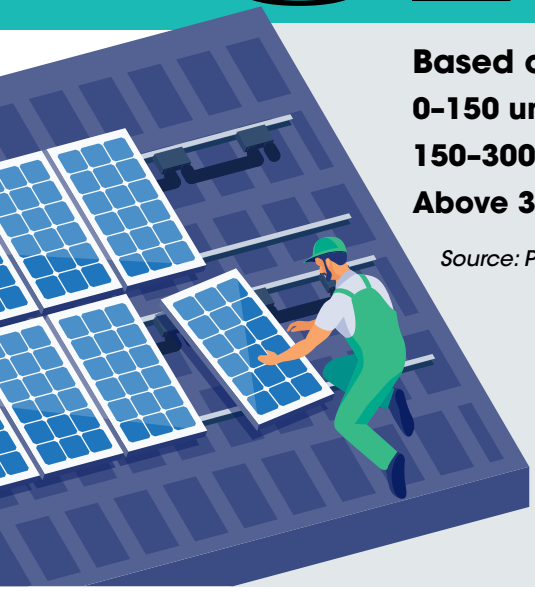
SOLAR ROOFTOP CALCULATOR

A simple guide to installing rooftop solar PV for your home

Thinking of installing rooftop solar but unsure where to begin?

If you are considering installing a rooftop solar PV system but are unsure where to begin, this guide will help you understand what system size may work for your household, how much space you need, and the options available in the market.

01 How much solar PV should I install?



Based on your electricity consumption

0–150 units/month: 1–2 kW system

150–300 units/month: 2–3 kW system

Above 300 units/month: More than 3 kW

Source: PM Surya Ghar: Muft Bijli Yojana – https://pmsuryaghar.gov.in/#/

Monthly electricity use (units)	Recommended solar system size
0–150	1–2 kWp
150–300	2–3 kWp
>300	Above 3 kWp

02 How much rooftop area do I need?

The electricity you can generate depends on the amount of unshaded rooftop space available.

Around 10 sq m (110 sq ft) of unshaded rooftop area is required to install 1 kWp of solar PV.

You may also choose to install solar PV based purely on available space and benefit from peer-to-peer trading (explained later).

Rule of thumb

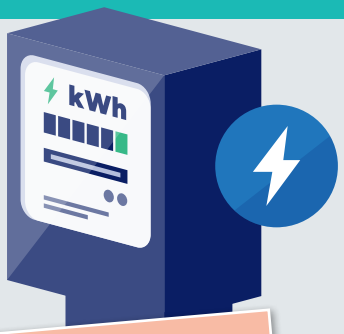
10 sq.m. or ~110 sq.f.t of unshaded rooftop area.

Solar panel of 1 kWp

03 What does 1 kWp mean? How much is it in terms of electricity units?

1 kWp (kilowatt-peak) refers to the maximum power output of a solar PV system under ideal under optimal, standardized conditions

A rooftop solar system rarely operates at its full peak capacity due to factors such as sun angle, weather, dust, shading, and system losses. Consequently, in India, a 1 kWp solar PV system typically generates around **4–5 kWh of electricity per day** under normal conditions.



Rule of thumb

A 1 kWp solar PV system

↓

4-5 kWh (units) of electricity/ day in India

110 sq.f.t of unshaded area

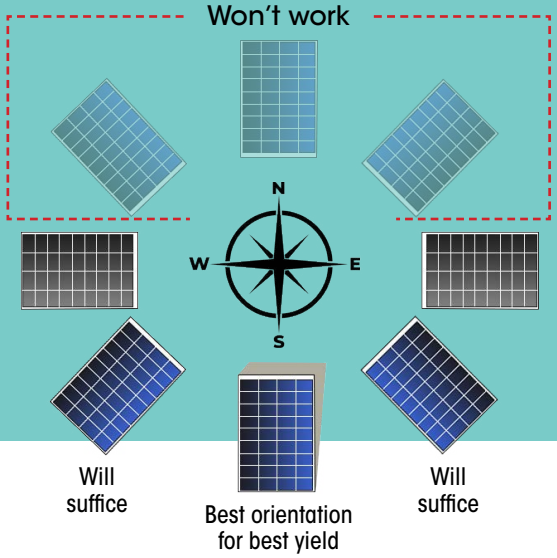
↓

4-5 kWh units of electricity per day

04 Which direction should my panels face?

In India

- **South-facing panels** provide the highest electricity generation.
- **Southeast or southwest** orientations also work well if true south is unavailable.
- **East or west-facing panels** may be considered if other options are unavailable
- North or North-East or North-West facing panels are unsuitable



