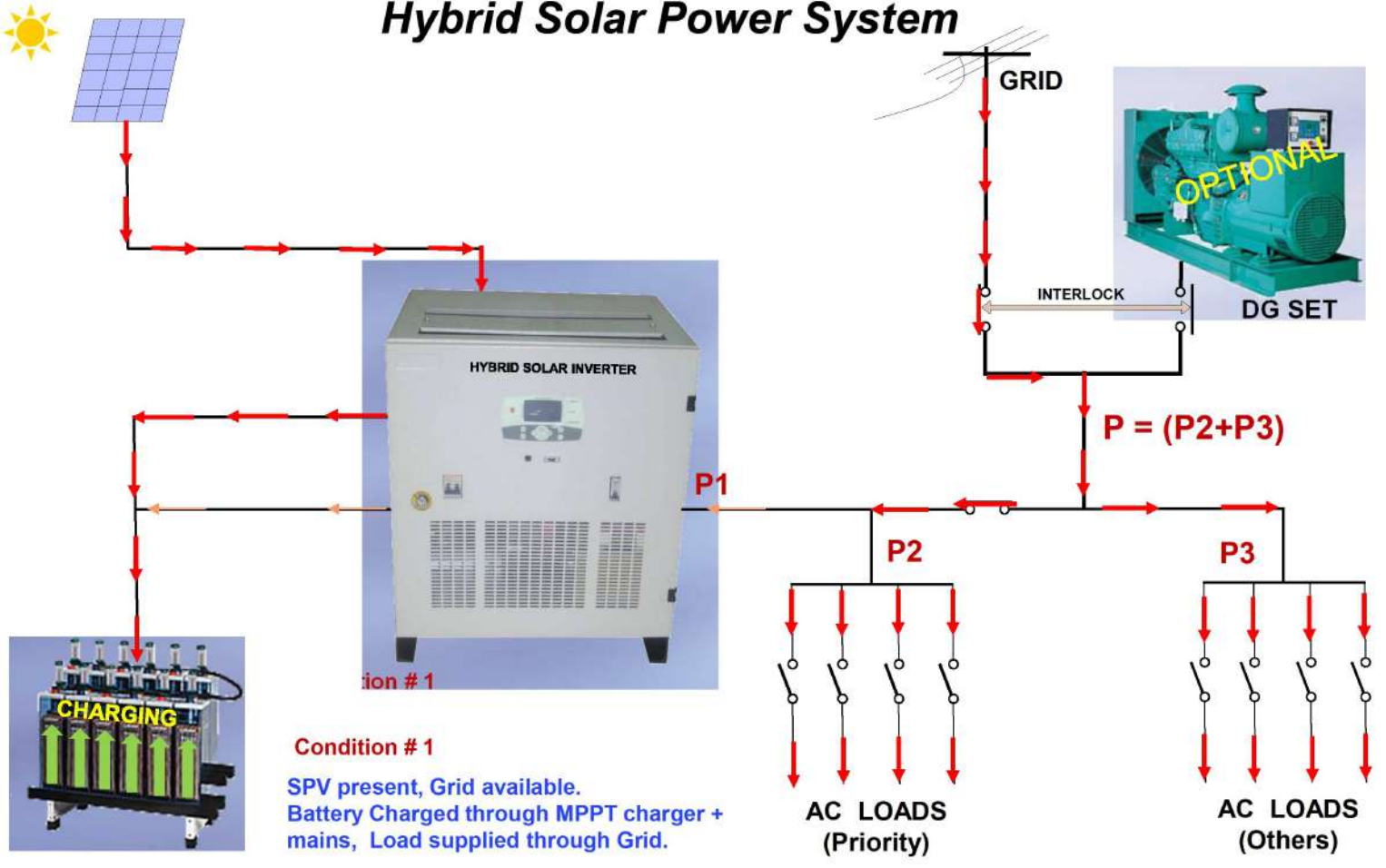


TECHNICAL INFORMATION OF HYBRID

Maximum yield from PV & 100% peace of mind- A critical approach

Hybrid Solar Power System

