



Homeowners Guide To Rooftop Solar

This handbook is a two-part guide. An honest initiative to bring you all the information you need before switching to solar in your home.

These are your questions, answered by experts at SolarSquare.



25,000+
downloads

“

The amount of solar energy received by Earth could power a civilization over 100 times larger than ours!



Elon Musk,
CEO, Tesla Solar

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PART 1

Rooftop solar made simple

Why should I consider switching to solar?

In short, **to save over 90% on your electricity bills every month!**

Let us explain with an example:

Say the electricity tariff in your state is ₹9.5, and you get an electricity bill of ₹3,000 per month.

In a year, this means you pay ₹36,000.

Now, the cost of electricity increases each year by 3-10%.

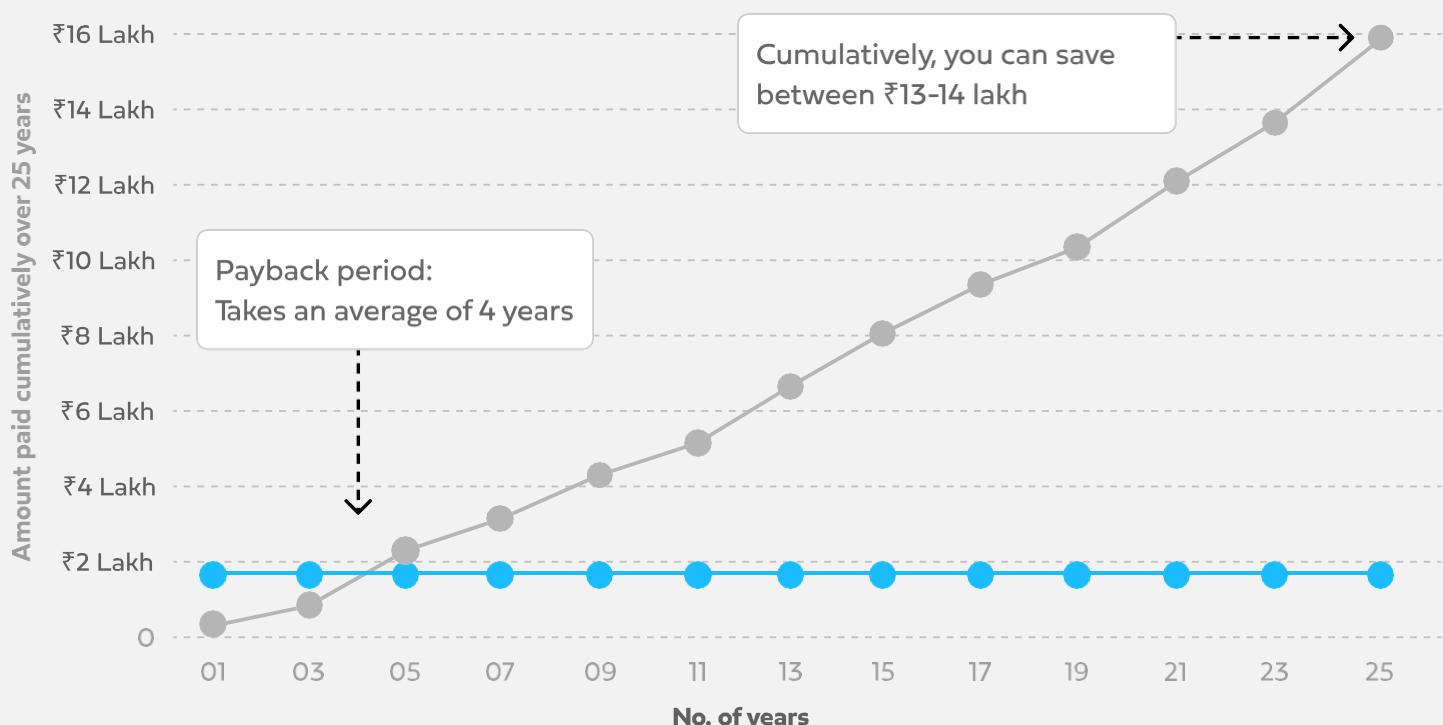
This means, in the next 25 years, you will pay around ₹13-14 lakh in electricity bills.

Based on your consumption of electricity, a 3 kW solar system that starts at ₹2,10,000 can fulfil your needs. On top of this, the government offers a subsidy of ₹78,000 on a 3 kW system.

Now, would you rather pay ₹13-14 lakh in electricity bills or switch to solar for ₹1,32,000 and forget paying bills forever?

Solar vs grid electricity - Cost over years

Solar Grid Electricity



And savings is not all that you can gain by adopting solar.
Here are a few more benefits:

1 Protect yourself against rising costs

Electricity costs are rising in many Indian states, and a solar system can give you a stable and predictable source of electricity and shield you against price fluctuations.

2 Enjoy energy independence

By generating your own electricity, you can become less reliant on the grid and enjoy greater energy independence.

3 Reduce your carbon footprint

Solar energy is a clean and renewable energy source that helps to reduce greenhouse gas emissions and combat climate change.

4 Avail subsidy

The Indian government offers financial help, in the form of a subsidy, to homeowners installing on-grid rooftop solar systems. This reduces the cost of installing solar. You should take advantage of this while you still can; the subsidy on solar will not be offered forever.



Did you know?

