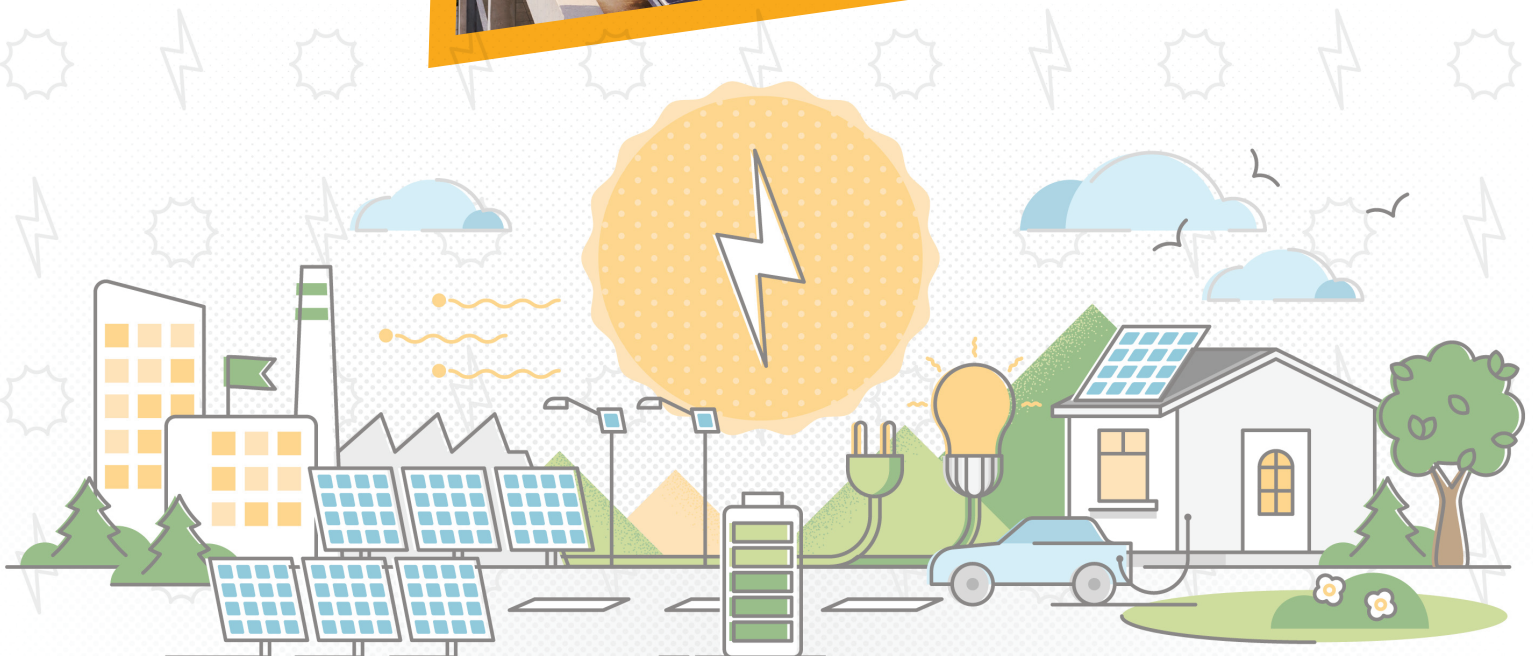
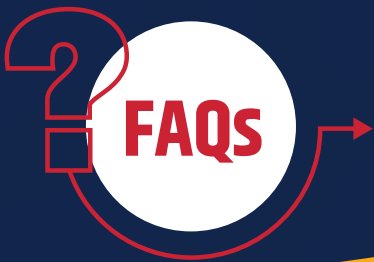
