

Solarise Safdarjung

Get Power through Rooftop Solar Systems

Save Money | Reduce Pollution | Become Sustainable



Image - IEA



What others are saying about rooftop solar!



I was looking to make an investment and was thinking of some conventional methods. Then my grandson convinced me to go for a rooftop solar system. Soon after, I installed a 3-kW system on my roof. It is 3 years old now and I'm quite happy with this new-age investment! The benefit to the environment is also an additional bonus that is priceless.

R.P. Gupta, Ghaziabad

I was one of the first residents in our neighbourhood to install a rooftop solar system 6 years ago. Thanks to Delhi's favourable policies, we have been enjoying huge savings on electricity bills since then, and have generated more solar power than we use every year since the installation. We can run 3 air conditioners without any bills, thanks to our system.



Roopika Anand, New Delhi

What is the Solarise Safdarjung campaign?

The Solarise Safdarjung campaign is designed to guide you at each step of your journey towards becoming a proud owner of an RTS system - while at the same time virtually presented to adhere to social distancing guidelines. It brings together solar vendors, the government and financiers, to provide you value-added services at your doorstep.

- A unique community-based campaign under the US-India Clean Energy Finance Task Force.
- A pilot initiative by BSES Rajdhani Power Limited (BRPL) in partnership with non-governmental organisations [SmartPower](#) and the Council on Energy, Environment and Water ([CEEW](#)).
- Aims to raise awareness about rooftop solar (RTS) PV systems in order to increase its adoption within the local communities.

By showcasing successful RTS systems in your neighbourhood and providing reliable information on various aspects of RTS, the campaign aims to help communities take the oft-difficult decision of investing in renewable energy in order to move to a greener and more sustainable future!

How is the Solarise Safdarjung campaign organised?

Solarise Safdarjung is an online outreach campaign that will help residents adopt RTS by:

- Providing community participation, information, and support
- Leveraging community trust
- Online awareness activities for you and your neighbours
- A streamlined platform and processes for signing up for solar
- Trusted solar vendors who will provide excellent services

Campaign activities

The campaign will run for 10 weeks beginning on November 1 and will include a variety of activities. Among them are -

- **Campaign kickstart:** virtual launch
- **Solar masters:** a series of e-workshops
- **Shine some light:** virtual RWA open houses
- **Welcome to my roof:** virtual rooftop tours
- **Starting young:** youth engagement activities

An activity calendar will also be shared with all residents.



What is the Solarise Safdarjung campaign?

A campaign driven by the community

Solar ambassadors: Community volunteers who champion this cause and represent the best interests of the community.

RWA support: The Resident Welfare Association (RWA) forms the centre for all peer-to-peer outreach and connections in the campaign.

Neighbourhood mobilisation: The campaign relies on neighbourhoods coming together to learn and adopt RTS technology.

Why participate in Solarise Safdarjung?

- Actionable and easy-to-understand information about RTS systems
- Assurance of top-quality installations that will perform well over 25 years
- Access to experts who can answer all your questions
- Competent solar vendors who will offer high quality services
- Contribute to a cleaner future for your community and the country!

In times like these, going solar is one of the most significant contributions you can make. The sun is the most abundant source of energy known to humankind and no greenhouse gases are released into the atmosphere when solar energy is used to produce electricity. Plus, you save on your electricity bill!

Campaign partners

Lead campaign organisers



Implementation support



Implementation support



Begin your solar journey here!

Are you confused by rooftop solar? Do you wonder what is a solar panel? What is net-metering? The prices? The vendors? Do you wish you knew where to look for all the important information on rooftop solar? Well you need not look any further! This booklet is designed to help you Solarise! Here, we bring together all the necessary information you need to make the right decision about rooftop solar and begin your sustainable energy journey!

Click through the links below to understand specific topics or read through like a book! It's full of simple and easy-to-digest sections on the various aspects of rooftop solar!

Let's Solarise!

[What is the Solarise Safdarjung Campaign?](#)

[What is rooftop solar and how does it work?](#)

[Is rooftop solar right for you?](#)

[Ten things to consider when you buy a rooftop solar system](#)

[Why would I want to give up terrace space for rooftop solar panels?](#)

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[What is net-metering and how does it work?](#)

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Frequently asked questions

- [Application, billing, metering](#)
- [Rooftop solar performance and efficiencies](#)
- [Ownership and maintenance](#)
- [Safety](#)

What is rooftop solar and how does it work?