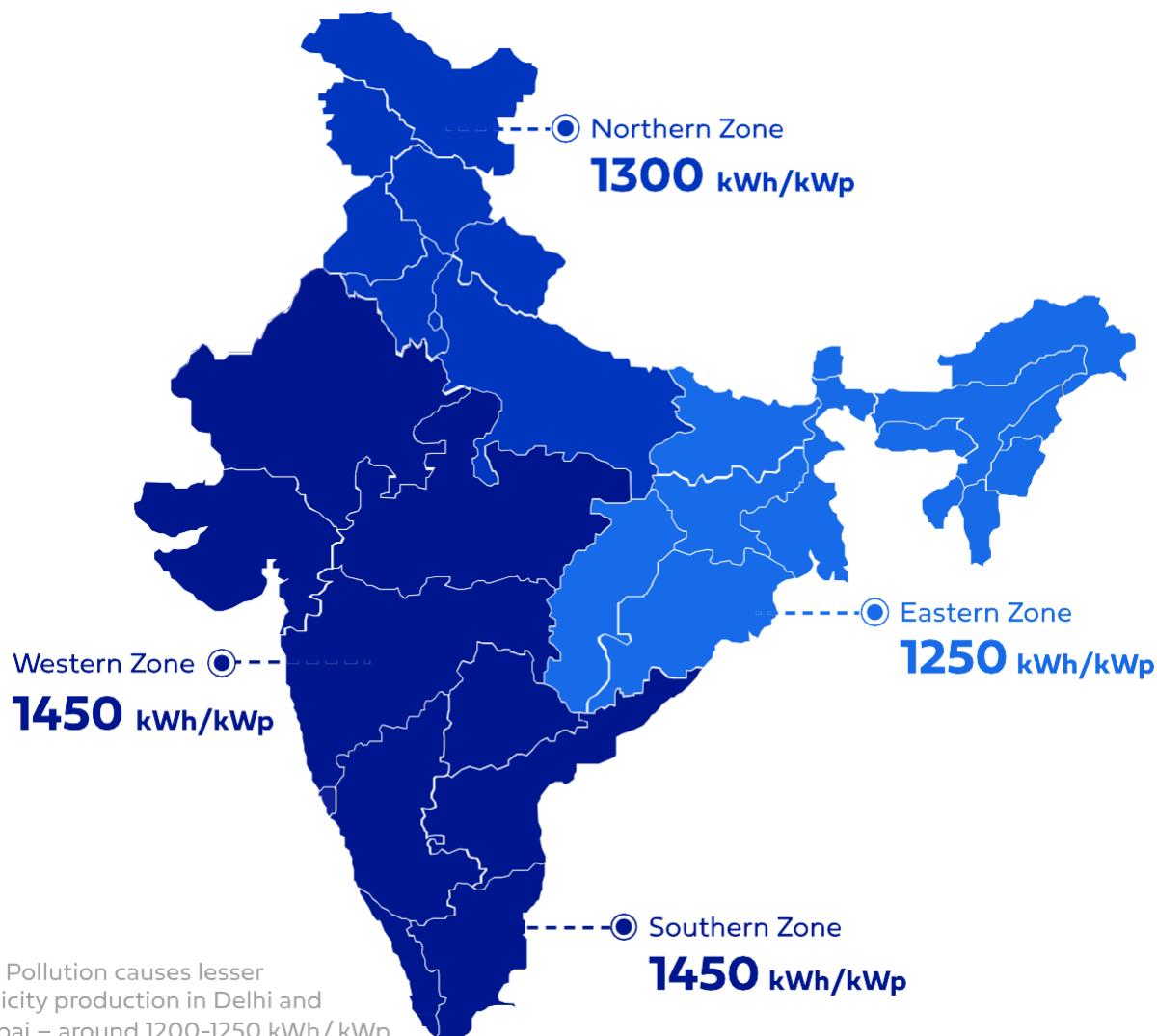
Electricity bills are expected to double for an average Indian family in the next 5 years because of increasing electricity rates, global warming and heat waves across the country, as reported by ET Money in March 2023.

Does solar work in all Indian states and seasons?

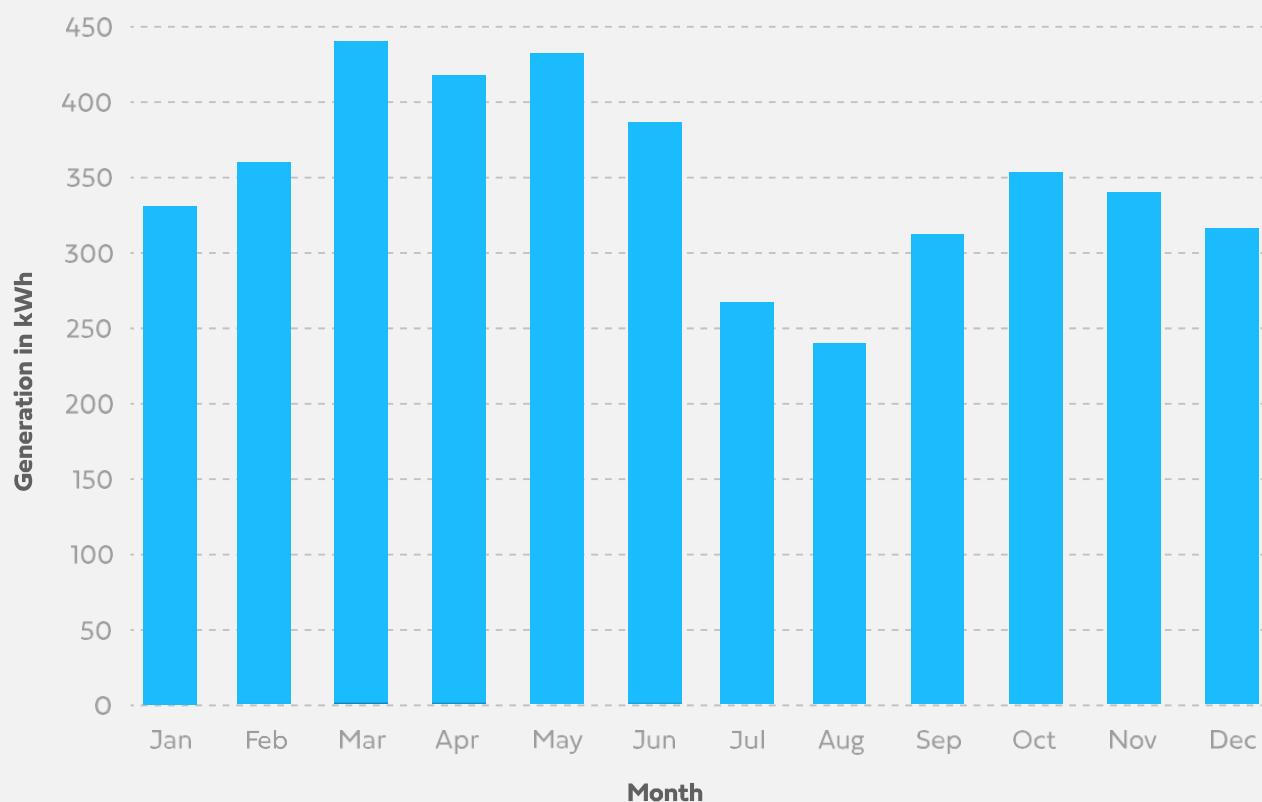
Solar energy is a viable source of power in all parts of India throughout the year. So much so that we can predict the annual power generated by a rooftop solar system.