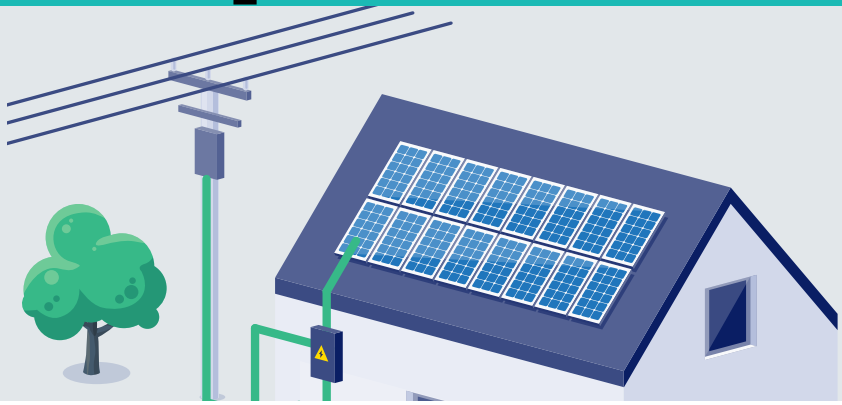
Rule of thumb

South-facing panels work best in India, but southeast or southwest orientations can be made to work if true south is unavailable.

05 What other factors affect the energy generation of the solar panels.

The exact amount of electricity generation will be dependent on your location.

Another factor to consider is the tilt of your solar panel, ideal tilt based on location will give best results.



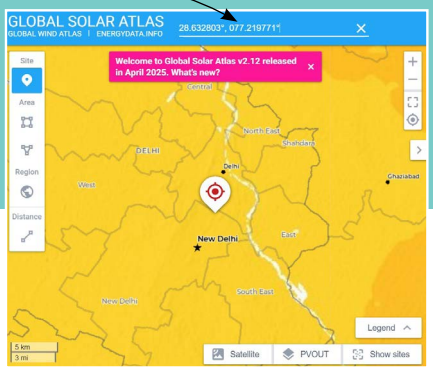
06 What is the ideal tilt for solar panels?

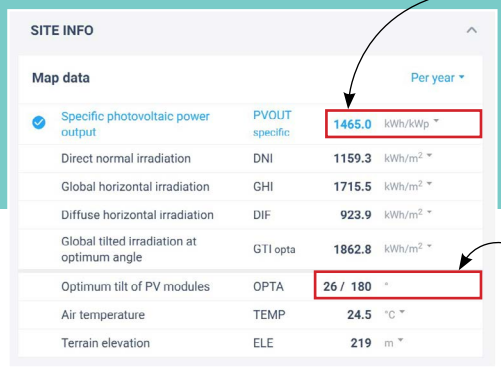
The answer depends on your location. However, across most of India, the optimal tilt angle ranges between **10 degrees and 35 degrees**.

Tools such as the **Global Solar Atlas** can help estimate:

- Daily electricity generation from a 1 kWp system in your location
- Ideal tilt for your location (https://globalsolaratlas.info/map)

Set location





Expected daily electricity generation for a 1 kWp solar panel at the given location.

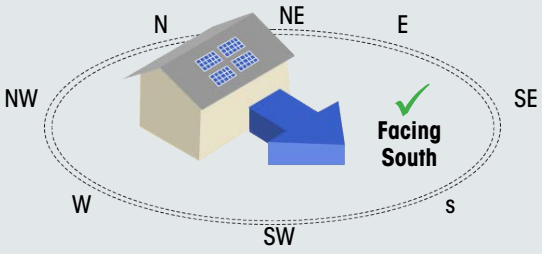
Ideal tilt of panel for the location.