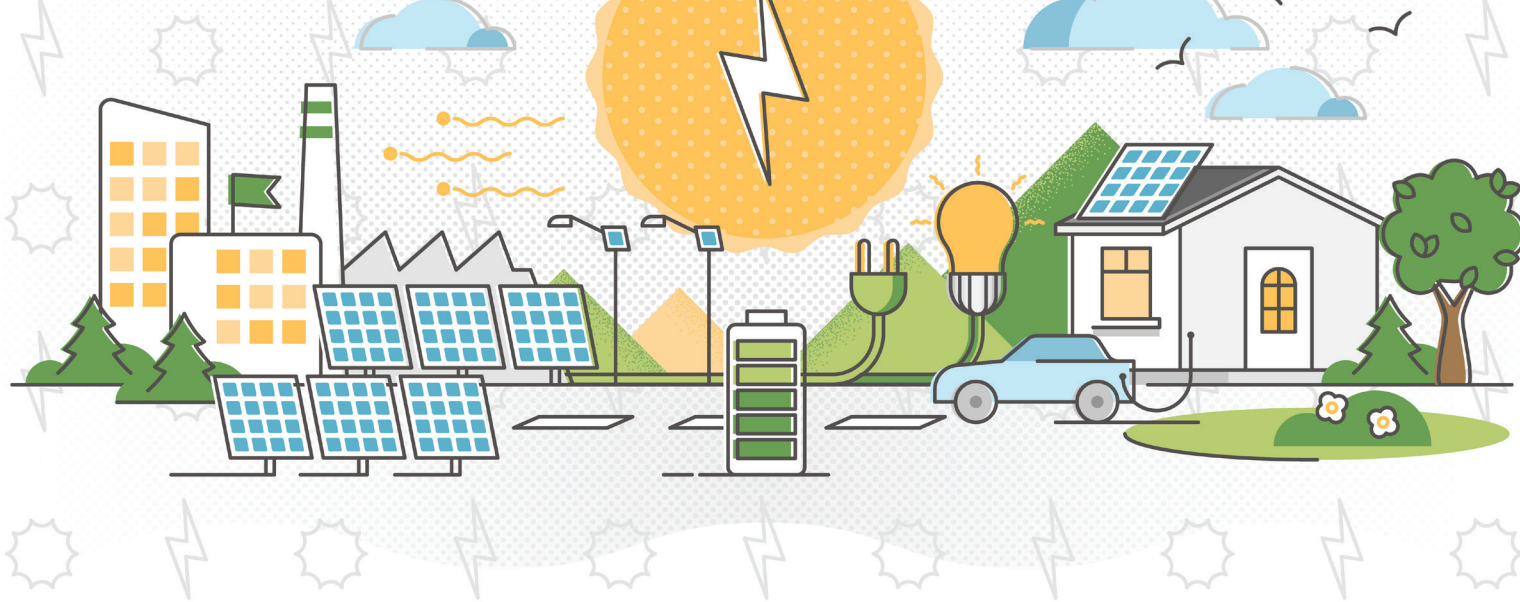