There are, however, some day-to-day and seasonal variations. For instance, solar energy production is typically lower during the monsoon season, while summer sees the highest production.

The map below shows how much energy different states in India can generate annually using rooftop solar systems. This data is based on the proven performance of well-maintained solar systems (with regularly cleaned solar panels) nationwide.



Average month-on-month solar energy generated by a 3 kW system in India



How do I decide what size solar system will suit my needs?

You can power all your appliances with a solar system, as long as you pick the right system size. **Consider these points to figure out the right capacity system for you.**

#1. Your power consumption

- ✓ Review your electricity bills from the last year
- ✓ Calculate the average number of units consumed in six months or a year

For example, if your yearly consumption is 7,000 units, then you will need a 5kW solar system to meet your requirements.

(Yearly consumption / yearly units generated per kW | 7,000/1,400)

Units required	Solar system size
1,400 ⚡	1 kW (1,400/1,400)
2,800 ⚡⚡	2 kW (2,800/1,400)
4,200 ⚡⚡⚡	3 kW (4,200/1,400)
5,600 ⚡⚡⚡⚡	4 kW (5,600/1,400)
7,000 ⚡⚡⚡⚡	5 kW (7,000/1,400)
14,000 ⚡⚡⚡⚡⚡	10 kW (14,000/1,400)



#2. Estimated solar system size as per appliance usage

Appliances type	3 kW	5 kW	10 kW
 Air conditioner	No	2	3-4
 Fridge	1	1	1
 Geyser	1	2	2-3
 Washing machine	1	1	1
 TV	1	1	2
 Pump	No	No	1
 LED bulb	3-4	3-4	6-7
 Tube light	1-2	1-2	3-4
 Fan	4-5	4-5	6-7

#3. Miscellaneous factors to consider



Shadow free space on your rooftop

In order to generate electricity, at least 100 square feet of shadow-free space is needed per kilowatt of system capacity.



Sanctioned load by your discom

Sanctioned load is the maximum amount of electrical load that a discom allows a home to draw from the grid at a particular point in time. Before you decide on the size of your system, it is essential to figure out what the load is for your electricity connection.

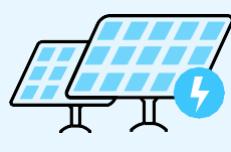


Rooftop suitability

To handle the weight of solar panels, the roof should be made of reinforced concrete, metallic sheet or shingles. An asbestos roof is unsuitable for solar panels.

What type of solar system is best suited for my home?