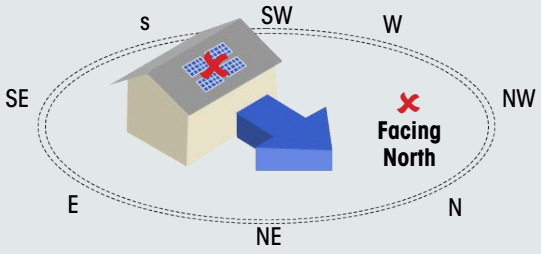
07 Can solar PV be installed on sloped or pitched roofs?

Yes. Most pitched roofs do not exceed **40 degrees**, making installation feasible.

However:

- Output from photovoltaic modules may not be optimal if it exceeds these angles.
- Pitched roofs usually offer less usable area than flat roofs due to having two opposing surfaces
- Roof structure must be able to support the weight of panels and mounting systems.





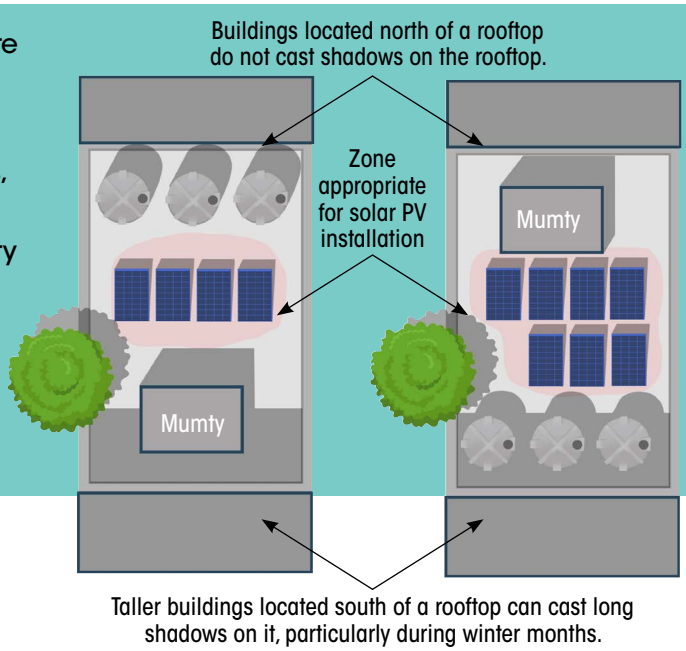
08 How can I estimate the area suitable for solar rooftop placement ?

The following factors determine where the solar PVs can be placed.

- Building orientation
- Space availability
- Shade from nearby buildings, trees, water tanks, mumty structures etc.

Companies that install solar PVs carry out a detailed assessment of the space available before installation.

Areas free from shading by taller structures, either overhead or in the direction the panels face, are most suitable for solar PV installation. The extent of shadow cast by neighbouring buildings increases with building height.

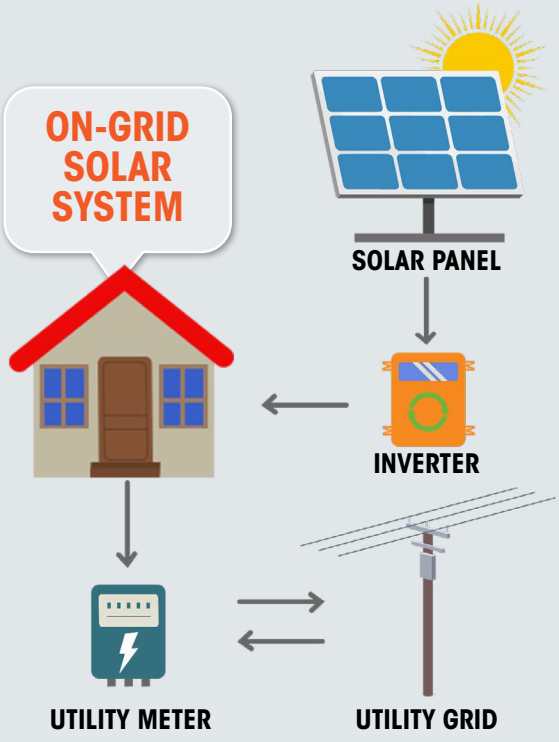


09 What types of solar PV systems exist in the market?

There are two basic systems one can use depending on requirement: on-grid and off-grid