Grid-Connected Rooftop Solar in Resident Welfare Association (RWA)



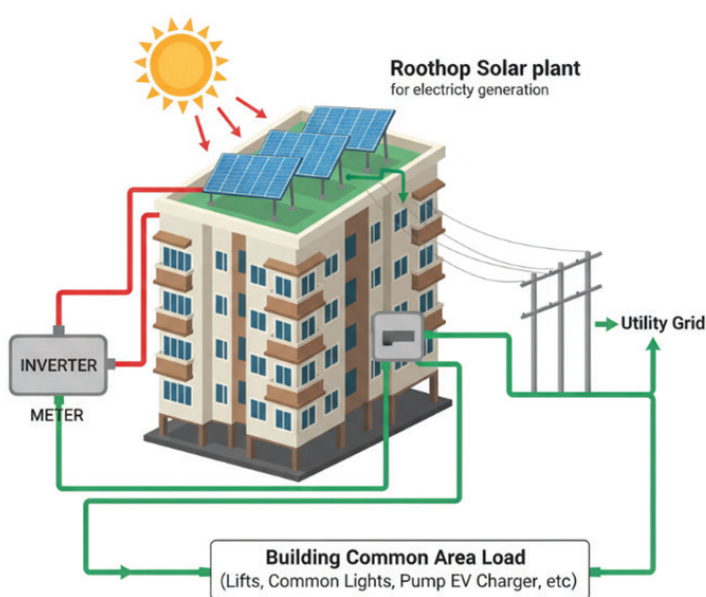




1. ABOUT GRID-CONNECTED ROOFTOP SOLAR (RTS) SYSTEM

1.1 What is a grid connected RTS system?

In a grid connected RTS system, the direct current (DC) power generated from the solar panels is converted to alternating current (AC) power using an Inverter. The power is then utilised for self-consumption and the surplus generation is fed into the electricity grid.



1.2 What equipment can be connected to a grid-connected RTS system in a Group Housing Society (GHS)/ Resident Welfare Association (RWA)?

A grid-connected RTS system can be connected to the common area load of the GHS/RWA, such as lifts, lights in common areas, water pumping systems, street lights, electric vehicle charging stations, with surplus generation being transferred to the electricity grid.

1.3 Who is treated as the 'consumer' for such a plant- individual flat owners or the society?

For a grid-connected RTS system in a GHS/RWA, on common roof, the ownership of the RTS plant lies with the GHS/RWA.

1.4 Is it mandatory to have a separate electricity meter for common services, for installing a RTS plant in GHS/RWA under PM-Surya Ghar Yojana (PMSGY)?

Yes, the presence of a separate electricity connection for common services in the society is required under the scheme. The plant capacity and net-metering connection shall be linked to the DISCOM consumer number for the common services of the GHS/RWA.

1.5 Can individual flats and a RTS plant for GHS/RWA, both avail benefits under PM-Surya Ghar Yojana?

Individual flat owners may install separate RTS systems on their allotted roof areas, linked to their respective DISCOM electricity consumer numbers, and are eligible to apply for subsidies. In addition, the GHS/RWA can install a rooftop solar system on the common roof area to cater to common services, using the DISCOM electricity connection for the common-area load. In both cases, the presence of an individual DISCOM meter is mandatory.

1.6 What are the main components of a grid-connected RTS system?



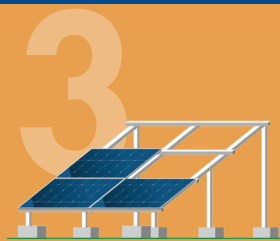
Solar PV Modules/Solar Panels

The Solar PV modules/Solar Panels convert solar energy to DC electrical energy. Crystalline silicon solar PV panels are most commonly used in RTS systems. Multiple panels are connected to form arrays/strings as per the desired capacity of the system.



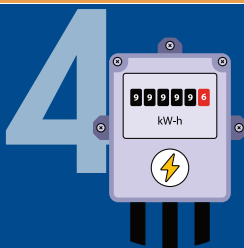
Inverter

Inverter converts variable DC output of Solar PV panels into AC power. The inverter also synchronizes with the grid so that generated power from the module can be injected into the grid.



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.



Bi-directional Meters

Meters are used to record the generation or consumption of electricity. These meters are used to keep track of the electricity that the RTS system injects into the utility grid and the electricity that is drawn from the utility grid.



Balance of System

These consist of cables, switchboards, junction boxes, earthing systems, circuit breakers, fuses, lightning protection systems, etc.

1.7 Will a grid-connected RTS system act as an inverter at the time of the power cut?

The grid-connected RTS system does not supply/generate AC output power when there is a power cut. The system requires a reference voltage from the grid to operate which will not be available during power cuts.

1.8 Is a battery included with the grid-connected RTS system?

There is no battery provided with the grid-connected RTS system; however, a battery can be later added to the system, in case of a hybrid solar inverter being installed with the plant. The addition of a battery to the RTS plant at a later stage is to be done only after informing the respective DISCOM about the system change.

