



13/12/2025 10:14 am GMT+5
Panmalewadi Maharashtra
Lat: 17.751131 Long: 73.98638



13/12/2025 10:21 am GMT+5
Panmalewadi Maharashtra
Lat: 17.75116 Long: 73.98642



13/12/2025 10:21 am GMT+5
Panmalewadi Maharashtra
Lat: 17.75116 Long: 73.98642



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ARVIND GAVALI COLLEGE OF ENGINEERING

▪ **ENGINEERING (B.Tech & M.Tech)** ▪ **BCA** ▪ **MCA** ▪ **B.VOC**

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- Phone : 02162 - 261122 , 200100
- e-mail : agcenggsatara@gmail.com
- Website : -www.agce.edu.in

- Institute Code : Engg. DTE EN-6545
- BCA 6545, MCA 6545, B.Voc 6545

Department Of Electrical Engineering

Point no 4 : Installation Of Grid Connected Solar Rooftop / Power Systems.

4 Kw Off Grid Solar Power Plant

This report provides a more detailed, in-depth summary of the 4 kW Off-Grid Solar Powered Plant project, drawing on all the specific information provided in the presentation slides.

1. Project Context and Fundamentals

Project Identification

- **Plant Capacity:** 4 kW Off Grid Solar Powered Plant
- **Institution:** Department of Electrical Engineering AGCE, Satara
- **Academic Year:** 2020-21
- **Guidance:** Mr. P. N. Karande

Introduction to Solar Power

A solar power plant is fundamentally based on the conversion of sunlight into electricity. This conversion can occur via two primary technologies:

- **Photovoltaic (PV) Technology:** This method directly converts light into an electric current using the photoelectric effect. This is the technology used for the solar panels in this system.
- **Concentrated Solar Power (CSP):** This functions as a thermal power plant. CSP systems use lenses or mirrors and tracking systems to focus a large area of sunlight into a small beam. Concentrated solar power plants first appeared in the 1980s.

2. Off-Grid System Architecture

The project utilizes an off-grid system configuration, meaning it is independent of the main utility power grid. The energy flow is precisely controlled through a series of components:

- **Generation (1):** The **Solar Panel** produces DC electricity.
- **Regulation (2):** The DC current is passed to the **Charge Controller** (specifically an MPPT model is shown in the diagram).



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- **Storage (3):** The regulated power charges the **12V Battery** bank.
- **Conversion (4):** The **Inverter** draws power from the battery bank/controller and converts the stored DC power into AC power.
- **Utilization:**
 - **DC Loads:** Can be powered directly from the Charge Controller/Battery circuit.
 - **AC Loads:** Powered by the Inverter, supplying 'Green Power to Home'.

3. Detailed Component Analysis

A. Solar Panel (Photovoltaic Module)

- **Function:** These are the primary components responsible for converting sunlight into electrical energy.