Solar power is one of the simplest and cleanest sources of renewable energy. It powers straight from the sun and is enough for your energy needs. And if you have more on a sunny day – we have so many of those in Delhi – **you can sell the electricity generated by your RTS system to your electricity provider through a provision called 'net-metering'.**

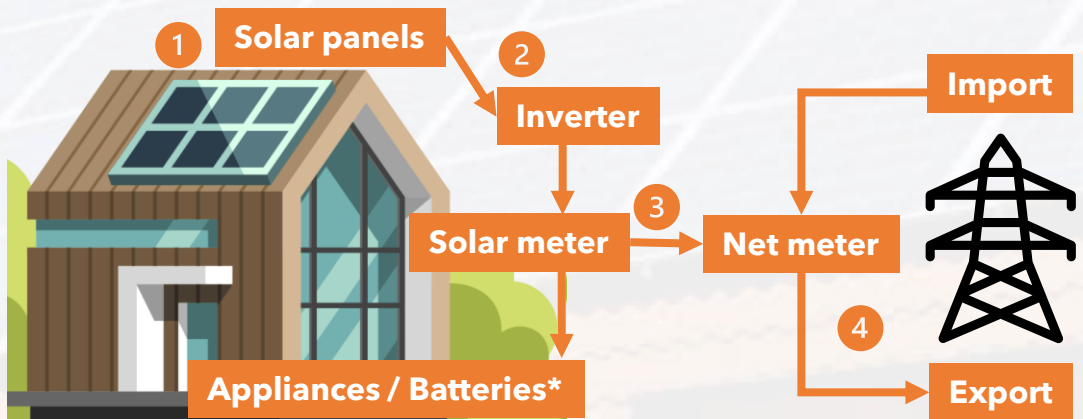
This means that the electricity your panels generate is subtracted from your monthly electricity bill – **saving you money every month!**

Or you can also store the excess electricity in batteries* for later use. This can help provide backup power during power cuts.

Solar power is safe, efficient, and cleaner than the electricity generated by thermal power plants!

RTS systems have a long life of 20 – 25 years, and will save you money while helping you do your bit for the environment.

How rooftop solar system works



1 Solar panels

Solar panels on your roof absorb sunlight and convert it into electricity using components known as photovoltaic (PV) cells.

2 Inverter

The electricity generated in the panels is direct current (DC). An inverter converts the DC into alternating current (AC) – the type of electricity used in the grid and most household electric appliances.

3 Solar and net meter

The solar meter keeps track of the solar energy generated and used by appliances. The net meter measures import from the grid, and the extra energy exported to the grid. The net difference of import and export is billed by the discom.