1.9 How much area is required for a 100 kWp RTS system?

A 1kWp RTS system generally requires 10 sq. meters of shadow-free area, so for a 100 kWp RTS plant, around 1,000 sq. meters of shadow-free area is required. However, actual area requirements may vary depending on the efficiency of solar modules, their placement, etc.

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

Solar modules (and cells within) need uninterrupted sunlight to produce maximum electrical energy. Having a shadow on even a part of the module reduces the generation to great extent and wastes the installed system capacity.

1.11 What types of roofs are suitable for RTS systems?

RTS systems can be installed on any type of roof having sufficient load-bearing capacity.

1.12 How much energy does a 1 kWp RTS system generate on a daily basis?

On a clear sunny day, a 1 kWp RTS system can generate 4 to 5.5 units (kWhs) in a day.

1.13 Will I get constant/same energy generation from the RTS system all year around?

No, the daily energy generation from the RTS system shall be dependent on the temperature and solar irradiance among other parameters and these may not be the same every day throughout the year.

1.14 Will I get the same annual energy generation from the RTS system over a system life of 25 years?

No. When exposed to sunlight and outdoor environmental conditions, a solar module gradually loses some of its generation capacity; this phenomenon is known as degradation. However, it is important to note that degradation is a normal process and the loss in performance is very minimal.

1.15 What are the advantages of a grid-connected RTS system for a GHS/RWA?

- Savings on electricity bill from common services.
- Earnings from the surplus solar generation supplied to the DISCOM via net-metering.
- Utilisation of available vacant roof space, no additional land required.
- Aids in green building certification of the apartment block.
- Improvement in the tail-end grid voltages and reduction of system congestion.
- Long-term energy and ecological security due to reduction in carbon emission.

2. COST OF SYSTEM AND SUBSIDIES

2.1 What is the average cost of grid-connected RTS system?

The average cost varies depending on the vendors and the quality of components used in the system. The average cost varies between 55 to 60 thousand INR per kWp.

2.2 What are the subsidies/financial support available from the central government?

Central Finance Assistance (CFA) or subsidy, under PM-Surya Ghar Yojana is available for grid-connected RTS in an GHS/RWA, basis the following:

- Subsidy is provided for use of RTS capacity for common services, including EV Charging, upto a total load of 500 kW.
- ₹18,000/kW RTS capacity is provided to the GHS/RWA under this model.
- Capacity eligible for subsidy is calculated as per:

Capacity 1: Number of participating households x 3kW

Capacity 2: Total capacity installed in GHS/RWA for common services

The subsidy amount is calculated basis the lower capacity out of the 2 capacities calculated above.

Central Financial Assistance (CFA) to GHS/RWA

Case	Installed Capacity	Participating Households	Eligible Central Subsidy
RWA - 1	100 kW	20	₹18,000 x 60 = ₹10,80,000 (i.e. Lower of (20x3 kW), 100 kW)
RWA - 2	100 kW	50	₹18,000 x 100 = ₹18,00,000 (i.e. Lower of (50x3 kW), 100 kW)
RWA - 3	200 kW	100	₹18,000 x 200 = ₹36,00,000 (i.e. Lower of (100x3 kW), 200 kW)

CFA support will be provided to entities created by residents for overall operation and maintenance of common facilities and these may be known by alternative terminologies such as Apartment Owner Associations (AOAs), etc.

2.3 Is there any additional subsidy/financial support from the state government for grid-connected RTS in GHS/RWA?

No, Uttar Pradesh government does not provide any additional subsidy in case of a grid-connected RTS in GHS/RWA, installed for common services.

2.4 Does the GHS/RWA have to pay the full cost of the system for getting the subsidised RTS plant installed at the premise?