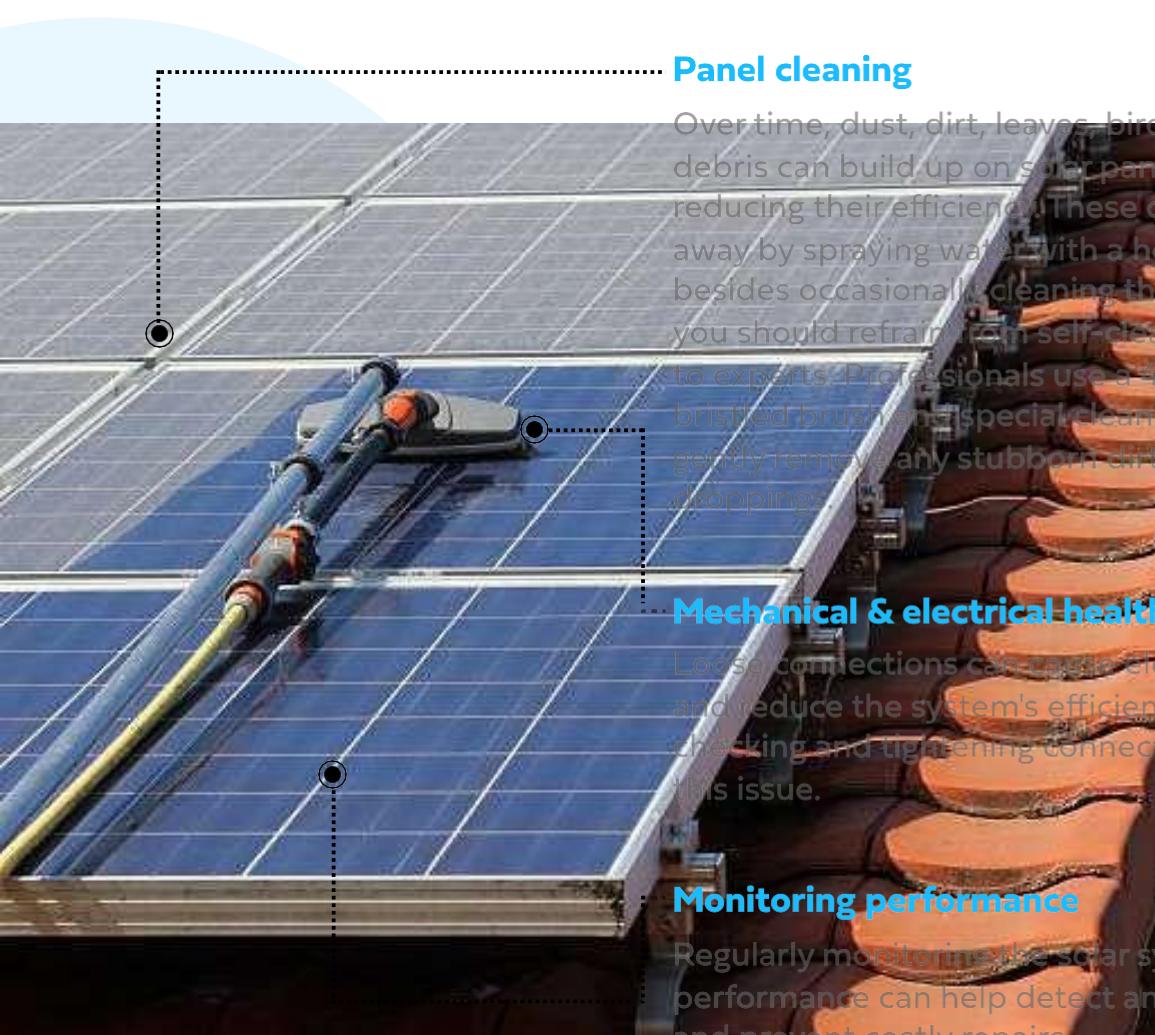
In India, the two most common types of solar energy systems are **on-grid** and **off-grid systems**, which differ in their use of battery storage. What you choose will depend on your energy consumption, the size of your roof, and the amount of sunlight that your area receives.

	VS.	
Good choice in urban areas with a reliable grid	 Viability	Best for rural areas without a grid connection
Connected to the grid	 Connection to the grid	Connected to a battery, not the grid
Doesn't prevent power outages, since it relies on the grid for energy	 Power outages	No power outages since the system is not connected to the grid; power can be drawn from the battery at any time
Lower upfront cost, since battery storage is not needed	 Cost	Expensive to install since it needs battery storage
Homeowners can get a subsidy up to 10 KW for on-grid systems	 Subsidy	No subsidy is offered for off-grid solar systems
Can take advantage of net metering, which allows homeowners to receive credits	 Net metering	Does not get the advantage of net metering, since excess electricity is stored in batteries

Are solar systems difficult to maintain? Will I have to clean them frequently?

Maintenance for solar panels is not just required, but essential for their optimum performance and longevity. Neglecting maintenance can lead to a whopping 40% reduction in power generation, in just a few months.

A solar system should be cleaned and maintained by professionals using the right tools and techniques. Here's what maintenance should include:



Panel cleaning

Over time, dust, dirt, leaves, bird droppings and debris can build up on solar panels, thereby reducing their efficiency. These can be washed away by spraying water with a hose pipe. But besides occasionally cleaning them with water, you should refrain from self-cleaning and leave it to experts. Professionals use a 4-5 inch long soft-bristled brush and special cleaning solutions to gently remove any stubborn dirt or bird droppings.

Mechanical & electrical health check

Loose connections can cause electrical problems and reduce the system's efficiency. Regularly checking and tightening connections can prevent this issue.

Monitoring performance

Regularly monitoring the solar system's performance can help detect any issues early on and prevent costly repairs.

Pro tip



Choose a solar installation company that provides live monitoring of your system via a mobile app. You should be able to keep track of the performance of your solar system to ensure it is generating power at its best capacity.

Will I need to invest a lot of time and effort in buying solar?

Switching to solar can be a complex process, but it doesn't have to be difficult. A reputable solar provider will facilitate all the steps, end-to-end, on your behalf.

#1 Evaluate your electricity needs

The first step is to determine **how much electricity you and your household need**. This can be done by looking at your monthly electricity bills to find out how many units are consumed in a year.

#2 Have your roof evaluated

Next, it's important to get your roof surveyed to determine whether it is suitable for solar panels. It should be strong enough to support the weight of panels and also have a sufficient shadow-free area.

#3 Find a reputable solar provider

Look for a **reputable solar provider** in your area. The provider should be licensed, have experience installing solar panels, be able to answer all your questions, have good customer reviews and provide comprehensive maintenance service.

Obtain necessary permits #5

Before installation can begin, you will need to obtain any necessary permits from your local government. **Securing a net meter permit is essential**. In addition, some homeowners may also require a **load change permit, name change permit, and a subsidy application**. Your installation company will be able to guide you on whether or not you will need the last three permits.

Get a solar quote #4

Once you have found a solar provider, **request a solar quote**. The quote will include the cost of all the solar system components, installation, and necessary permits.

#6 Install solar panels

- Once all permits have been obtained, the solar provider will install the **solar panels on your roof**.

#7 Connect to the grid

- After installation, the solar panels will need to be **connected to the electrical grid**. This will require an inspection from your local discom.