4 Use and export

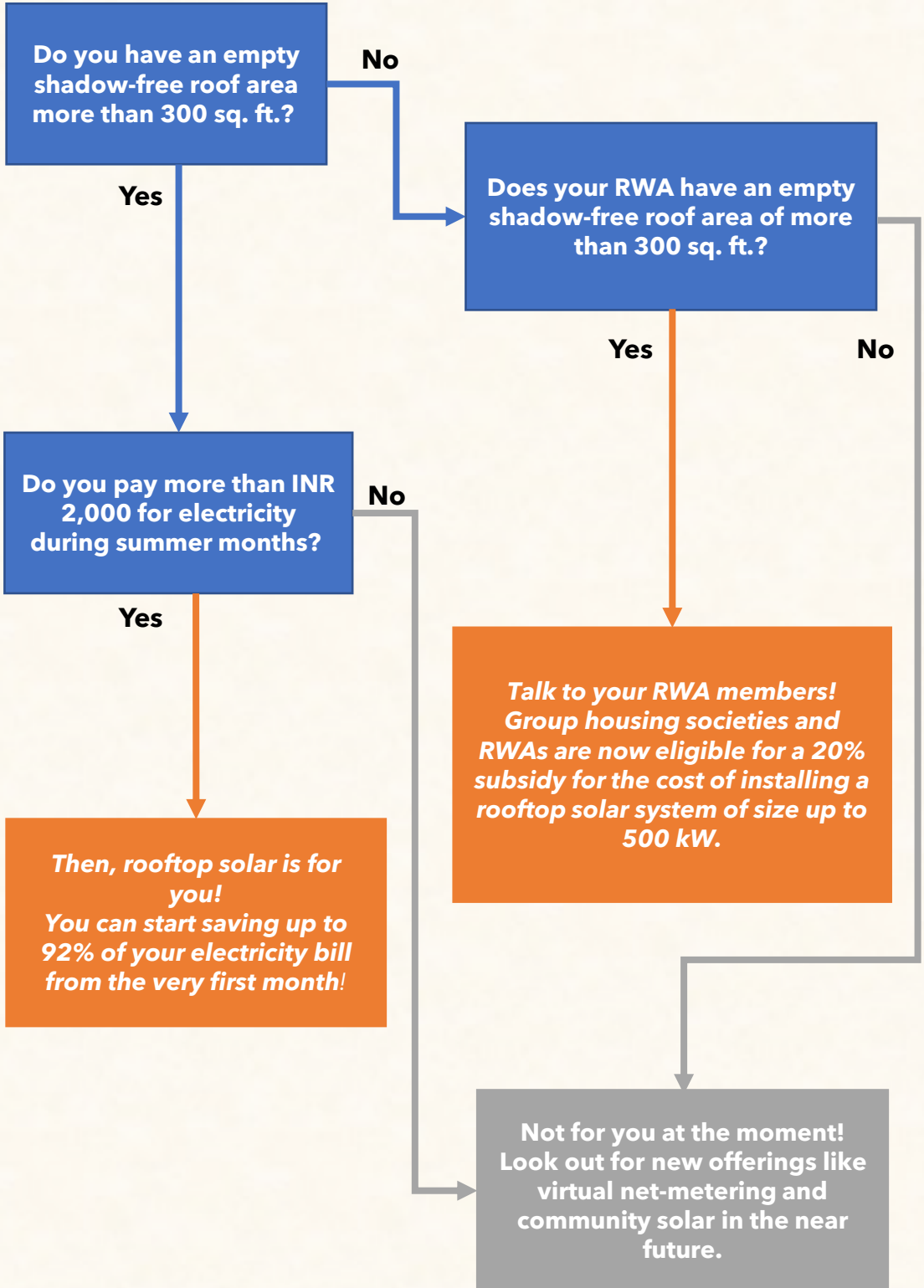
The electricity can be used to power appliances in your home, sent to the grid through a net metering device, or stored in batteries* for usage during power cuts.

* The normal grid-connected rooftop solar system sends all the generated solar power to the grid. To use the generated power for backup, the batteries have to be bought and added to the system at an additional cost.



Is rooftop solar right for you?

Not every home is right for solar -- ask these simple questions to find out if solar is right for you!



10 things to consider when you buy a rooftop solar system

Things you should consider

1. Ensure you have sufficient non-shaded roof space with a flat surface for the installation of the RTS system.

2. Check that your roof is intact without any weak spots. Also check the orientation of your roof. An open south-facing area is ideal.

3. Check the site assessment and production estimates provided by the vendor to determine if you will realise the expected savings, and if the system is sized to your requirements.

The Solarise campaign offers a dedicated e-workshop on various system components and quality checks.

4. Obtain a thorough understanding of the various components being offered by the vendor and their quality.

5. Understand the financing options available and decide if you want to make a full payment from your savings or use a mix of cash and loan.

Through partner vendors, the campaign offers easy financing options (additional information is available on the platform)

How Solarise helps

Through the Solarise Safdarjung portal, book a free site assessment by a partner vendor and get all your queries on roof suitability answered.

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10 things to consider when you buy a rooftop solar system

Ask your questions during virtual events for assistance and easily sign up for a free roof evaluation

6. Ensure that your RTS system is registered with BSES Rajdhani Power Limited (BRPL) and the net-metering system has been installed.

7. Go through the installation and maintenance contract with the vendor and study the terms and conditions.

8. Regularly monitor the output from the system and report any irregular generation to the vendor.

The Solarise campaign offers a dedicated e-workshop on billing, metering, and how to keep a track of savings

9. Once installed, clean your solar panels every 7-10 days (depending on dust levels) with a damp cloth or water from a low-pressure pipe. Regularly check the wiring for any breakages. This will help keep your system in optimum condition.

With Solarise Safdarjung, hear from others who have installed a system and become a solar ambassador yourself!

10. Share your RTS experience with community members and encourage them to install RTS systems as well!



Why would I want to give up terrace space for rooftop solar?

RTS systems offer several benefits for you, the environment and the economy at large. By generating clean energy right at home, you can reduce your electricity bills, reduce pollution from thermal power plants, create jobs in the solar industry, and make India 'Atmanirbhar' in meeting its energy needs! India has also made strong commitments to combat climate change and it is every citizen's duty to support the country in this regard.