Yes, the GHS/RWA/AOA needs to pay full cost of the system to the vendor and the subsidy shall later be credited to the beneficiary's bank account via direct benefit transfer (DBT) from the central government.

2.5 Whether State has empanelled any vendor for implementation?

UPNEDA has empanelled several vendors through which you can get the grid-connected RTS installed in your apartment block for common services.

2.6 What are the main points of consideration to be kept in mind while evaluating a RTS system vendor?

Along with the price of the system being offered, the main points to be considered are as follows:

- Warranties of the system and components
- Energy generation estimates and guarantees
- Use of shadow assessment and system design tools such as- PvSyst, Google Earth, UP Solar Cities Portal etc.
- Service backup and arrangements the vendor has in the area
- Previous track record of the vendor

2.7 What system and documentation considerations should be kept in mind while getting a grid-connected RTS plant, under PMSGY, installed in the premise?

The following considerations should be kept in mind while getting a grid-connected RTS plant installed in the apartment block:

- There should be separate DISCOM connection for common services. If separate connection is not available, audit from a certified electrical auditor (CEA) needs to be conducted to assess the load for the same.
- The DISCOM connection for the common services should be on the name of the GHS/RWA/AOA.
- The bank account to be used for subsidy disbursement should be on the name of the GHS/RWA/AOA.
- The system is to be installed as per the guidelines mentioned under PMSGY.
- To ensure smooth transition towards net-metering, all the previous pending bills for the electricity meter should be paid in full.

2.8 Once the grid-connected RTS system is installed in the GHS/RWA, how would the electricity bill from the electricity distribution company (DISCOM) be calculated?

Since the system is grid-connected through net-metering, DISCOM shall generate a bill based on the reading provided by the net-meter installed at the premise. For this, the import units (consumption of electricity from the grid) and the export (surplus units from the solar generation) shall be considered and the RWA shall have to pay for the net units (Import-Export) only.

2.9 Can I make the monthly electricity bill go to 'zero' for common services, after installing the RTS system?

This is possible but only in rare cases, as even though the energy consumption units may be reduced to nil, the GHS/RWA shall still have to pay other charges, such as fixed charges, etc.

2.10 Can the surplus electricity be distributed amongst the residents instead of supplying to grid?

Under the PMSGY and net metering arrangement, it is not possible to supply surplus electricity generation to the residents.

3. COST ECONOMICS AND SAVINGS FROM GRID-CONNECTED RTS SYSTEM

3.1 How much savings are expected from the grid-connected RTS system installed for common services in an GHS/RWA?

With the subsidy provided by the central Government, the effective cost of the system reduces significantly.

The details of monthly calculation and saving for an RWA with 50 households installing 100 kWp as Case-1 and an RWA with 100 households installing 250 kWp system as Case-2 are provided below:

Parameter	Unit	Case-1	Case-2
Capacity	kWp	100	250
Cost per kWp (Tentative)	Rs (₹)	55,000	55,000
Cost of system	Rs (₹)	55,00,000	1,37,50,000
Total subsidy	Rs (₹)	18,00,000	45,00,000
Net cost of system	Rs (₹)	37,00,000	92,50,000
Unit generation per month	kWh	12,000	30,000
Average unit cost	Rs/kWh	7	7
Savings from Electricity per month	Rs (₹)	84,000	2,10,000
Pay back (Tentative)	Year	3.5 to 4	4.5 to 5
Life of plant	Year	25	25

Note: These figures represent indicative savings, and the actual savings may vary depending on the financing approach used for the RTS system.