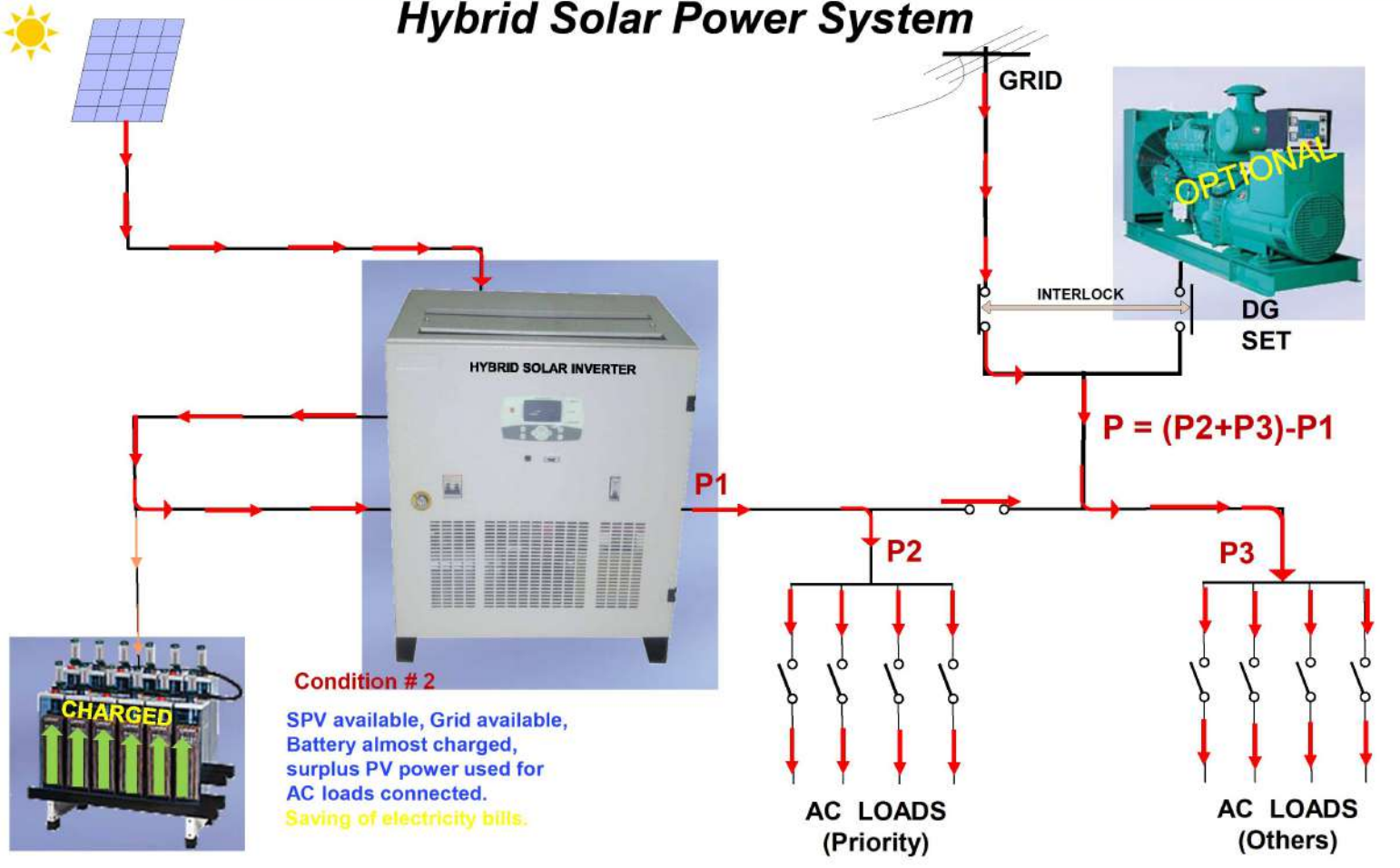


Condition # 1

SPV present, Grid available.
 Battery Charged through MPPT charger + mains, Load supplied through Grid.