#8 Enjoy solar

- Once the solar system is connected to the grid, you can start enjoying the benefits of solar power and **generating your own electricity**.

How do I choose an installation company – what should I look out for?

Never choose an installation company precariously. Solar is a one-time investment and placing your money in the right hands is important. **Here are the major things you should look for when choosing a solar provider:**



Experience and reputation

Look for a solar provider with a proven track record and positive reviews from previous customers. Check online reviews and ratings.



System design and installation

Choose a solar provider that can design and install a solar system that meets your specific needs and preferences. Check their design capabilities.



Quality of products

Choose a solar provider that offers high-quality solar panels, inverters, and other components. Check the warranties provided by the manufacturer.



Customer service

Go with a solar provider that offers prompt and educated responses to your queries and concerns.



Cost and financing options

Compare the cost and financing options offered by different providers. Consider the total cost of ownership, including installation, maintenance, and operation costs. Look for a company that offers EMI plans.



Experience of working with discoms and subsidy assistance

The paperwork and procedure to go solar can be tedious. Choose a solar company that will take on the hassle of securing government permits for you.



Did you know?

Till March 2023, more than 5 lakh families in India had switched to rooftop solar for their electricity needs!

How much does rooftop solar cost? What about government subsidy?

Solar installation costs depend on factors such as panel choice, system size, and inverter type. The government also offers subsidy benefits to homeowners and housing societies to make solar adoption more accessible.

On July 30, 2022, PM Modi launched the [**National Portal for Rooftop Solar**](#) and a unified solar subsidy scheme for the entire country. Here are the details:

Subsidy for homeowners

System capacity	Applicable subsidy*
1 kW to 2 kW	₹30,000/kW
2 kW to 3 kW	₹30,000/kW for the first 2 kW; thereafter, ₹18,000/kW
Above 3 kW	₹78,000 fixed

*Latest figures, as per February 13, 2024 notification



Now, the Ministry of New and Renewable energy (MNRE) transfers the subsidy directly to the customer's bank account within 30 days after local discom inspection.

To avail the subsidy, there are three eligibility criteria:

1. Solar panels must be made in India
2. Panels must comply with ALMM specifications
3. The solar system should be a rooftop on-grid solar system

Taking the subsidy into account, here's an estimated cost of a rooftop solar system (as per prevailing commodity cost as of March 2023):

System capacity	Avg. installation cost (excluding subsidy)	Subsidy offered	Avg. installation cost (including subsidy)
2 kW	₹1,85,000	₹60,000	₹1,25,000
3 kW	₹2,10,000	₹78,000	₹1,32,000
4 kW	₹2,70,000	₹78,000	₹1,92,000
5 kW	₹3,25,000	₹78,000	₹2,47,000
10 kW	₹5,80,000	₹78,000	₹5,02,000

Please note: Costs aren't fixed and vary based on product variant, net-metering charges, panel and inverter type, type of module mounting structure and type of after-sales service opted for. The installation costs provided above considers

- Made-in-India bi-facial monocrystalline panels
- Mounting on metallic shed
- No maintenance package/contract
- String inverters and installation charges



Did you know?

You can recover your solar installation cost within 4 to 5 years! Scan the QR code for a rough calculation of the expected solar internal rate of returns (IRR). Solar internal rate of returns (IRR) indicates the returns your installation is expected to generate.

What about easy financing? Can I get a loan to go solar?

You have three options for solar financing:

1 Personal loan

Some banks offer solar loans that allow homeowners to finance the installation of their solar systems over time. These loans, though, typically have high interest rates and are cumbersome to secure.

2 Bundle with a home loan

If you're taking on a loan to build a new house, you can bundle it with a solar loan. Note: only the State Bank of India (SBI) offers this type of loan.

3 EMIs via solar companies

A handful of solar companies offer EMI plans to make your switch to solar easier. Take this option if it comes with an attractive interest rate and flexible repayment terms, allowing you to pay off the loan over a period of several years. **To see SolarSquare's EMI plans with a choice of 1, 3, and 5-year tenures, flip to page 32.**

Type	Collateral	Interest rate
Personal loan	Collateral-free. No personal assets need to be put up as collateral to secure this loan	16-18%
Solar bundled with home loan	Your home serves as the collateral here	10%
EMI via solar company	Your solar system serves as the collateral here	11-15% (if your credit score is above 700)

How much can I actually save by going solar?

Your actual total savings will depend on your current electricity usage, the size of the solar system, your location and the cost of electricity in your area.

Based on an estimate, here's what your average savings can look like in a year of going solar.

