

TECHNO-COMMERCIAL PROPOSAL

ROOFTOP GRID CONNECTED SOLAR POWER PLANT

COMMERCIAL & INDUSTRIAL BUILDINGS

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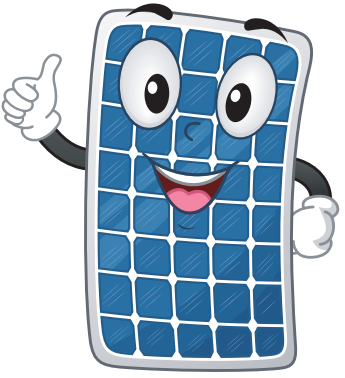
WHAT IS ROOFTOP GRID CONNECTED SOLAR POWER PLANT?

The solar power sector in India has emerged as a fast upcoming section in the last few years. It supports the nation's agenda of sustainable growth, while, emerging as an integral part of the solution to meet the nation's energy needs and an essential player for energy security. India has achieved 4th rank in the world in solar power deployment.

A rooftop grid-connected solar power plant is a solar energy system installed on the rooftop of a building that is connected to the electricity grid. The solar panels on the rooftop convert the energy from sunlight into DC electricity, which is then converted into AC electricity using an inverter. This AC electricity is used to power the electrical loads of the building, and any excess electricity generated is fed back into the grid.

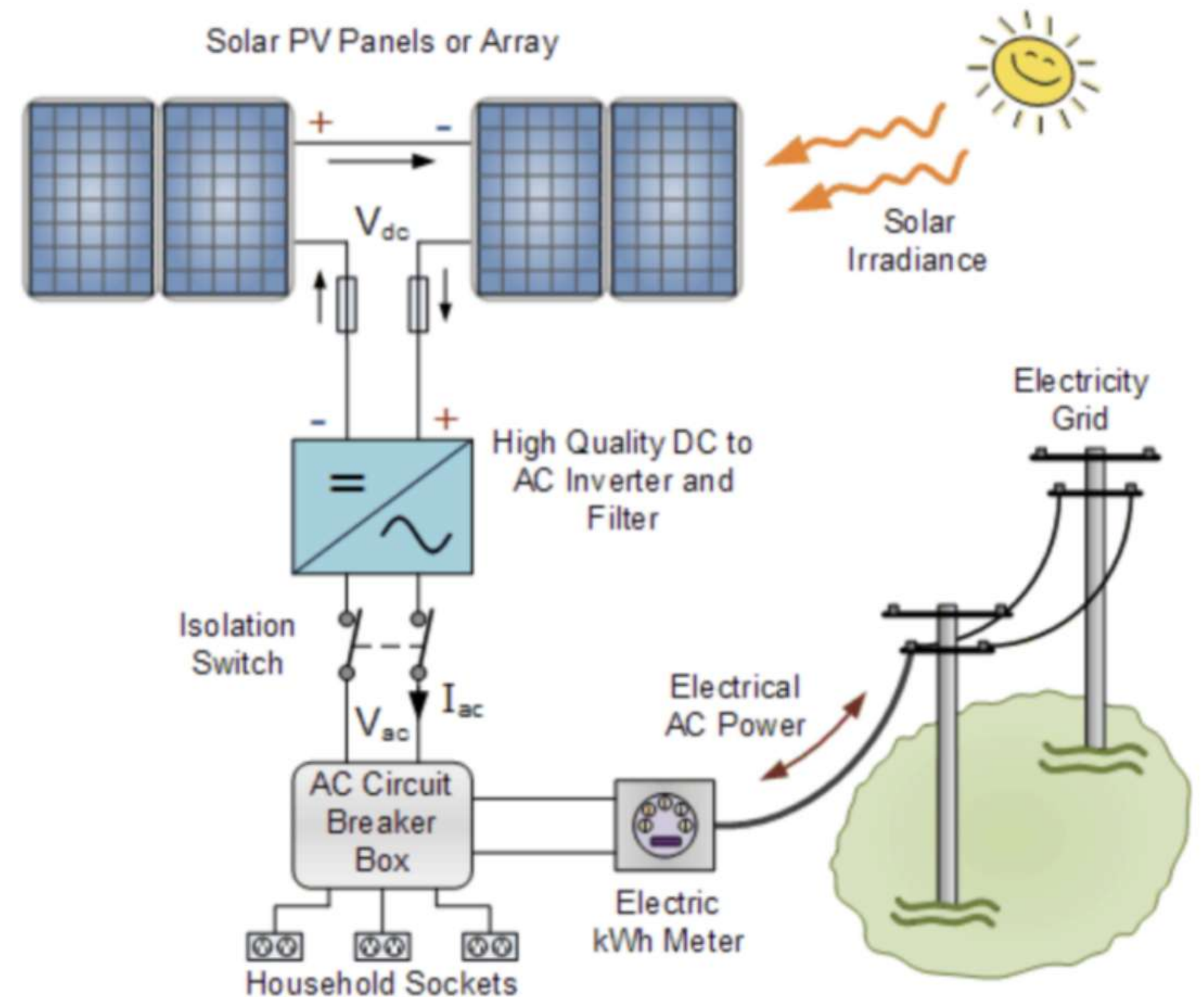
The grid connection allows for the solar power system to supplement the building's electricity consumption with power from the grid when solar power production is insufficient, and to export excess solar power back into the grid when solar production is high. This can help reduce the building's reliance on fossil fuels and reduce greenhouse gas emissions. Additionally, some utilities may offer net metering programs that allow the building owner to receive credits for the excess solar power generated, which can help offset their electricity bills.