Maximum yield from PV & 100% peace of mind- A critical approach

Hybrid Solar Power System

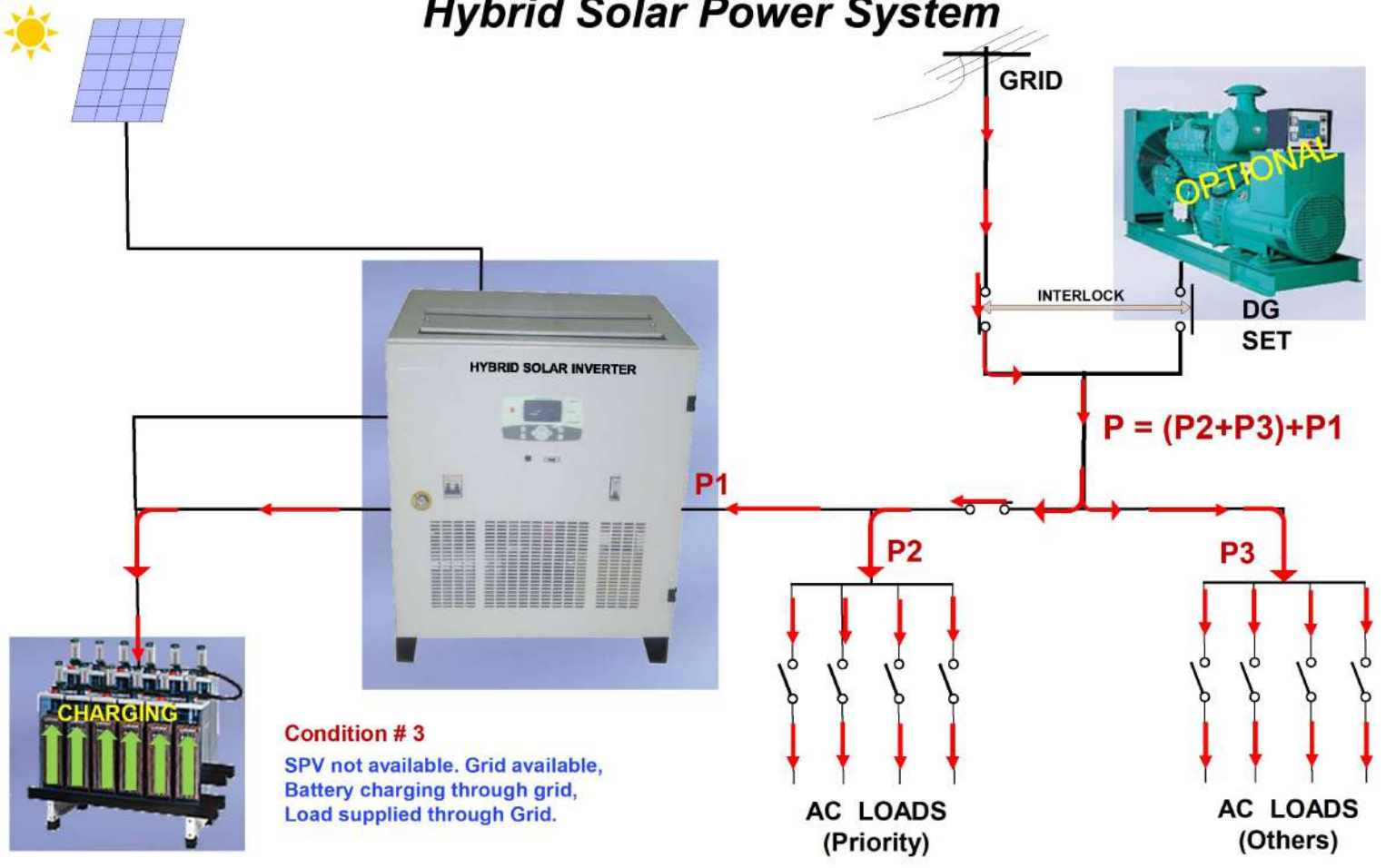


Condition # 2
 SPV available, Grid available,
 Battery almost charged,
 surplus PV power used for
 AC loads connected.
 Saving of electricity bills.



