

# Frequently Asked Questions for Grid Connected Solar Rooftop Systems

## 1. What is a Solar Rooftop System?

In a solar rooftop system, the solar panels are installed in the roof of any residential, commercial, institutional and industrial buildings. This can be of two types (i) Solar Rooftop System with storage facility using battery, and (ii) Grid Connected Solar Rooftop System.

## 2. What is a Solar Rooftop System with Storage facility?

Such rooftop system has battery as storage facility. The solar electricity is stored in the battery and can be utilized during night also when the sun is not available.

## 3. What is a Grid Connected Solar Rooftop System?

In grid connected rooftop or small SPV system, the DC power generated from SPV panel is converted to AC power using power conditioning unit and is fed to the grid either of 33 kV/11 kV three phase lines or of 440/220 Volt three/single phase line depending on the capacity of the system installed at institution/commercial establishment or residential complex and the regulatory framework specified for respective States.

These systems generate power during the day time which is utilized fully by powering captive loads and feed excess power to the grid as long as grid is available. In case, where solar power is not sufficient due to cloud cover etc., the captive loads are served by drawing power from the grid.

**4. Where such plants can be installed?**

Such rooftop systems can be installed at the roofs of residential and commercial complex, housing societies, community centers, government organizations, private institutions etc.

**5. What is the average cost of grid connected rooftop solar systems?**

The average cost of grid connected rooftop solar systems is about Rs. 80 per watt or Rs. 8.0crore per MWp capacity.

**6. What is the Financial Assistance provided by the Ministry?**

There is a provision of Central Financial Assistance of 15% of the total cost or Rs. 12 per watt or Rs. 1.20 crore per MWp under the Grid Connected Rooftop and Small Solar Plants Programme of the Ministry. This CFA has been reduced from 30% to 15%.

**7. What are the other fiscal incentives are available for Solar Rooftop Systems?**

There are provisions of concessional import duty/excise duty exemption, accelerated depreciation and tax holiday for setting up of grid connected rooftop power plants.

**8. What efforts Government is making to providing loans for solar rooftop systems?**

Department of Financial services has instructed to all Public Sector Banks to encourage home loan/ home improvement loan seekers to install rooftop solar PV plants and include cost of system in their home loan proposals. So far, nine PSBs namely Bank of India, Syndicate Bank, State Bank of India, Dena Bank , Central Bank of India, Punjab National Bank, Allahabad Bank, Indian Bank and Indian Overseas Bank have given instructions to extend loan for Grid Interactive Rooftop Solar PV Plants as home loan/ home improvement loan.

**9. What is the size of grid connected rooftop solar system?**

The rooftop solar systems from 1 kWp upto 500 kWp or in combination can be set up on the roofs.

**10. How much roof area is required to set up the grid connected rooftop solar system?**

About 10sq.m area is required to set up 1 kWp grid connected rooftop solar system.

## **11. What are the advantages of Grid-Connected Rooftop Solar System?**

- Electricity generation at the consumption center and hence Savings in transmission and distribution losses
- Low gestation time
- No requirement of additional land
- Improvement of tail-end grid voltages and reduction in system congestion with higher self-consumption of solar electricity
- Local employment generation

## **12. What is the potential available in India?**

According to a study conducted by TERI, a potential of 124 GWp SPV Rooftop plants has been estimated in the country. This can be achieved through active supports from the States.

## **13. Net metering**

The grid connected rooftop system can work on net metering basis wherein the beneficiary pays to the utility on net meter reading basis only. Alternatively two meters can also be installed to major the export and import of power separately. The mechanism based on gross metering at mutually agreed tariff can also be adopted.

## **14. Feed-in-Tariff**

In feed-in-tariff the Government offers a tariff for purchase of the solar power generated from such plants.

**15. Among net metering and feed-in-tariff what is preferred?**

Net metering mechanism is more popular among States.

**16. In case of grid failure, is there any chance for shocks to the person who is repairing?**

In case the grid fails, the solar power has to be fully utilized or stopped immediately feeding to the grid so as to safe-guard any grid person/technician from getting shock (electrocuted) while working on the grid for maintenance etc. This feature is termed as 'Islanding Protection'.

**17. What are requirements from State to promote grid-connected rooftop solar systems?**

- (i) States should have conducive solar policy to allow the grid connectivity.
- (ii) State Regulators have issued tariff order for appropriate tariff, net-metering/feed-in tariff and the grid connectivity, and
- (iii) The Distribution Companies agree to allow grid connectivity and purchase the electricity on feed-in-tariff or through net metering arrangement.

**18. How many States have policies to promote grid-connected rooftop solar systems?**

So far, 13 States/UTs namely Andhra Pradesh, Chhattisgarh, Delhi, Gujarat, Haryana, Karnataka, Kerala, Punjab, Rajasthan, Tamil Nadu, Uttarakhand, Uttar Pradesh and West Bengal have notified policies that include promotion of grid connected rooftop solar systems with net metering. Regulation from the State Electricity Regulatory Commission is also required to allow net metering/ feed-in-tariff.