You can be the leader for sustainable living in your community, inspiring your children, your family, your friends, and neighbours, to value the earth we have inherited and will pass on to our children.

Benefits for you

- **Affordable, dependable, sustainable, and safe** form of renewable energy
- Reliable performance with **lifetime of around 25 years**
- **Potential annual savings of up to 92%** on electricity bills
- **Investment recovery in 3-6 years** with up to 37% return on your investment and free electricity for next 15-20 years
- **Minimal operational and maintenance** requirements - just clean the panels 3-4 times a month (depending on dust levels) and check the wiring once in 3 months.
- **Protection from rising electricity prices**



Image - Getsolarmax



Image - Greenmatch

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Why would I want to give up terrace space for rooftop solar?



Image - Ecowatch

Benefits for the community

- **Reduces pollution** by cutting down emissions released by thermal power plants, leading to cleaner air for all
- **Mitigates the effects of climate change**
- **Creates jobs** in the renewable energy sector - and helps in sustainable rebuilding of local and national economy

Benefits for the nation

- Contributes to India's ambition to install **40 GW of RTS capacity by 2022**.
- Contributes to meeting India's **nationally determined contribution (NDC)** targets under the Paris Agreement:
 - Reduce the emissions intensity of GDP by 33-35% (compared to 2005 levels) by 2040.
 - Increase the share of non-fossil power generation to 40% in India's total power generation capacity by 2030.
- Switching to solar energy will have far-reaching economic impacts in a post-COVID world, given the positive impacts on **jobs, health, growth in eco-friendly industries, and energy security**.
- **Increases India's energy security** by reducing the country's dependence on imported coal and other fossil fuels.



Image - Saurenergy

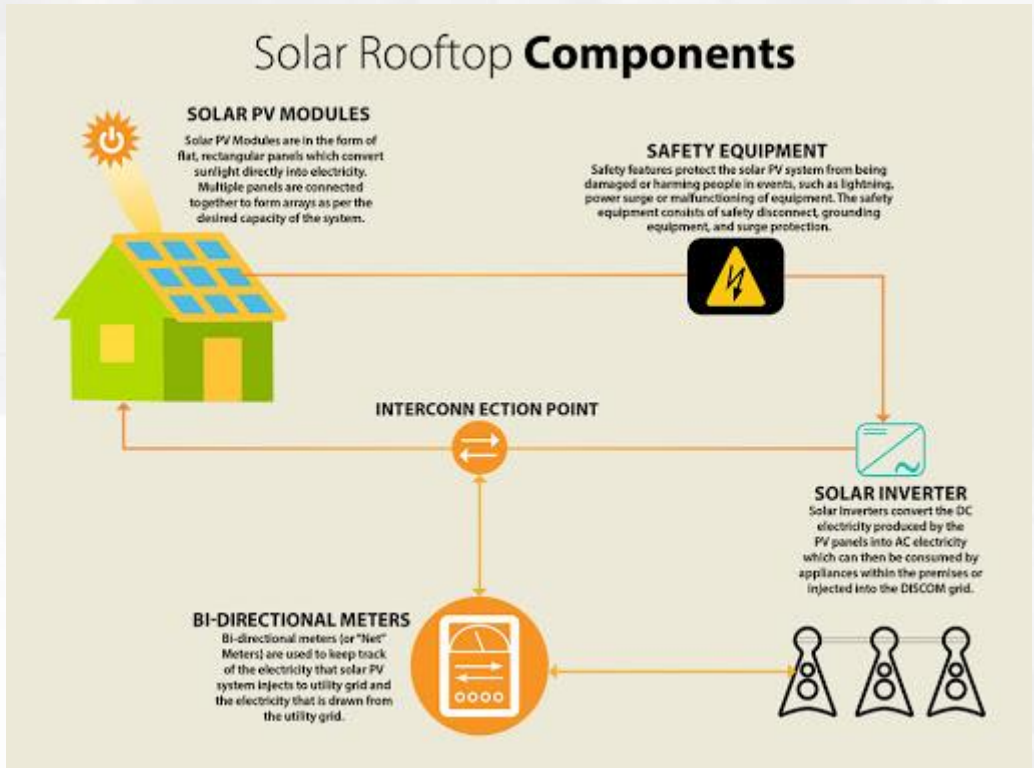


Image - Saurenergy



Know what you are paying for

Each RTS system is made of several important components that serve different purposes. While purchasing a solar rooftop system, it is essential to understand what you are paying for and to check the quality of each component. The main components of RTS systems are illustrated below.