Solar System Explained

Simplified Grid Connected PV System



Major components of solar power plant

Operating modes of grid-connected rooftop solar PV systems can be explained by understanding its major components.

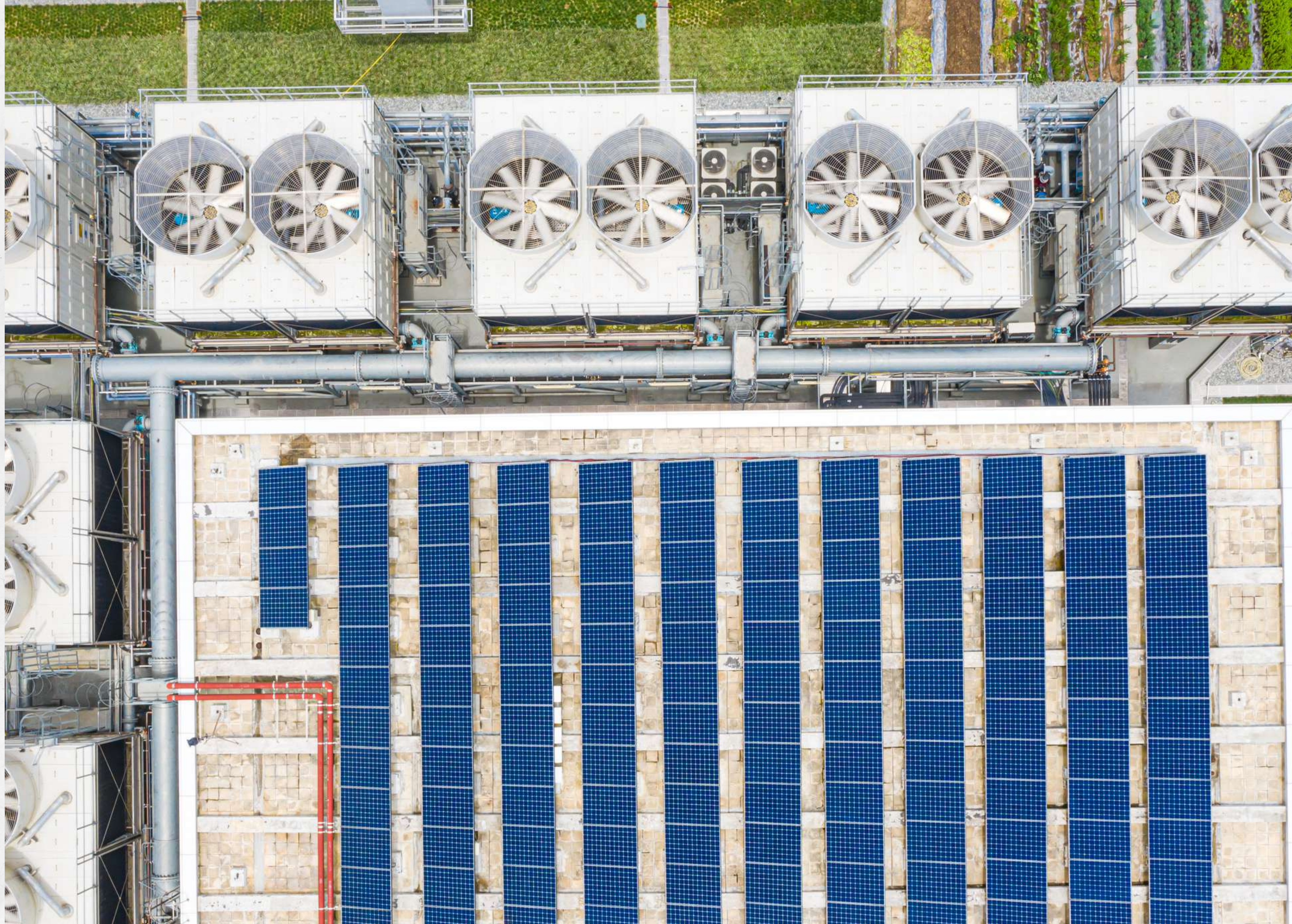
1. **Solar Panel:** The Solar PV modules/Solar Panels convert solar energy to DC (direct current) electrical energy. solar Panels use light energy that is photons from the Sun to generate electricity through the photovoltaic effect. Mainly two types of solar panels in the Indian market which are polycrystalline and monocrystalline. Multiple panels are connected together to form arrays as per the desired capacity of the system.
2. **Inverter:** The solar inverter is the heart of the PV System. Inverter converts the variable DC output of Solar PV panels into AC power which in turn needs to be converted into acceptable form (AC) to run electrical devices. Inverter also synchronizes with the grid so that generated power from the module can be injected into the grid.
3. **Module mounting structure:** The module mounting structure, is the support structure that holds the Solar PV panels in place for full system life and is exposed to all weather conditions. These are normally fixed at particular angles and orientations in the case of solar rooftop systems.
4. **Bi-direction Meters:** Meters are used to record the generation or consumption of electricity. Bi-direction (or Net-Meters) are used to keep track of the electricity that solar PV system injects into the utility grid and the electricity that is drawn from the utility grid
5. **Balance of System:** These consist of cables, switchboards, junction boxes, earthing systems, circuit breaker, fuses, lightning protection system, etc.



Rooftop grid-connected Solar Plant at commercial buildings



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Advantages of Rooftop grid connected solar power plant?

- A photovoltaic power system is carbon negative over its lifespan. Long-term energy and ecological security by the reduction in carbon emission. Contribute to a clean and green environment.
- Improvement in the tail-end grid voltages and reduction of system congestion.
- Utilization of available vacant roof space, no additional land required.
- Reduces T&D losses as power consumption and generation are collocated. Save more money with net metering.
- No additional requirement of transmission and distribution (T&D) lines.
- The utility grid is a virtual battery.
- Minimum maintenance of the system.
- The solar system is silent because they don't produce sound hence it doesn't create noise pollution.
- Solar reduces the need for finite sources, unlike other conventional-based power-generating systems.
- Meeting of the Renewable Purchase Obligations (RPOs) of obligated entities.
- Better management of daytime peak loads by DISCOM/ utility.