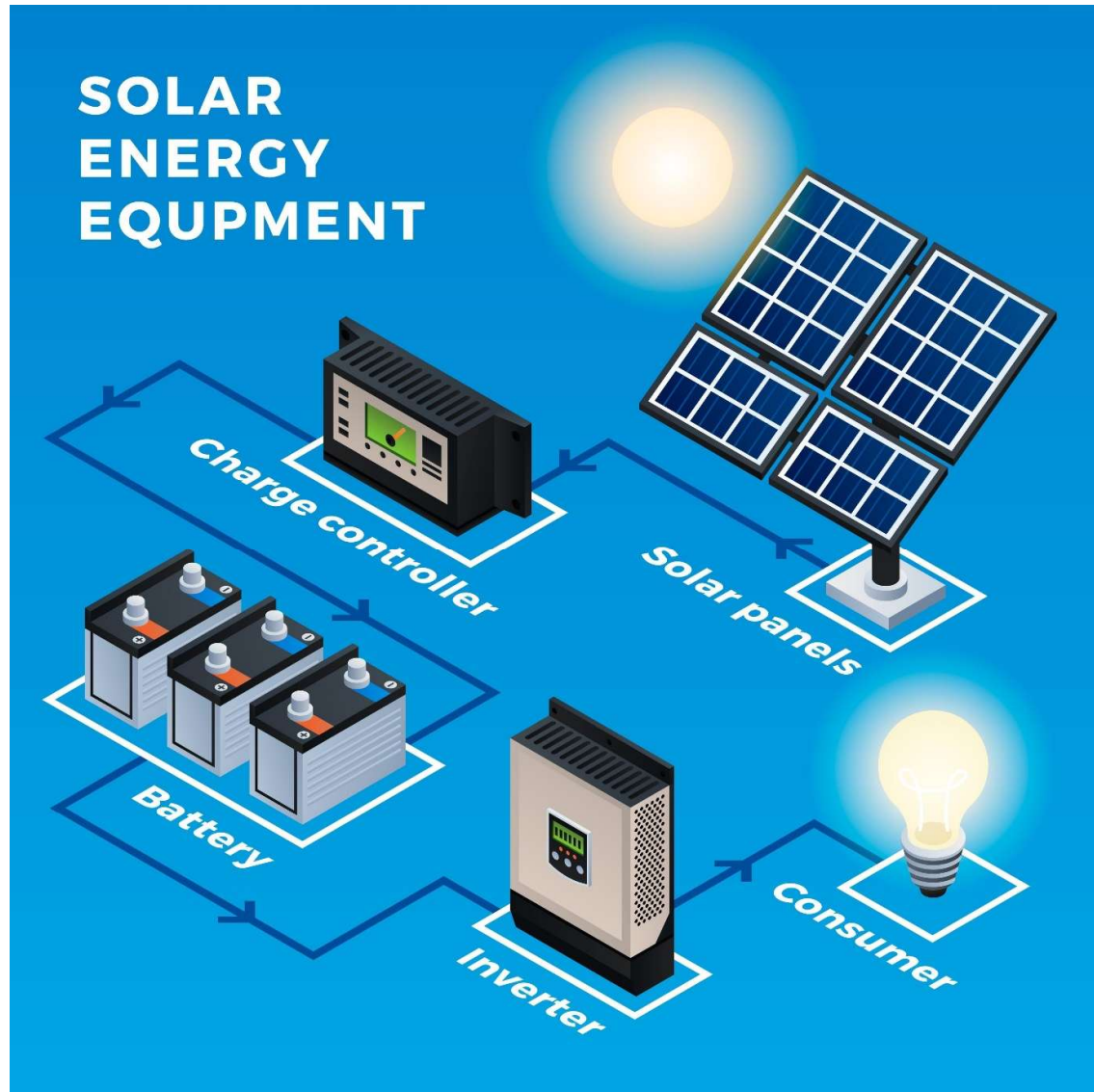
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- **Mechanism:** They consist of many solar cells made from semiconducting materials, such as silicon, that generate **Direct Current (DC)** electricity when exposed to sunlight.
- **Identification:** Also known as photovoltaic (PV) modules.

B. Battery Charge Controller



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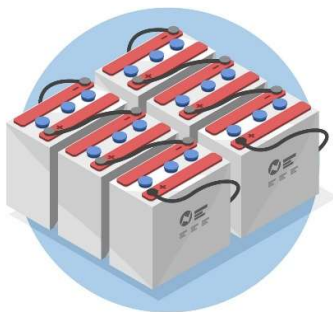
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- **Function:** This is an essential device that regulates the flow of electricity from the solar panels to the battery bank.
- **Safety Features:** It performs critical protective functions, including preventing **overcharging, deep discharging, and reverse current flow.** These measures are vital for ensuring long battery life and safe operation.

C. Battery

- **Function:** The battery bank stores excess energy produced by the solar panels during the day.



Lead Acid



Lithium



Saltwater

Shutterstock

- **Reliability:** Stored energy ensures the system remains reliable, providing continuous power for use at night or during cloudy weather and power cuts. The diagram specifies the use of **12V Batteries.**

D. Inverter

- **Function:** The inverter's core role is to convert the **DC power** (from the panels or batteries) into **AC power.**
- **Application:** The resulting AC power can be utilized by standard electrical appliances.



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- **Grid Context:** In grid-connected setups, the inverter must synchronize the AC output with the grid's voltage and frequency. One of the images includes a tag that mentions the cost for **Solar Panel** equipment is **₹1,72,241**.

4. System Evaluation: Benefits and Drawbacks

The implementation of this solar power plant involves consideration of its specific advantages and disadvantages:

Advantages of Solar Power

- **Resource Longevity:** The sun is essentially an infinite source of energy.
- **Renewability:** Solar energy is a renewable source of energy.
- **Environmental Impact:** It is environmentally very clean and is hence pollution-free.
- **Financial Structure:** The system has low maintenance cost and is considered a one-time investment.