Source – BSES Solar City Initiative

Solar PV modules - Flat, rectangular panels that convert sunlight into electricity through the photovoltaic effect. Multiple panels are connected to form a system of the required size.

Solar inverters - Convert the DC electricity generated by the panels into AC electricity that can be consumed by appliances or injected into the grid network.

Safety equipment - Protect the system and residents in case of events such as lightning strikes, power surges, or equipment malfunction. Includes an AC distribution board (ACDB), circuit breakers, surge protection, grounding equipment, and a lightning arrester.

Bi-directional meter - Also known as 'net-meters', helps keep track of the electricity generated by the RTS system, injected to the grid and the electricity taken from the grid.

Cables - For transmitting electricity from the panels to the consumer and the grid in a safe manner.



Importance of quality in rooftop solar

Would you compromise on safety and quality when buying a car? The simple answer is No. Rooftop solar is a similar investment - choosing quality components will only improve the quality of power generated and ensure a satisfying ownership experience! And while a car loses its value over time, your rooftop solar system continues to save you money right till the end!

	Panel	Inverter	Cables
Why should you care?	<p>It is the source of power.</p> <p>A good-quality panel will provide more energy and will last longer.</p> <p>Check for the following: (a) glass - no breakage; (b) back sheet - no cut or tears; (c) frame - should be properly attached and should not be loose; (d) junction box - properly attached, IP65/67 rating.</p>	<p>It converts DC power from the solar panel to AC power.</p> <p>A higher-quality inverter will deliver better power quality.</p> <p>A higher-quality inverter will last longer.</p> <p>Good inverters will have proper safety mechanisms to prevent accidents such as fires.</p>	<p>Cables are important as the wires connect the panels to the inverter and then to the load.</p> <p>Good-quality cables will have greater fire and short-circuit prevention.</p> <p>The losses on the DC and AC side will be limited.</p>
Price range (INR)	<p>About INR 15 to INR 25 per watt peak. It varies across module technologies and efficiency.</p> <p>Monocrystalline panels are more efficient and have higher generation compared to polycrystalline panels.</p>	<p>About INR 10 to INR 25 per watt. It may vary across brands and the features of the inverters.</p> <p>More efficient inverters with quality components are usually in the range of INR 18 to INR 25 per watt.</p>	<p>The cost will vary as per the protection provided over the wire and the thickness. Depending on the system configuration, the diameters of the cables can vary.</p>
Common brands (Indicative list)	<p>WAAREE, Vikram Solar, Adani Solar, Indosolar, Tata Power Solar, MoserBaer, Jinko Solar, Trina Solar, Canadian Solar.</p>	<p>Growatt, Solis, Sungrow, Delta. Goodwe, ABB, Huawei, Solaredge, SMA, Fronius.</p>	<p>Polycab, HPL, Havells, Finolex, RR KABEL.</p>

Apart from the electronic components, it is important to have a good structure for the whole system. It provides the required stability to ensure that sunlight falls uniformly upon the solar panels, thereby maximising power generation. The optimal installation of the entire system and structure plays a vital role in safety and the long-term efficiency of the system.



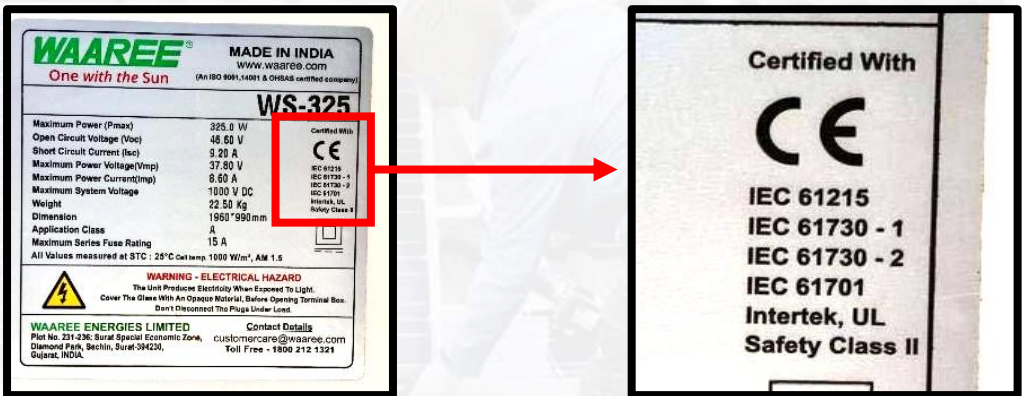
Importance of quality in rooftop solar

A reliable solar vendor can provide top-quality components. The Solarise campaign provides the platform to put you in touch with trustworthy vendors.