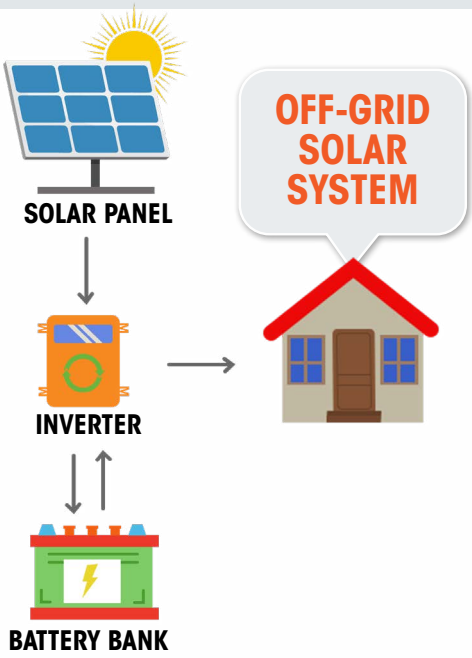
ON-GRID SOLAR PV SYSTEM

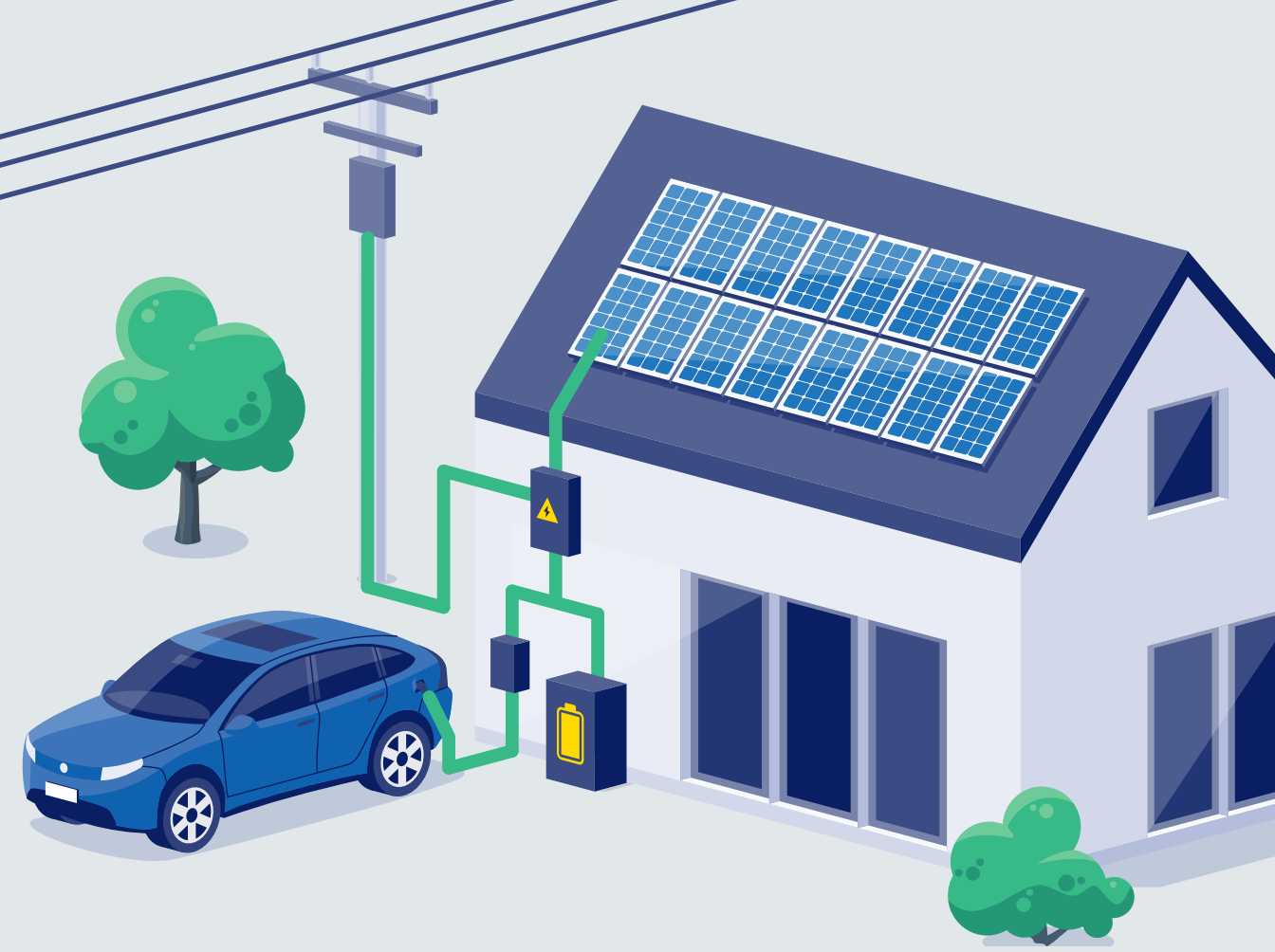
- Generates electricity during the day; excess electricity can be exported to the grid.
- During times when solar panels may not produce enough power, electricity is drawn from the grid instead.
- When extra solar electricity is sent to the grid, the homeowner receives bill credits through net-metering.
- The credits earned from exporting surplus solar help reduce the overall electricity bill.
- Does not provide backup during power cuts as it does not involve batteries, hence it is unsuitable for areas with frequent power outages.
- Best suited for homes with reliable grid supply.