Maximum yield from PV & 100% peace of mind- A critical approach

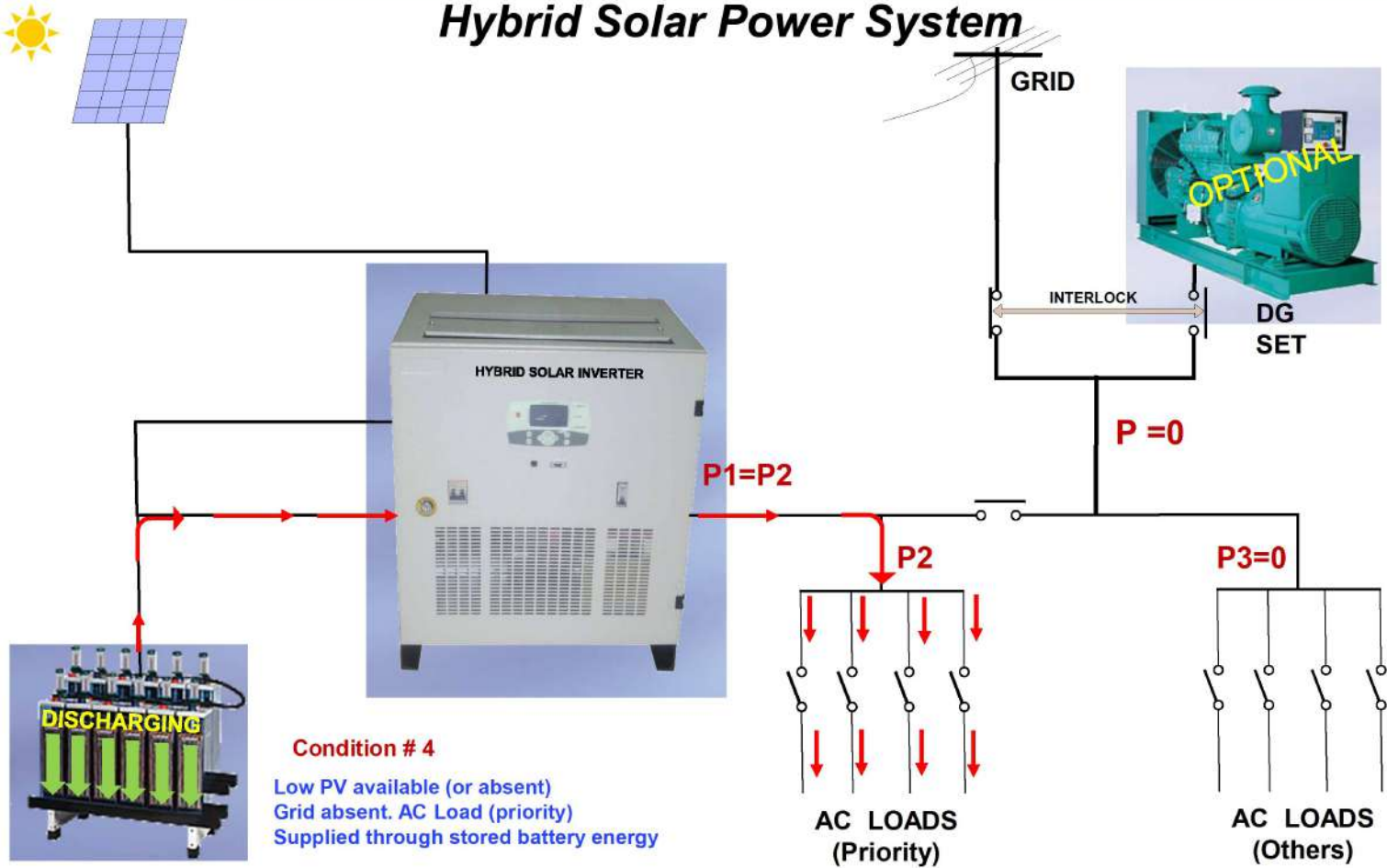
Hybrid Solar Power System



Condition # 3
 SPV not available. Grid available,