Component certification explained

It is also important to know how to identify the quality of components in your RTS system. Each component in the RTS system is certified. The certification is displayed as a sticker on the component.

For example, for a solar panel, the product details sticker and certification are as seen below and are usually provided at the back of the panel. These certifications and panel specifications are also provided in the datasheet supplied along with the components.



Source - CEEW

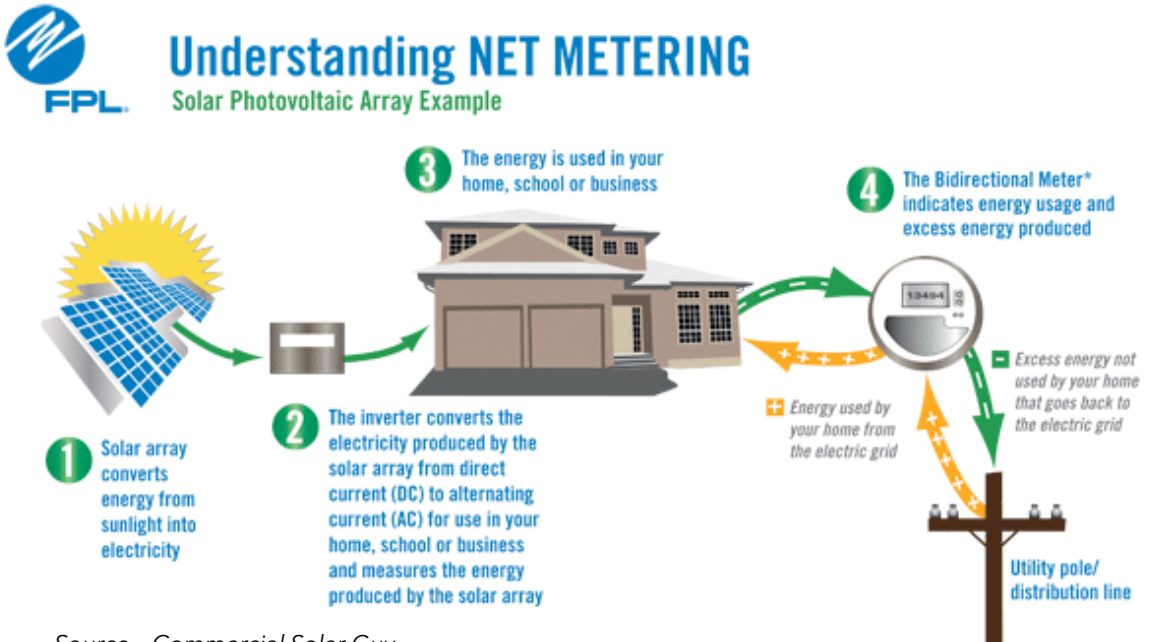
This certification indicates that this batch of panels was tested as per international standards. Similar accreditations can be found on the inverter, batteries, and cables as well. It is essential to have good-quality components as it will lower the risk of any mishap or damage. Better quality will also ensure higher energy production, lower maintenance charges, and a longer lifetime.

Do join Solarise events for dedicated e-workshops on component quality checks. Check out solarisesafdarjung.wee.green for the workshop schedule of your neighbourhood.



What is net metering and how does it work?

Net-metering is an agreement that allows the RTS owner to buy or sell energy to the electricity distribution company using a meter to track this energy exchange. The meter calculates the difference in excess energy fed back to the grid and total energy consumed from the grid by the system owner.



Source - Commercial Solar Guy

- If the solar energy generation (in kWh) is less than your needs at any time (early morning/late evening/night), the net-meter takes the deficit from the grid (in kWh), and you are charged only for those units consumed.
- If your RTS system generates more than your needs at any time, the excess energy is then injected into the grid and you are credited for those units (in kWh).
- At the end of the billing cycle, if your injected units are greater than your consumed units from the grid, you get a credit on your next bill. And if your grid consumption is more than your solar generation, then you pay for only the difference in units as per the usual tariff.



I'm convinced! How do I get started with rooftop solar?