OFF-GRID SOLAR PV SYSTEM

- Stores energy in batteries and operates independently from the utility, ensuring power even during outages.
- Suitable for remote and rural areas with unreliable or no grid access, as well as urban rooftops where net metering is not feasible
- Ideal for areas where higher costs, larger batteries, and the inability to export surplus power limit financial returns.
- Important to remember that some states do not provide subsidies for off-grid systems.





ON-GRID vs OFF-GRID PROS AND CONS

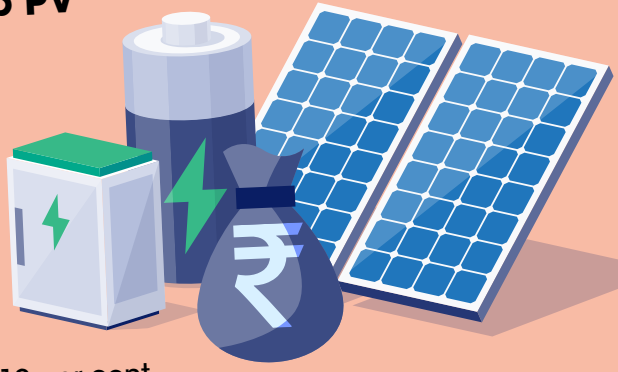
TYPE	Grid backup	Export allowed	Cost	Best use case
On-grid	The system shuts down during power cuts and cannot supply electricity without the grid.	Yes, surplus solar energy can be exported to the grid and credited through net-metering.	Low, since no batteries are required, installation and maintenance costs are lower.	Ideal for homes with reliable electricity supply where the main goal is to reduce monthly bills.
Off-grid	Yes, it operates independently using stored solar energy.	No, the system is not connected to the grid, so surplus energy cannot be exported.	High; requires sufficient battery capacity to meet all energy needs. Some states do not offer subsidies on off-grid systems.	Best for remote locations/ rooftops that cannot be connected to net-metering or unreliable grid areas where complete energy independence is needed.

10 What is the system cost? Is there an extra amount for installing a battery?

ON-GRID SOLAR PV SYSTEMS - ROUGH COSTS

Additional battery charges: Roughly ₹ 85,000 to 1 lakh additional cost per kWp of installed solar panel capacity.