- **How much area is required for a 1 kW rooftop Solar PV system?**

1 kW rooftop system generally requires 10 sq. meters of shadow-free area. However, actual area requirements may vary depending on the efficiency and type of solar module, their placement, etc.

- **Why do I need a shadow-free area for modules?**

Solar modules (and cells within) need uninterrupted sunlight to produce maximum electrical energy. With the shadow even on a part of the module, the generation reduces to a great extent thereby wasting installed system capacity. Also, prolonged (regular, though intermittent) shadow on some cells or modules reduces their life substantially and these become useless much before their standard life of over 25-30 years.

- **What types of roofs are suitable for Rooftop solar (RTS) systems?**

Rooftop solar PV systems can be installed on any type of roof having sufficient load-bearing capacity. The most commonly used roofs are Tin shed and RCC based.

- **What is the daily energy generated from a 1 kW Solar Power Plant?**

On a clear sunny day, a 1 kW solar power plant can generate 4 to 6 units in a day.

- **Will I get constant/same energy from the RTS all year round?**

No, the daily energy generation from the Rooftop Solar plant shall be dependent on the temperature, weather conditions, and solar irradiance among other parameters and these may not be the same every day.

- **What are the factors affecting generation?**

Plant Location, Quality of equipment used, No. of sunshine hours, Workmanship PV module tilt angle and orientation, Module Cleaning O&M activities, etc.



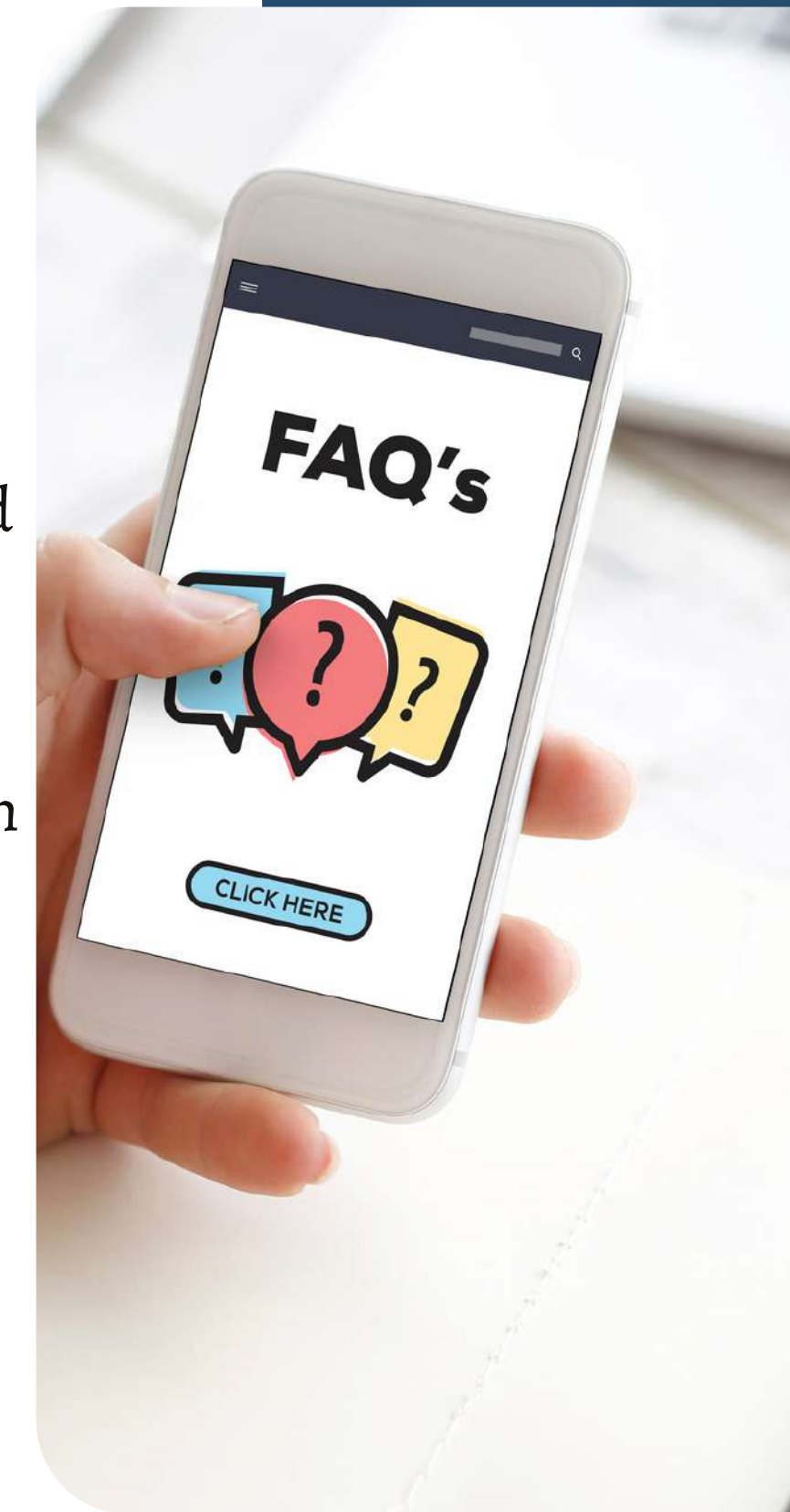
- **There is a presence of monkeys in our area. Would they be damaging the Rooftop Solar?**