**19. How many States Regulators have notified orders to promote grid-connected rooftop solar systems?**

20 State/UT Regulators from Andhra Pradesh, Chhattisgarh, Delhi, Gujarat, Haryana, Karnataka, Kerala, Odisha, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, Uttarakhand and West Bengal, Andaman & Nicobar, Chandigarh, Dadra & Nagar Haveli, Daman & Diu, Lakshadweep, Pondicherry and Goa have so far issued these regulations for net-metering/gross metering.

**20. What is the present status about sanctions under the grid connected rooftop solar programme?**

The Ministry has so far sanctioned 361 MWp aggregate capacity of grid connected rooftop solar systems in the country of which 42 MWp have been commissioned.

## **21. What are the grid connectivity levels for such systems?**

The Projects under these guidelines fall within two broad categories i.e.(a) the projects connected to HT voltage at distribution network (i.e. below 33 kV) (b) the projects connected to LT voltage i.e. 400/415/440 volts (3-phase) as the case may be or 230 volts (1-phase). Accordingly, the projects may be under the following two categories.

### **Category 1: Projects connected at HT level (below33kV) of distribution network**

The Projects with proposed installed capacity of minimum 50 kW and upto 500 kW and connected at below 33kV shall fall with in this category. The projects will have to follow appropriate technical connectivity standards in this regard.

### **Category 2: Projects connected at LT level (400 Volts-3 phase or 230 Volts-1 phase)**

The Projects with proposed installed capacity of less than100kW and connected of the grid at LT level (400/ 415/ 440 volts for 3-phase or 230V for1-phase) shall fall within this category.

**22. What are the business models that can facilitate the promotion of grid connected rooftop solar systems?**

There can be many possible business models, some of which can be considered are as follows:

**(a) Solar installations owned by consumer**

- i) Solar Rooftop facility owned, operated and maintained by the consumer(s).
- ii) Solar Rooftop facility owned by consumer but operated and maintained by the 3<sup>rd</sup> party.

**(b) Solar installations owned, operated and maintained by 3<sup>rd</sup> Party**

If the 3<sup>rd</sup> party implements the solar facility and provides services to the consumers, combinations could be:

**i) Arrangement as a captive generating plant for the roof owners**

The 3<sup>rd</sup> party implements the facility at the roof or within the premise of the consumers; the consumer may or may not invest as equity in the facility as mutually agreed between them. The power is then sold to the roof owner.

**ii) Solar Lease Model, Sale to Grid**

The 3<sup>rd</sup> party implementing the solar facility shall enter into a lease agreement with the consumer for medium to long term basis on rent. The facility is entirely owned by the 3<sup>rd</sup> party and consumer is not required to make any investment in facility. The power generated is fed into the grid and the roof top owner gets a rent.

**(c) Solar Installations Owned by the Utility**

**i) Solar installations owned operated and maintained by the DISCOM**

The DISCOM may own, operate and maintain the solar facility and also may opt to sub contract the operation and maintenance activity. The DISCOM may recover the cost in the form of suitable tariff. The electricity generation may also be utilized by DISCOM for fulfilling the solar renewable purchase obligation.

**ii) Distribution licensee provides appropriate viability gap funds**

The DISCOM may appoint a 3<sup>rd</sup> party to implement the solar facilities on its behalf and provide appropriate funds or viability gap funds for implementing such facility.

**23. Which organizations are setting up the projects for end users?**

The programme is being implemented through multiple agencies for rapid up-scaling in an inclusive mode. These agencies are:

- (i) State Nodal Agencies(SNAs)**
- (ii) Solar Energy Corporation of India (SECI)**
- (iii) Channel Partners:**

- a) Renewable Energy Service Providing Companies (RESCOs)
- b) System Integrators
- c) Manufactures of any component of the Solar Plants
- d) Project developers
- e) Vendors/ suppliers of solar equipment
- f) Reputed and relevant NGOs of National level

**(iv) Financial Institutions/Financial Integrators**

The Financial Institutions like NABARD, National Housing Banks, Other Banks, IREDA, SECI etc.

**(v) Other Govt. Departments/Agencies**

The other Govt. Departments/Agencies i.e., Railways, Defense/Para Military Forces, Local Government Bodies including Municipal Corporations/Municipalities, PSUs, Institutions, Development Authorities, DMRC, State Departments interested in directly implementing the programme.

**24. What are the targets under Jawaharlal Nehru National Solar Mission (JNNSM)?**

The targets under JNNSM are as under:

<b>Application Segment</b>	<b>Target for Phase I (2010-13)</b>	<b>Cumulative Target for Phase 2 (2013-17)</b>	<b>Cumulative Target for Phase 3 (2017-22)</b>
<b>Grid solar power</b> (large plants, roof top & distribution grid plants)	1,100 MW	10,000 MW	20,000 MW
<b>Off-grid solar applications</b>	200 MW	1,000 MW	2,000 MW
<b>Solar Thermal Collectors</b> (SWHs, solar cooking, solar cooling, Industrial process heat applications, etc.)	7 million sq. meters	15 million sq. meters	20 million sq. meters

**25. What are the achievements against the targets fixed for Phase-I of JNNSM in solar energy?**

The achievements against the targets fixed for Phase-I are as under:

<b>Application Segment</b>	<b>Target for Phase - I (2010-13)</b>	<b>Achievements</b>
<b>Grid solar power</b> (large plants, roof top & distribution grid plants)	1,100 MW	1686.44 MW commissioned
<b>Off-grid solar applications</b>	200 MW	252.5 MW sanctioned
<b>Solar Thermal Collectors</b> (SWHs, solar cooking, solar cooling, Industrial process heat applications, etc.)	7 million sq. meters	7.01 million sq. meter installed

**26. What are the achievements of JNNSM till date?**

The achievements of JNNSM till date are:

<b>Application Segment</b>	<b>Achievements</b>
<b>Grid solar power</b> (large plants, roof top & distribution grid plants)	3382.78 MW commissioned
<b>Off-grid solar applications</b>	357.18 MW sanctioned
<b>Solar Thermal Collectors</b> (SWHs, solar cooking, solar cooling, Industrial process heat applications, etc.)	8.77 million sq. meter installed

**27. What is the gross potential of solar power in the country?**

India is endowed with vast solar energy potential. About 5,000 trillion kWh per year energy is incident over India's land area with most parts receiving 3-5 kWh per sq. m per day. Based upon the availability of land and solar radiation, the potential of solar power in the country has been assessed to be 750 GWp.

**28. What is the State-wise total commissioned capacity of Grid Solar Power Projects in the country so far?**

The State-wise commissioned capacity of Grid Solar Power Projects in the country are as under:

<b>Commissioning Status of Grid Connected Solar Power Projects under Various Schemes</b>		
<b>Sr. No.</b>	<b>State/UT</b>	<b>Total commissioned capacity till 28-02-15 (MW)</b>
1	Andhra Pradesh	236.86
2	Arunachal Pradesh	0.025
3	Chhattisgarh	7.6
4	Gujarat	949.05
5	Haryana	12.8
6	Jharkhand	16
7	Karnataka	77
8	Kerala	0.025
9	Madhya Pradesh	499.58
10	Maharashtra	334.4
11	Orissa	31.76
12	Punjab	119.77
13	Rajasthan	902.1
14	Tamil Nadu	111.76
15	Telangana	8
16	Uttar Pradesh	49.71
17	Uttarakhand	5
18	West Bengal	7.21
19	Andaman & Nicobar	5.1
20	Delhi	5.465
21	Lakshadweep	0.75

22	Puducherry	0.025
23	Chandigarh	2
24	Others	0.79
<b>TOTAL</b>		<b>3382.78</b>

## **29. Scheme for Development of Solar Parks and Ultra Mega Solar Power Projects.**

The scheme for development of Solar Parks and Ultra Mega Solar Power Projects has been rolled out by Ministry of New & Renewable Energy 12-12-2014. The Scheme has been conceived on the lines of the “Charanka Solar Park” in Gujarat which is a first-of-its-kind large scale Solar Park in India with contiguous developed land and transmission connectivity.

This scheme envisages supporting the States in setting up solar parks at various locations in the country with a view to create required infrastructure for setting up of Solar Power Projects. The solar parks will provide suitable developed land with all clearances, transmission system, water access, road connectivity, communication network, etc. This scheme will facilitate and speed up installation of grid connected solar power projects for electricity generation on a large scale. All the States and Union Territories are eligible for benefitting under the scheme.

### **Salient Features**

- i. It is proposed to set up at least 25 Solar Parks and Ultra Mega Solar Power Projects targeting over 20,000 MW of solar power installed capacity within a span of 5 years starting from 2014-15.
- ii. The capacity of the Solar Parks shall be 500 MW and above. However, smaller parks may be considered in Himalayan Region & other hilly States where contiguous land may be difficult to acquire in view of difficult terrain and in States where there is acute shortage of non-agricultural land.

- iii. The solar parks will be developed in collaboration with the State Governments and their agencies. The choice of implementing agency for developing and maintaining the park is left to the State Government.
- iv. The implementing agency will be sanctioned a grant of upto Rs.25 Lakh/Park for preparing Detailed Project Report (DPR) of the Solar Park.
- v. Thereafter, application may be made by the implementing agency to Solar Energy Corporation of India (SECI) for the grant of up to Rs. 20 lakhs/MW or 30% of the project cost including Grid-connectivity cost, whichever is lower. The approved grant will be released by SECI as per milestones prescribed in the scheme.
- vi. Subsequently, in-principle approval was accorded to 16 Solar Parks of aggregate capacity of 12120 MW planned to be set up in 10 States (A.P, Gujarat, Rajasthan, M.P, Telangana, Punjab, U.P, Tamil Nadu, Meghalaya and Karnataka). Grant of Rs. 141.50 Cr. has been released to Solar Energy Corporation of India (SECI) by 31<sup>st</sup> December, 2014.
- vii. M/s AP Solar Power Corporation Pvt. Ltd. a JV amongst SECI, AP Genco and NREDCAP, is setting up a Solar Power Park of capacity 1500 MW at Anantpur & Kadapa. M/s NTPC has planned to set up 1000 MW in the said Solar Park.