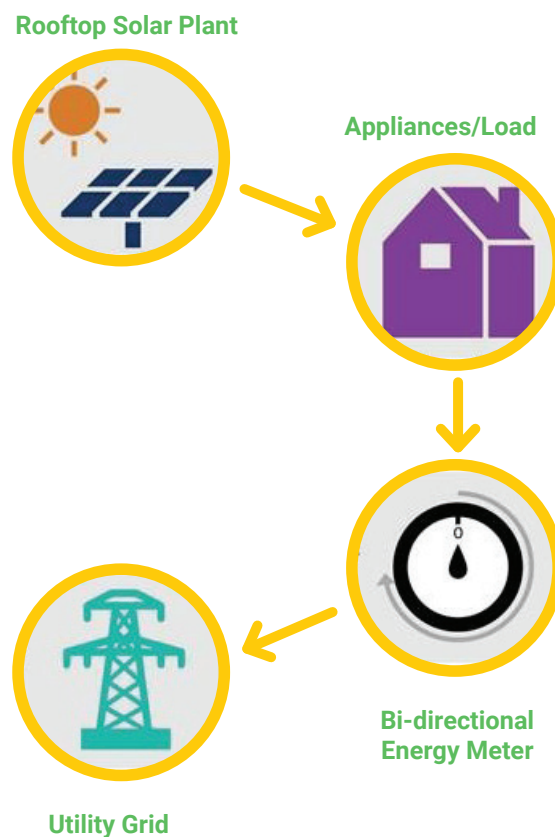
4. METERING ARRANGEMENT FOR GRID-CONNECTED RTS SYSTEM

4.1 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 utilised for self-consumption, and excess power is exported to the grid as long as the grid is available. In cases when solar power is not sufficient due to cloud cover etc., power is drawn from the grid to power the loads. A bi-directional meter 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.

4.2 Can the RTS system be installed for only captive use without being connected to the grid?

Yes, the plants which are not connected to the grid are normally called behind-the-meter plants and subsidy is not available for such plants. However, it is required to follow rules and regulations specified by the state authorities.