PM Surya Ghar: Muft Bijli Yojana offers subsidy for solar rooftop PV



For residential households:

- ₹ 30,000 per kW (up to 2 kW)
- ₹ 18,000 per kW (for additional capacity up to 3 kW)
- ₹ 78,000 - Total subsidy for systems larger than 3 kW (capped)

For special states, an additional 10 per cent subsidy is applicable per kW.

For details visit https://pmsuryaghar.gov.in/#/

In addition, many states offer their own subsidies both for setup and Generation-based incentive. Hence checkout the subsidy provided by your own state to get a realistic estimate.

11 Apart from rooftops, where else can one install solar PVs?

There are multiple ways in which solar PV modules can be integrated into a building apart from rooftop:

Chajjas over window

Space frames

Vertically in balconies

Over outdoor parking

Over balconies

Over common facilities

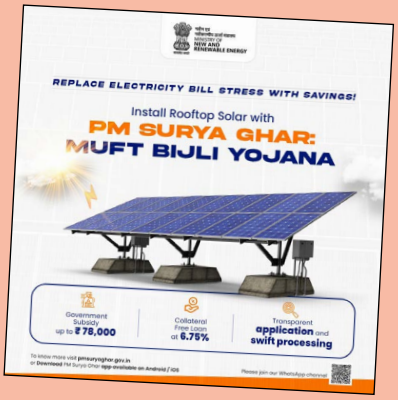
External solar lighting

PM Surya Ghar: Muft Bijli Yojana offers subsidy for solar PV in common areas

For Group Housing Society/Resident Welfare Association:

- ₹ 18,000 per kWp for common facilities, including EV charging, up to 500 kW Capacity (@3 kW per house) with the upper limit being inclusive of individual rooftop plants installed by individual residents in the Group Housing Society/Resident Welfare Association

For details visit https://pmsuryaghar.gov.in/#/



12 What funding and installation models are available?

What funding and installation models are available?

CAPEX MODEL

- Consumer purchases and owns the system directly from the solar vendor
- Customer is responsible for maintenance
- Customer can earn from selling surplus electricity.