Setting up your own RTS system is now easier than ever with the Solarise campaign! Just visit solarisesafdarjung.wee.green and set up a free home visit by a trusted solar vendor. The solar vendor will assess your roof structure and estimate the possible installation capacity and savings. They will guide you through every step of the way towards getting your own RTS system!



15 KW rooftop solar system in Karkardooma, Delhi

1 MW of rooftop solar:

- Avoids emitting 28,000 tonnes of carbon dioxide over its lifetime
- Equivalent to planting 45,000 teak trees
- Can create employment for 25 people
- Can power 440 Delhi homes for a year.

100 kW of rooftop solar:

- Avoids emitting 2,800 tonnes of carbon dioxide over its lifetime
- Equivalent to planting 4,500 teak trees
- Can create employment for 2-3 people
- Can power 44 Delhi homes for a year

Source: SPIN-MNRE, 2019. https://solarrooftop.gov.in/rooftop_calculator; CEEW analysis



Financing models for rooftop solar

Ownership models for RTS

1.CAPEX model - you pay upfront for the whole system and can choose to either operate and maintain the plant yourself or hire the solar vendor on an annual maintenance contract (AMC). A one-year AMC is usually provided as a free service by vendors nowadays. The upfront payment can be made directly from your savings or it can be financed through a mix of loan and cash.

2.RESCO/OPEX model - you only provide the premises for the RTS plant, while the solar vendor owns and operates the plant. You pay a monthly fee to the solar vendor based on a 10-25 year contractual agreement. This model greatly reduces the need for upfront cash and lets you enjoy the benefits of RTS without worrying about maintenance!

However, vendors currently offer the RESCO model only to residential societies with system sizes of above 25 kW and do not offer it to individual residential consumer - so do talk to your neighbours and RWA for installing a community system!

Do attend dedicated e-workshops with the Solarise campaign to understand these ownership models in more detail and talk to the solar vendors!

I got my rooftop solar system 9 years ago and have been reaping the benefits ever since. Being a doctor, it was important that I had reliable power for my clinic, and the RTS system with battery back-up has been providing that since day one.

Dr. Pankaj Agarwal, Ghaziabad



Estimate your savings

Shadow-free roof area (sq. feet)	Average monthly electricity bill (INR)	System size (kW)	Without subsidy		
			Savings on electricity bill in the first year	Payback period (years)	Internal rate of return (IRR)
300	2,000 - 4,000	2	35-65%	3-6	13-36%
450	2,000 - 4,000	2-4	65-75%	4-8	5-25%
900	4,000 - 7,000	4-8	75-85%	4-8	10-25%
1,800	4,000 - 7,000	8-16	80-90%	3-6	5-25%

*Source - CEEW Analysis

These are indicative calculations. Visit solarisesafdarjung.wee.green to book a home consultation and get an accurate and customised energy savings assessment for your home!

Your savings will vary based on component quality, their costs, and other factors such as subsidy availability. Your solar vendor can give you a more detailed savings estimate after surveying your roof and calculating your generation potential. Be sure to purchase components that come with quality and performance assurances from well-known brands.



Frequently asked questions

Application, billing, metering

Frequently asked questions

1. Whom should I approach to apply for rooftop solar?

You can apply for a site visit at solarisesafdarjung.wee.green and the designated solar vendor will contact you. They will walk you through the process of registering RTS system and all the necessary applications.



2. Do I have to change the meter after installing the rooftop solar system?

Yes, the existing meter must be replaced by the solar meter and the net-meter. The electricity distribution company is responsible for procuring and installing both the meters. Consumers have to pay ONLY for the net-meter, which is usually priced at around INR 3,000 for a single-phase and INR 9,000 for a three-phase meter.



3. What are solar meters and net meters?

The solar meter measures the energy production from the RTS plant and the net-meter records the difference between export from the RTS and import from the main grid.

4. How will I get compensated for the extra units generated from the rooftop solar system?

Extra units generated are carried forward to the next month and adjusted against solar PV generation and electricity consumption. Any units left at the end of the financial year are adjusted in your bill at the rate decided by the Delhi Electricity Regulatory Commission (DERC). This is also known as net-metering.



Rooftop solar performance

Frequently asked questions

1. Why should I invest in a rooftop solar system?

Given rising electricity prices and the economic uncertainty of the post-COVID world, RTS can be a safe and effective means to reduce expenses now and in the future. As the technology is fully mature and widely available, investing in RTS today makes economic and environmental sense. It also offers potential annual savings of up to 92% on your electricity bills (depending on consumption)



2. What is the annual energy generated by a 1 kW solar plant?

A 1 kW system installed in shadow-free space in Delhi would generate around 1,300-1,600 units (kWh) in a year. However, the wear-and-tear of panels over the years, use of components of varying quality, and lack of maintenance can reduce energy generation.

