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## Sustainable Cold Storage with Alloy Charge

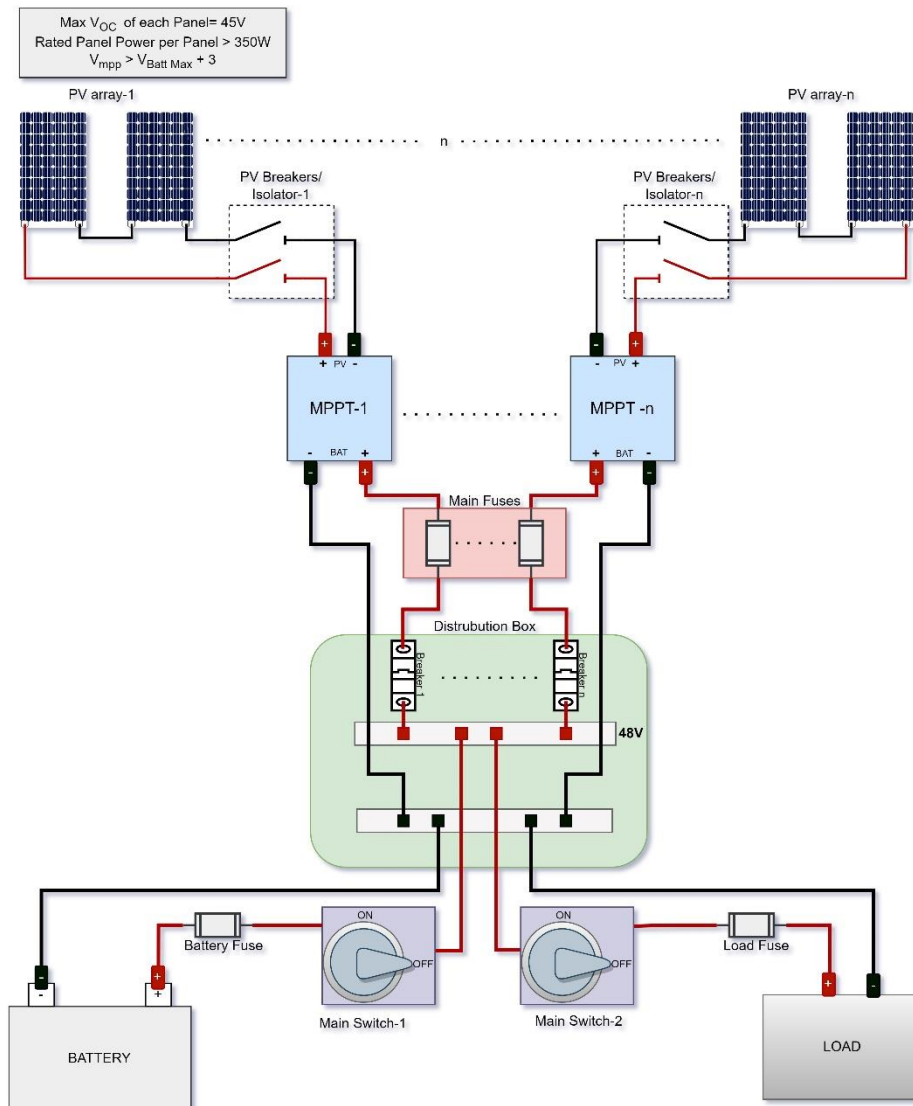
### Introduction:

This document outlines a comprehensive architecture for implementing an off-grid cold storage unit powered by solar energy. This solution leverages Alloy Charge's innovative Solar MPPT Charger, designed to maximize solar power harvest and ensure efficient battery charging.

This architecture empowers you to achieve energy independence and sustainable operation for your cold storage unit, ideal for remote locations or areas with unreliable grid access. By integrating solar power and efficient battery storage, you can maintain consistent refrigeration temperatures while minimizing your reliance on traditional energy sources.

The following sections will delve into the key components, their functionalities, and the overall system design for a reliable and efficient off-grid cold storage solution

### Block Diagram:



## Description:

The system comprises of PV array connected to alloy charge mppt charge controller. An isolator/PV breaker should be provided to disconnect the panel from the charge controller. Based on the load requirement, N number of such systems can be connected as shown in the block diagram. Battery terminal(+ve, -ve) of each mppt controller is connected to the bus bar inside distribution box via individual fuse and breaker. Battery and load can be connected to bus bar. For the purpose of protection and isolation, individual fuse and switch is to be provided for battery as well as load. It is important to note that load should only be used while battery is connected to the system. For cold storage application, load should be connected via inverter. Based on the load and hours of backup required, battery capacity should be chosen.

## Design Example:

### Cold Storage System of 5kWp power with 48V battery

#### System Requirements

Sl No.	Requirements	Specification
1	Solar Panel	5 kW
2	Lead Gel Battery	48V, 200Ah
3	Load	5 kW

#### Alloy Charge MPPT Charger Specification:

Maximum PV open circuit voltage = 90V

Maximum Charging Current output = 20A

For 48V system,

Maximum Power Output of charger =  $48 \times 20 = 960W$

Considering safety factor of 0.75,

Output Power =  $960 \times 0.75 = 720W$

#### Panel Selection Criteria:

While selecting Solar Panels, following criteria should be met:

- 1) Max open circuit voltage of panel  $V_{oc} = 90V$
- 2)  $V_{mpp}$  of Panel  $> V_{Batt\_Max} + 3V$
- 3) Rated Panel Power  $> 700W$

As an example,

1. Loom solar panel 350 watt – mono crystalline

#### Specifications of panel:

Max open circuit Voltage = 44.91V

Voltage at maximum power  $V_{mpp} = 38.50V$

Current at maximum power  $I_{mpp} = 8.84A$

Maximum Power = 350W

No of panels required =  $5000W/350W = 14$  panels

Two panels are connected in series to meet the selection criteria.

No of Chargers required =  $14/2 = 7$  chargers

System can be connected as shown in the block diagram above.