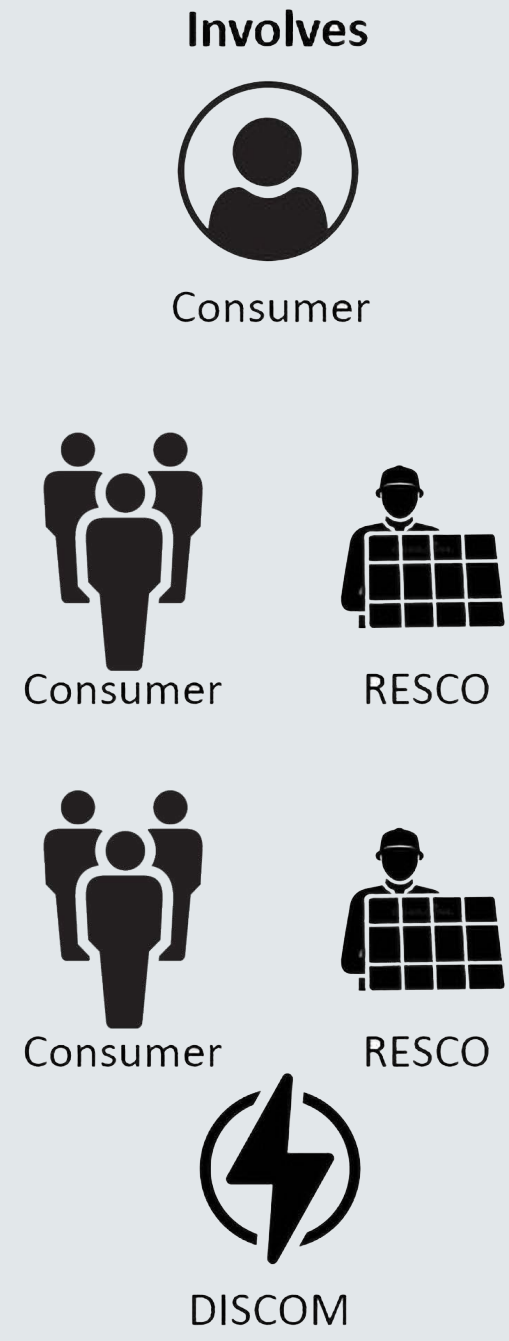
RESCO MODEL

- RESCO installs, owns, and maintains the rooftop solar system on the consumer's property.
- The consumer does not pay for the system upfront; instead, they pay the RESCO for the electricity produced at a tariff decided in the Power Purchase Agreement, usually cheaper than regular grid rates.
- The consumer also receives net-metering benefits for excess energy sent to the grid.

HYBRID RESCO MODEL

- This model involves a tripartite agreement between consumer, DISCOM, and RESCO.
- RESCO sells the solar power generated on the consumer's rooftop to the DISCOM, which then supplies it to the consumer.
- The consumer pays a single bill that includes solar power at the PPA rate plus any additional grid consumption.
- The consumer continues to receive net-metering benefits, and the DISCOM pays the RESCO according to the PPA terms.

(Source: https://eerem.delhi.gov.in/eerem/pathways-install-solar)



13 Can I benefit from solar if I don't own a rooftop?

Some consumers cannot install rooftop solar panels because they do not have their own roof (e.g., tenants, apartment residents) or their roofs are too small or shaded. Some states such as Delhi have made multiple provisions for such a scenario:

COMMUNITY SOLAR MODEL

- Consumers buy a share of a solar power system that is installed elsewhere (usually owned by a third party).

or

- A group of consumers may jointly install a solar plant on one member's rooftop.
- Electricity from the shared plant is fed into the grid, and each participant receives bill credits in proportion to their ownership share.

GROUP NET METERING

Consumers with multiple properties or connections can use surplus solar power across them, provided all fall under the same DISCOM.

PEER-TO-PEER TRADING

Consumers without their own rooftop solar can purchase surplus electricity from other consumers via peer-to-peer energy trading platforms.

(Source: https://eerem.delhi.gov.in/eerem/pathways-install-solar)

14 Do solar PV systems require maintenance?

Yes. Regular maintenance is essential. Rooftop solar panels perform best when they receive maximum sunlight.

- In India, where dust, air pollution, bird droppings, and seasonal pollution are common impediments when it comes to solar panel function.
- Dirt accumulation on panels can significantly reduce electricity generation, even upto 30 per cent or more if not cleaned regularly.

WHY MAINTENANCE MATTERS

- Regular maintenance helps ensure that the system operates efficiently, lasts longer, and provides the maximum return on investment. Early detection prevents costly repairs.
- It also helps detect potential issues early, such as loose wiring, shading from new structures or trees, or panel degradation, preventing costly repairs later.

14 Do solar PV systems require maintenance?

Tips for maintenance of solar PVs

Schedule cleaning regularly: In dusty or polluted regions, clean panels every few weeks; reduce frequency in less dusty environments

Pick the right time of day: Clean early morning when panels are cool as heat-water combination can damage equipment.

Use gentle cleaning methods: Rinse with clean water, use a soft microfiber cloth or sponge, avoid abrasive scrubbers or harsh chemicals. For higher installations, use a telescopic wiper with long handle.

Check for shading and damage: During cleaning, inspect panels for cracks, loose wiring, soiling at edges, or new shadows. Shading one module may reduce output of whole string.

Document and monitor performance: Keep a log of cleaning dates and monitor energy output via the inverter or monitoring app. A sudden drop may indicate a maintenance issue or cleaning requirement.

Avoid walking on panels: Do not step on modules.

Seasonal considerations:

- **Summer / Dust seasons:** High ambient dust — increase cleaning frequency.
- **Monsoon:** Rain clears some dust but may leave water spots; clear leaves and debris.
- **Winter / Smog seasons (North India):** Air pollution deposits fine particulates; cleaning becomes important even if rains are infrequent.

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