3. What is the efficiency of solar panels and inverters?

The efficiency of the solar panels available in the market range between 16-20%. Inverters are more than 97% efficient.



4. Will the solar panels work during power cuts?

Not all RTS systems can supply electricity during a power cut. If your system is configured with battery storage and hybrid inverters, it can supply power even during an outage. A battery system is essential to ensure that power supply continues during power cuts.

5. Will solar panels work on a cloudy day?

The output of the panels is sensitive to solar radiation. In case of cloudy or rainy weather, the panels produce 10-25% of their peak output, depending on how dark it gets. On average, Delhi experiences around 300 sunny days in a year.



Ownership and maintenance

Frequently asked questions

1. What are the minimum and maximum size requirements for rooftop solar?

As per Delhi Electricity Regulatory Commission (DERC) regulations, the minimum size for an RTS system is 1 kW and the maximum is 1 MW. A detailed site survey can help you arrive at the optimum system size for your roof.



2. What is the height of rooftop solar and the area it needs?

The height will be around 3 feet. RTS systems can also be installed on elevated structures. About 110-130 sq. ft. is required for a 1 kW system.



3. Can my roof bear the weight of a solar plant?

Yes, a structurally strong roof can easily tolerate the weight of solar panels, an inverter, and a mounting structure. The solar vendor will also check the suitability of your roof for RTS installation.



4. Is there any warranty for solar panels and other components?

Solar PV panels must be warranted for their output peak watt capacity, which should not be less than 90% at the end of 12 years and 80% at the end of 25 years. Confirm these warranty conditions with the solar vendor.



5. Do I have to give roof access to the vendor?

For installation and commissioning purposes, the vendor requires roof access for 8-12 weeks. You may need to periodically give the vendor access for any maintenance or repair activities. But the overall roof access remains with you.



6. How much time is required to install a rooftop solar system?

An RTS system can be installed in 4-8 weeks after getting the necessary approvals.



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Ownership and maintenance

Frequently asked questions (continued...)

7. What maintenance is required for rooftop solar?

RTS requires very little maintenance since there are no moving parts. The panels requires cleaning with water once in 7-10 days (may have to be more frequent depending on dust levels) and electrical check-up with maintenance once in 3 months. Most vendors nowadays provide maintenance services for up to five years.



8. How should I clean solar panels?



Solar panels can be cleaned periodically with a wet cloth or a low-pressure water hose to remove dirt and bird droppings. Your solar vendor may also provide these services depending on the agreement.

DO NOT clean the wiring underneath the panels with water.

DO NOT use a brush or abrasive substance to clean the solar panel surface.

9. Can I use heavy appliances on solar power?

Yes, in fact, solar power can be used to operate heavy appliances such as air-conditioners, geysers, etc. An optimal system size for running heavy appliances is 3 to 10 kW.



Cleaning the panels regularly ensures optimum generation. Ensure there is minimum dust accumulation on the panels



Safety of rooftop solar

Frequently asked questions

1. Can rooftop solar systems cause fire?

RTS in India has an excellent track record in terms of safety. Proper installation, maintenance, and use of good quality products would further ensure protection from short-circuits and fire.



2. Are panels easily breakable?



No. Good-quality panels can withstand external pressures such as wind and heavy rains, falling branches, birds, etc. However, improper installation and maintenance may diminish panel strength.

3. Can I insure my rooftop solar system?

As of now, there are no insurance products in the market to insure RTS systems against extreme events such as heavy rainfall and cyclones. However, it is possible to insure the panels against manufacturing defects. Some home insurance providers may cover the RTS system.



4. Do rooftop solar systems have any health or radiation impacts?



Studies have shown that RTS does not have any harmful radiation impacts on the residents. The electromagnetic radiation from an RTS system is equivalent to that emitted by home appliances such as televisions, refrigerators, and computers.



*Hoping to see you get
Solarised!*



<http://www.solarisesafdarjung.wee.green>



Image - IEA

Council on Energy,
Environment and Water
Sanskrit Bhawan
A-10, Outab Institutional Area
Aruna Asaf Ali Marg
New Delhi - 110067, India

CĒEW
THE COUNCIL

BSES
BSES Rajdhani Power Limited

SmartPower
Let's Get Energy Smart.