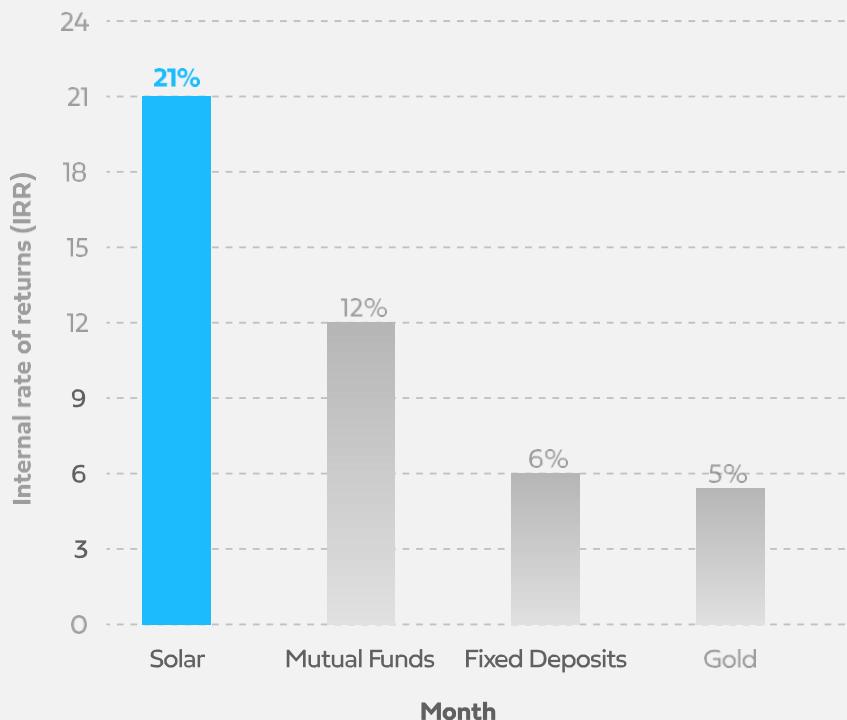
System capacity	Average electricity tariff (per unit)	Average installation cost (including subsidy)	Annual power generated by solar system (in kWh)*	Average annual savings
2 kW	₹6.5	₹1,25,000	2,800 units	₹18,200
3 kW	₹8	₹1,32,000	4,200 units	₹33,600
4 kW	₹8	₹1,92,000	5,600 units	₹44,800
5 kW	₹9	₹2,47,000	7,000 units	₹63,000
10 kW	₹10	₹5,02,000	14,000 units	₹1,40,000

*Note: A solar system generates around 3.7 units per kilowatt (kW) daily.

Did you know?

Rooftop solar offers a much higher rate of return than investments in gold, mutual funds and fixed deposits. Here is a general overview of the potential IRR associated with these four investments.

If you invest ₹2.1 lakh in any of the below,



Notes:

- ₹2.1 lakh is the estimated cost of a 3 kW solar system, the subsidy amount is ₹78,000 from the National Portal For Rooftop Solar and ₹3,000 per month is savings
- Solar IRR is calculated based on a 4% escalation in electricity rates annually
- Mutual funds, fixed deposits and gold IRR is based on the past 10-year performance



Do I need a battery with my solar system?

Battery storage is needed when the main power grid is unreliable and your area sees frequent and long power cuts.

Two types of batteries are used in solar systems: lead-acid batteries and lithium-ion batteries.

Although lithium-ion batteries are more advanced and have more benefits, lead-acid batteries are more popular. Lithium-ion batteries are 2.5 times more expensive than lead-acid batteries of the same capacity.

Efforts are being made to bring down the cost of lithium-ion batteries, though, since they are more environmentally friendly.



Did you know?



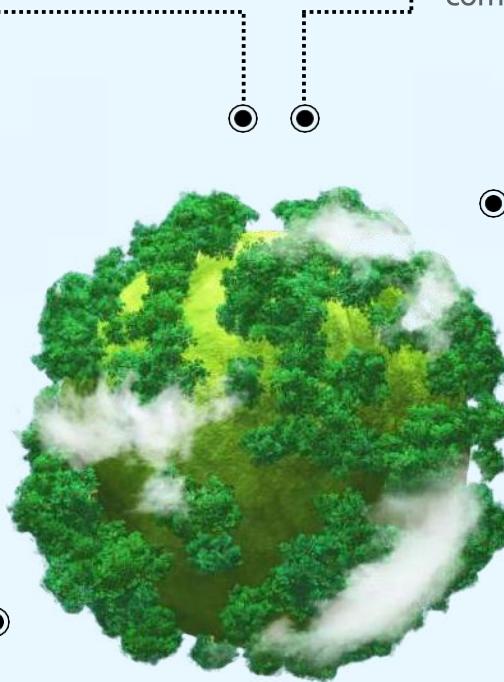
There is also a hybrid solar system. Hybrid systems are connected to the grid as well as batteries. Excess electricity left after the battery is charged is fed back into the grid. Of the three types, hybrid systems are the most expensive. The price depends on the size of the system as well as the battery's capacity.

7 SURPRISING

FACTS ABOUT SOLAR AND THE ENVIRONMENT

1. The sun continuously strikes the Earth with **173,000 terawatts** of solar energy, making it the most abundant energy resource on earth. **This amount of energy is more than 10,000 times the world's total energy use.**

3. India's carbon footprint is **2,411,730,000 metric tons** – which is equal to cutting about 361 crore full-grown trees! This has led to an increase in temperature, resulting in many tragic events such as flash floods in Bangalore and the Kedarnath tragedy of 2013.



5. Using solar energy produces **no air or water pollution and no greenhouse gases.**

7. The use of solar energy dates back to the **7th century BC**. The earliest application traces back to old folks using the sun's heat to light a fire.

2. With approximately 300 clear and sunny days each year, **India's land area receives about 5 quadrillion kilowatt-hours of sunlight per year**. This is more than the total energy output of all the fossil fuel reserves in the entire country combined.

4. Every kilowatt of a solar system can offset 1 metric ton of CO₂, which equals to planting 15 full-grown trees. **So if you install a 5 kW rooftop solar system at home, you will have single-handedly offset 3 metric tons of CO₂, which equals to planting 75 full-grown trees!**

6. **India has the largest solar power plant in the world – the Bhadla Solar Park in Jodhpur, Rajasthan.** It comprises more than 10 million solar panels and has a whopping capacity of 2,245 MW which can power 4 and a half million homes at its maximum capacity.

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I'd put my money on the sun and solar energy. **What a source of power!** I hope we don't have to wait until oil and coal run out before we tackle that.