 Battery charging through grid,
 Load supplied through Grid.

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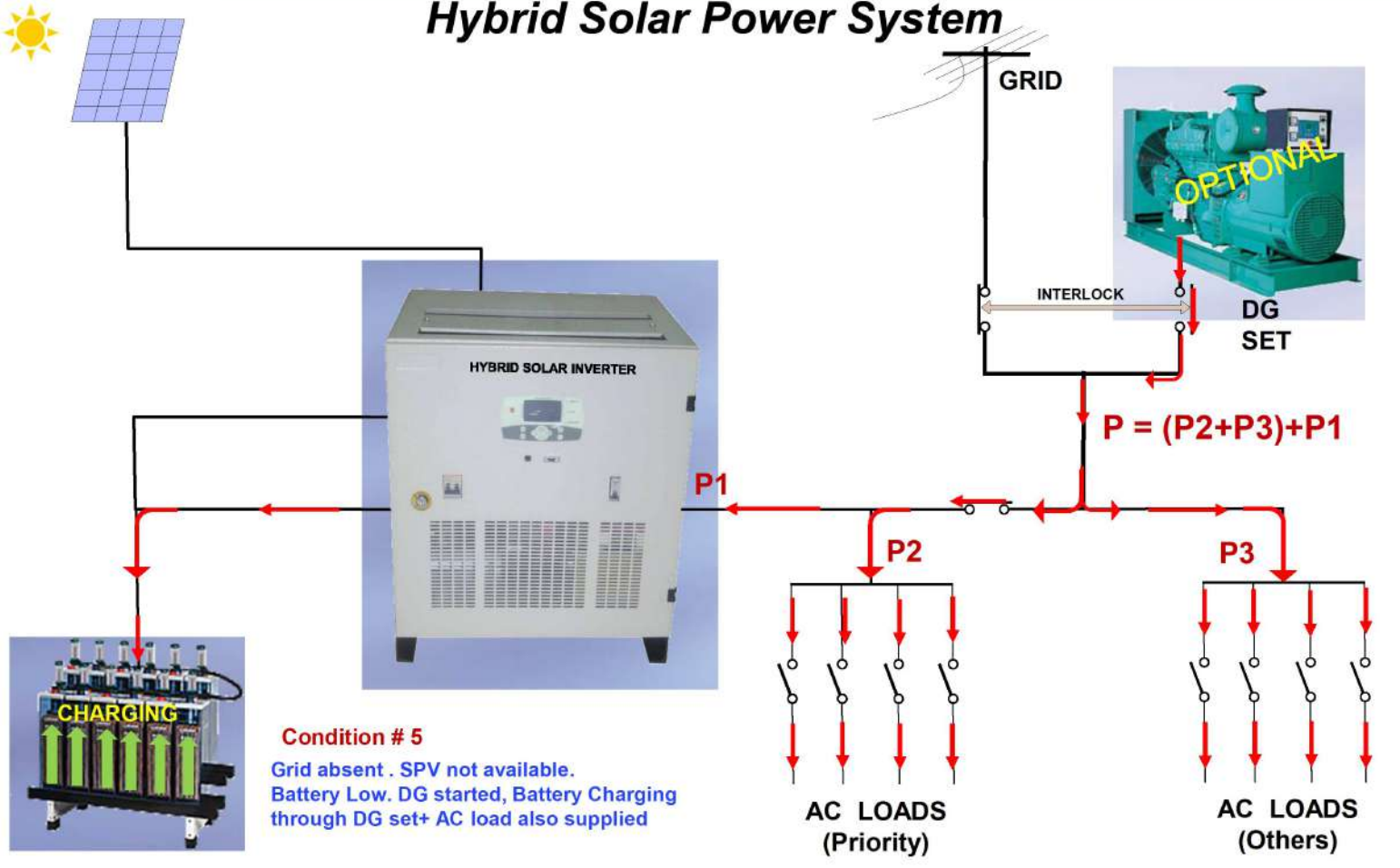
Hybrid Solar Power System