The solar modules are made up of toughened or tempered glass tops and so are not easily broken due to monkeys or any falling objects. These can be broken if deliberately someone throws stones. Guarding of module surface with wire mesh is one solution for monkey menace, but not recommended because this regularly casts a shadow on the modules.

- **What are the O&M aspects of a grid-connected rooftop solar PV system?**

Compared to most other power-generating technologies, solar PV systems have very low maintenance and servicing requirements. However, suitable maintenance of a PV plant is essential to optimize energy yield and maximize the life of the system. Some of the maintenance activities typically may include but are not limited to the following:

- Module cleaning is required periodically (dust, bird dropping, and other debris can cause a decrease in power generation)
- Periodicity depends on local conditions like dust, birds, air pollution, etc.
- Checking module connection integrity
- Checking junction boxes/string combiner boxes
- Inspecting the mechanical integrity of mounting structures
- Tightening cable connections that have loosened
- Replacing blown fuses
- Repairing lightning damage
- Repairing equipment damaged by intruders or during module cleaning



- **What is net metering?**

All solar PV systems generate power only during the daytime when the sun is available. In net-metered systems, the generated power is utilized for self-consumption, and excess power is exported to the grid as long as the grid is available. In cases, where solar power is not sufficient due to cloud cover etc., power is drawn from the grid to power the loads. A bi-directional or net meter records the energy flow in both directions and at the end of the billing period, the net energy used is calculated. The beneficiary has to pay for only the net energy used.

- **What is the procedure for getting the net metering approval?**

For net metering, it is first required to get a Technical feasibility report from the DISCOM authority and get the meter tested by the DISCOM testing lab. DISCOM authority will install a net meter after completion of the installation work of the solar power plant.

- **What if I don't want to export electricity into the grid?**

In such case zero export device is required to install. Zero export represents the impossibility of injecting any amount of electrical power into the grid. Zero Export device enables solar system owners & operators to limit the excess amount of solar power automatically based on the plant load.



EPC(Engineering, procurement, and construction)

We provide end-to-end services for grid-connected rooftop solar power plant which includes Project Management Consultancy (PMC), Engineering, Procurement & Construction (EPC), Installation & Commissioning (I&C).



Energy Audit

We understand and analyse design load and offer project capacity.



Design & Engineering

Design and engineering services for entire solar power project.



Procurement

Based on the design and engineering we do procurement of best components



Installation & Commissioning

Installation and commissioning of solar power plant at the building premises.

Choosing Raysteeds Energy as your EPC Partner

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