Thomas Edison,
American Inventor

PART 2

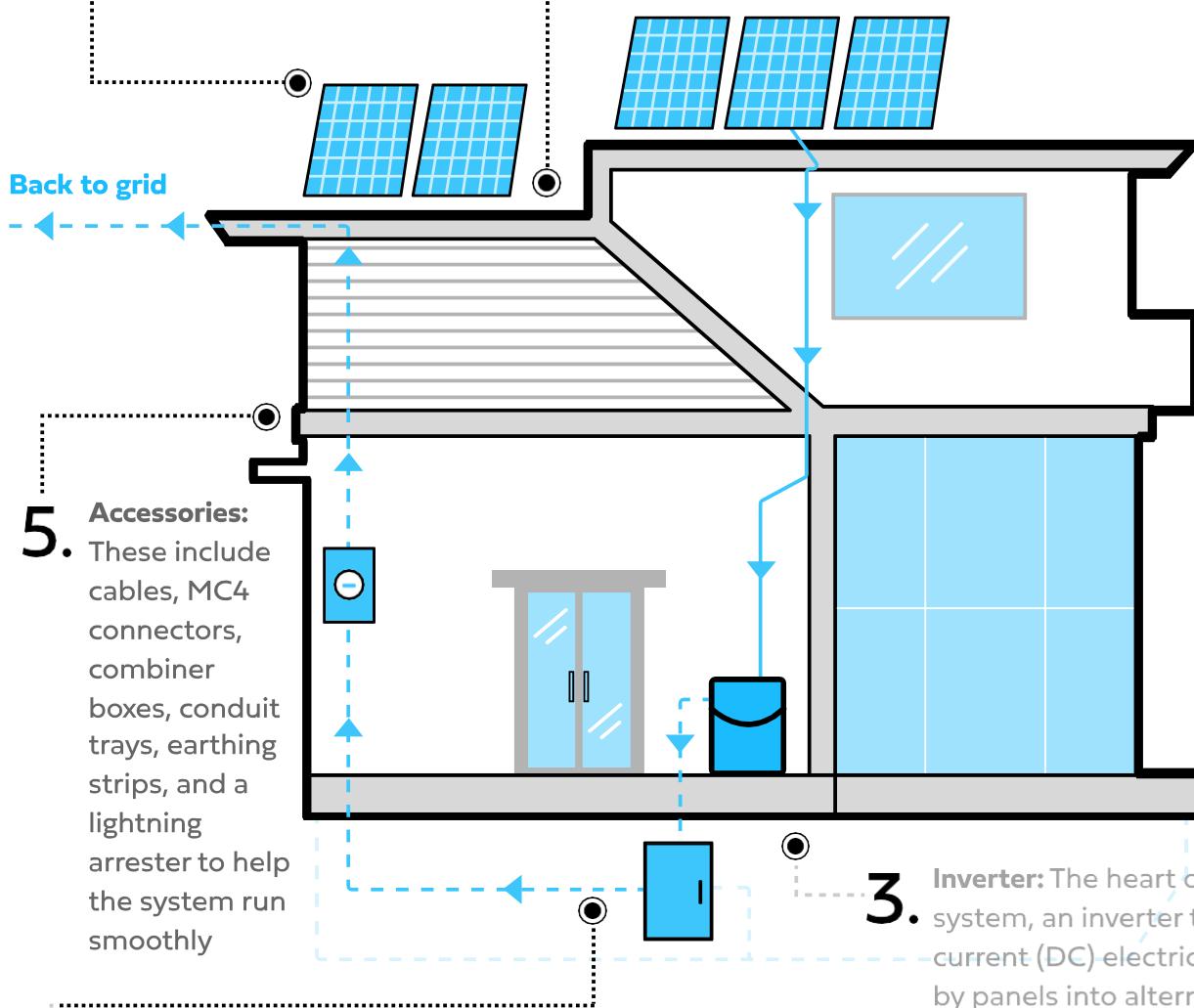
Top 5 things to know before you switch to solar

How does rooftop solar work?

A rooftop solar system is a careful arrangement of multiple components that work together to generate electricity.

- Solar panels:** The most critical part of a solar system, solar panels convert sunlight into DC electricity.

- Mounting structures:** Roof-hugging aluminium or 6-9 ft steel structures that boost and secure panels to sun-soaking heights, leaving the roof free to move around. The best solar mounting structures are prefabricated in precision labs. The steel structures are also coated with an anti-corrosive hot-dipped galvanised zinc layer to make them rust-proof.

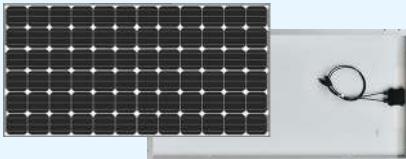
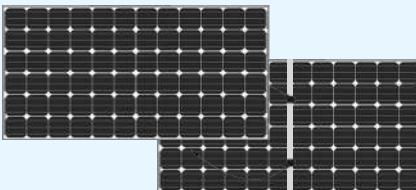


- Accessories:** These include cables, MC4 connectors, combiner boxes, conduit trays, earthing strips, and a lightning arrester to help the system run smoothly
- Bi-directional meter:** Enables net-metering by tracking and recording electricity imported from the grid and excess generation fed back to the grid. The excess/unused electricity fed back into the electrical grid earns the owner of the solar system credits from the local discom. These credits add up and can be used to reduce your electricity bill if your consumption exceeds the power generated by your solar system.

- Inverter:** The heart of a solar system, an inverter turns direct current (DC) electricity generated by panels into alternating current (AC) power which is the type of electricity used in all homes and buildings. The most popular solar inverters in India are the string inverter and the micro-inverter. The choice between the two depends on individual requirements, system design, and budget.

Which type of solar panel should I choose for my home?