Condition # 4
 Low PV available (or absent)
 Grid absent. AC Load (priority)
 Supplied through stored battery energy

Maximum yield from PV & 100% peace of mind- A critical approach

Hybrid Solar Power System



Condition # 5
 Grid absent . SPV not available.
 Battery Low. DG started, Battery Charging
 through DG set+ AC load also supplied



Maximum yield from PV & 100% peace of mind- A critical analysis

ADVANTAGES OF A HYBRID SYSTEM

- **High level of Battery availability.**
- **Better PV energy conversion efficiency into usable AC Energy.**
- **Lesser battery discharge and hence longer life of battery. It may last up to 8-9 yrs.**
- **Better PV yield resulting into reduced electricity bills.**
- **Highly reliable system and can be used in wide range of URBAN / Industrial / Institutional applications where grid is available on daily basis (8-16 hrs) and fails daily (5-6 hrs min).**
- **Also improves the quality of AC power and can be called solar UPS.**
- **Can be extended for grid export through software once Govt . Allows Bi-directional metering.**

Maximum yield from PV & 100% peace of mind- A critical analysis

Comparison

Sl. No.	Condition / Activity	Stand-Alone System	Hybrid System	Remarks
1.	Solar as priority	Yes	Yes	
2.	Option of greater load connected across Solar output to utilize full PV power generated daily.	No. Only small load be connected due to limitation of dependency on Solar power only.	Greater load can be connected on Solar power to ensure load availability thus ensuring full Solar power yield.	Hybrid system ensures full solar power extraction with better conversion efficiency. Better to use bigger rating PCU with smaller PV .
3.	Conversion efficiency of PV power into usable AC.	Moderate	Very good. On same lines as grid export Inverter.	Hybrid system has better AC conversion eff.
4.	Battery availability and thus peace of mind for buyer.	Moderate. Too dependent on factors like load Vs Battery capacity Vs PV availability. Back-up is grid, which is most unreliable.	Good. Battery remains on top of charge and hence less dependence .PV keeps Batt. Charged and avoids its discharge whenever grid is available.	Hybrid system has better conversion efficiency.
5.	Life of Battery	Very Poor	Very good since Battery remains in charged state	Hybrid system has better battery life + availability .
6.	Type of use	Fails as reliable Energy back-up under all conditions .	Excellent as reliable Energy backup with better use of Solar Power.	Hybrid system has better conversion efficiency.



Maximum yield from PV & 100% peace of mind- A critical analysis

MINIMUM REQUIRED FEATUES OF PCU

- ❖ **MPPT based charging**
- ❖ **Constant current / constant voltage charging**
- ❖ **High PV input range for better efficiency.**
- ❖ **Lighting & surge protection for PV & loads**
- ❖ **Higher battery voltages.**
- ❖ **Correct PV voltage & inverter selection.**
- ❖ **Monitoring of PV power (units) generated or daily / monthly & yearly basis.**
- ❖ **Galvanic isolation of Battery charger output as well as inverter outputs for human safety**
- ❖ **Imbalance loading in 3 phase**
- ❖ **Isolation in Grid export PCU**
- ❖ **Multi MPPT for > 20kw PCU supply for better use**
- ❖ **Temperature compensation during charging for VRLA Battery**