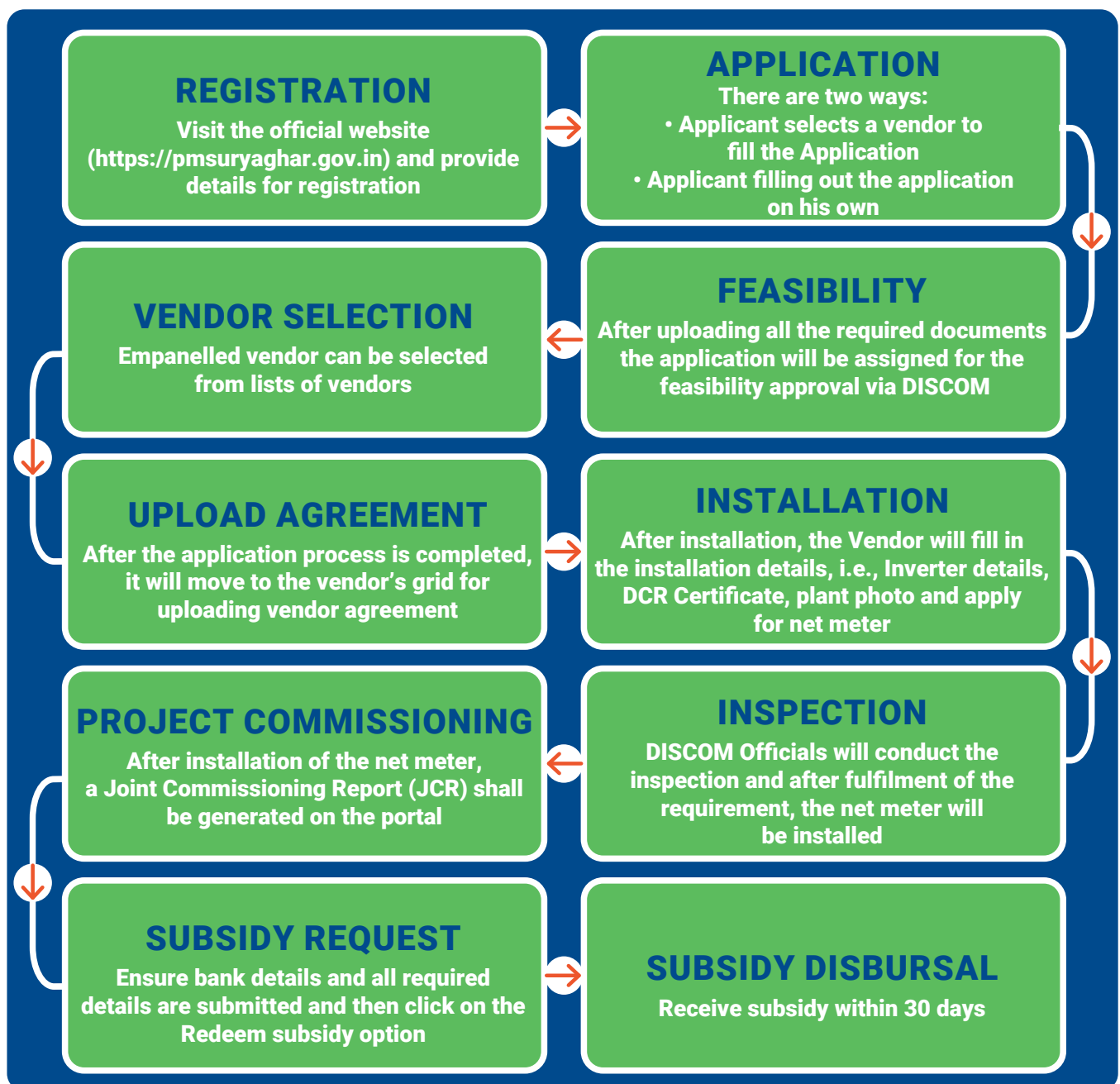


5. INSTALLATION OF A GRID-CONNECTED RTS SYSTEM IN A GHS/RWA

5.1 How can one apply for the installation of a grid-connected RTS system for GHS/RWA?

The nominated GHS/RWA representative can apply for the installation of grid-connected RTS system for common services in the society through PMSGY National Portal. The link for the online portal is www.pmsuryaghar.gov.in. The consumer number for the DISCOM electricity connection used for common services only, is to be used for the registration process and subsidy shall only be disbursed in the GHS/RWA bank account under the same name as that of the electricity connection.

5.2 What is the general procedure for the installation of a grid-connected RTS system for the beneficiaries?



5.3 Can a loan be availed for installation of the grid-connected RTS system in GHS/RWA?

Yes, loans are made available by major banks in India for installations under PMSGY, via Jan Samarth Portal. A complete list of loan products available is listed on- <https://pmsuryaghar.gov.in/#/consumer-financing-options>

6. OPERATION AND MAINTENANCE (O&M) OF GRID-CONNECTED RTS SYSTEM

6.1 What is the minimum warranty period envisaged under the scheme?

Solar PV modules used in solar power plants /systems must be warranted for their output watt peak capacity, which should not be less than 90% at the end of 12 years and 80% at the end of 25 years. The mechanical structures, electrical works including power conditioners/inverters/charge controllers/maximum power point tracker units/distribution boards/digital meters/switch gear/storage batteries, etc., and overall workmanship of the RTS systems must be warranted against any manufacturing/design/installation defects for a minimum period of 5 years.

6.2 What is the O&M aspects of a grid-connected RTS system?

Compared to most other power-generating technologies, RTS systems have very low maintenance and servicing requirements. However, suitable maintenance of the system is essential to optimise energy yield and maximise the life of the system. Module cleaning is a typical maintenance activity that is required periodically (dust, bird dropping, and other debris can cause a decrease in power generation). The frequency of cleaning is dependent on local conditions. On an average, the module needs to be cleaned and rinsed with water at an interval of 15 days.

6.3 There is presence of monkeys in our area. Would they be damaging the RTS system?

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 like hail. 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.



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