Disadvantages of Solar Power

- **Cost Barrier:** It is characterized by a high initial cost.
- **Availability Limitation:** Solar energy is not available at night or during cloudy or rainy days.
- **Space Constraint:** It requires a large land area for its requirements.

SIDDHESHWAR ELECTRICALS

At Post Sungam Mahuli Phata Satara
Satara, Maharashtra (MH - 27), PIN Code 415003,
India
9850502833 / 8390432832
piyushkarande825@gmail.com
GSTIN: 27APTPK9114K1Z9

Bill to:

Arvind Gavali Collage Of Engineering
Panmalewadi Varye Satara.
Satara, Maharashtra (MH - 27), PIN Code 415015,
India
Place of Supply: MH (27)

NO	PRODUCT / SERVICE NAME	HSN/SAC	QTY	UNIT PRICE	CGST	SGST	AMOUNT
1	Luminous Solar Tubular Battery Luminous LPTT12150H 5 Years FREE REPLACEMENT Warranty 12 Volts 150 Ah		3.000	17,445.310 -Disc. 30%	5,128.920 14.00%	5,128.920 14.00%	46,892.990
	Shipping & Packaging	@0%		1100.00	0.00	0.00	1100.00
	TOTAL		3.000	37735.15	5128.920	5128.920	47992.993

Total: ₹ Forty Seven Thousand Nine Hundred Ninety
Three Only

TOTAL BEFORE TAX 53,435.930
DISCOUNT (-) 15,700.779
TOTAL AFTER DISCOUNT 37,735.150
TOTAL TAX AMOUNT ₹ 10,257.840
ROUNDED OFF 0.007
TOTAL AMOUNT ₹ 47,993
AMOUNT RECEIVED (-) 46,893.000

AUTHORIZED SIGNATORY




Bank Account Details:

Name- Siddheshwar Electricals
Bank Name - State Bank Of India
Account No-39171532395
Ifsc Code-SBIN0017047
Address- Godoli Satara Branch.

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 India
 Place of Supply: MH (27)

NO	PRODUCT / SERVICE NAME	HSN/SAC	QTY	UNIT PRICE	CGST	SGST	AMOUNT
1	Luminous 165 Wp 12 Volts Solar Panel 12 V 165 Wp 25 Years Linear Performance Warranty 2 Years Warranty	8541	15.000	13,238.100 -Disc. 61.63%	1,904.800 2.50%	1,904.800 2.50%	80,001.480
2	Luminous Shine Retrofit 3650 36 V 50 Amp Retrofit 1 Years Warranty	8541	1.000	7,809.520 -Disc. 44.5%	108.360 2.50%	108.360 2.50%	4,551.000
3	Luminous I Cruze 450 I Cruze 4500 4 Kva 36Volts Heavy Duty Super Inverter	8507	1.000	28,117.190 -Disc. 47.35%	2,072.520 14.00%	2,072.520 14.00%	18,948.740

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i Place of Supply: MH (27)

NO	PRODUCT / SERVICE NAME	HSN/SAC	QTY	UNIT PRICE	CGST	SGST	AMOUNT
4	Hot Dip Galvanized Structure Hot Dip Galvanized Heavu Duty Solar Panel Mounting Structure For 15 Solar Panels	7308	1.000	18,516.950	1,666.530 9.00%	1,666.530 9.00%	21,850.000
TOTAL			18.000	113846.82	5752.200	5752.200	125351.215

Total: ₹ One Lakh Twenty Five Thousand Three
Hundred Fifty One Only

TOTAL BEFORE TAX 2,53,015.161
DISCOUNT (-) 1,39,168.341
TOTAL AFTER DISCOUNT 1,13,846.820
TOTAL TAX AMOUNT ₹ 11,504.390
ROUNDED OFF (-) 0.215
TOTAL AMOUNT ₹ 1,25,351
GRAND TOTAL AMOUNT ₹ 1,25,351.000

AUTHORIZED SIGNATORY

Bank Account Details:

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Bank Name - State Bank Of India
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Ifsc Code-SBIN0017047
Address- Godoli Satara Branch.