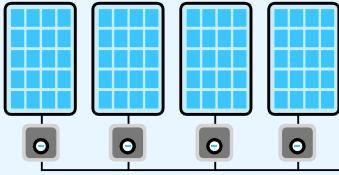
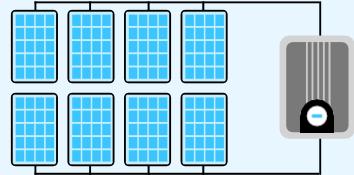
Choosing the right type of solar panel for your home depends on several factors such as the technology that works best for your needs, the brand and space availability on your roof. **The two major options to consider in India are monocristalline panels and bifacial panels.**

	VS.	
Monocrystalline panels		Bifacial panels
Single silicon crystal	Composition	Two silicon cells facing opposite directions
One side	Sunlight collection	Both sides
500-watt	Nominal maximum power	540-watt
0.55%	₹ Degradation rate/year	0.45-0.50%
20%	Module efficiency	21.6%

What are the different kinds of solar inverters?

The most popular solar inverters in India are **string inverters** and **micro-inverters**. A string inverter converts the DC output from solar panels attached in a series into AC power. Even if one panel stops working, the output from the string of panels dramatically drops by as much as 50%.

A micro-inverter, which is no more than the size of an iPad, is the best option for cluttered roofs with shadow problems.

	VS.	
Micro-inverters	 Efficiency	Lower efficiency under partial shadow
High efficiency, even with partial shadow	 System design	Limited configuration; changes require system redesign
Each panel has its own micro-inverter, allowing for customised system design	 Monitoring	Centralised monitoring may make issue identification difficult
Individual monitoring of each panel helps in issue identification and troubleshooting	 Cost	Less expensive but may require additional maintenance costs in the long run
Higher upfront cost	 Damage control	If a panel is damaged, the entire string of panels does not generate electricity
If a panel is damaged, only generation from the affected panel is lost; remaining panels continue to generate energy		

Which mounting structures are the most sturdy and durable?

A thunderstorm finds its way to your city, and the wind speed crosses 100 kmph – what happens to your solar panels then?

Multiple shadows from surrounding structures keep lurking over the solar panels – what of the solar power generation then?

These aren't unlikely situations. Hence, the mounting structures should be robust. **Here are the two major categories of mounting structures**



For reinforced concrete rooftops, steel mounting structures coated with a hot-dipped galvanised zinc layer make most sense. The coating makes these structures rust-proof and weather-proof. Most homeowners with reinforced cement concrete roofs prefer taller mounting structures – 6 to 9 ft, to reduce the chance of shadows falling on the solar panels



For metallic sheet rooftops, aluminium rail mounting structures work the best

Pro tip



Ensure that your solar installer uses chemical anchoring to secure mounting structures. This technique uses waterproofing chemicals to make certain that the structure remains free of water seepage for a decade, while also filling in any minor cracks that may occur.

What are some common solar myths I should know?

From 'solar panels don't work in cold weather' to 'solar systems are too expensive,' there are plenty of solar myths out there that just aren't true. Here are the facts.



MYTH #1

Solar systems don't work in the monsoons.

FACT

Solar works in all seasons – though the units generated vary.

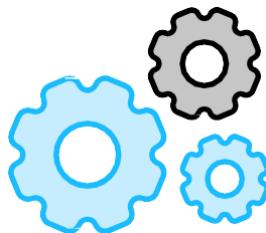
MYTH #2

Solar systems are too expensive to own.



FACT

Government subsidies and financing plans make solar systems easy to afford.



MYTH #3

Solar systems require extensive maintenance.

FACT

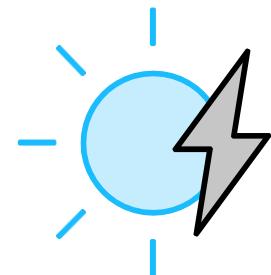
Solar systems need regular maintenance, and most reputed solar providers offer this service.

MYTH #4

Sale value of a house decreases when with a solar panel on the roof.

FACT

Homes with rooftop solar have a higher sale value when compared to homes without solar.

**MYTH #5**

By installing a higher capacity solar system, you can sell extra units generated and make extra money.

FACT

Extra units generated are sold at petty rates.
At the end of each year, they lapse.

MYTH #6

A solar system spoils the look of the house and rooftop.

FACT

A well-installed solar system is an aesthetic addition to a rooftop.



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Homeowners Guide To Buying Rooftop Solar

30

Why trust **SolarSquare** for your solar installation?

Rated 4.8 ★★★★★ by 3,000+ customers on Google

We are a group of 400+ engineers, MBAs, scientists, creative thinkers driven by the single vision of accelerating adoption of solar in homes. Our team is putting all its imagination and might behind making it easier for homes to switch to solar. **It is an honour to be powering homes, powering dreams and decarbonising India.**



10,000+
homes solarised



100+
housing societies powered



10+ years
in operation

90% of our customers recommend us to their friends.
Don't just believe us. Read the reviews for yourself.

Scan the QR code to read more



We've been featured in

Forbes

THE ECONOMIC TIMES

THE HINDU

mint



Quick, safe and professional installation

Installed in just 8 hours (up to 5 kW)

- ✓ Cyclone-proof prefab structures with 10-year warranty
- ✓ 100% rust-proof guarantee
- ✓ Tool-powered assembly, no welding



Easy EMI financing plans

With SolarSquare, you can buy a solar system at an easy ₹3,500 a month for 5 years.

System size	EMI tenure	Monthly EMI	Interest rate	Monthly savings
3 kW	6-month	₹25,000	0%	₹3,000-₹5,000
3 kW	60-month	₹3,500	6.7%	₹3,000-₹5,000

* Savings vary depending on the tariff in your city



Direct service by SolarSquare

No middlemen involved

- ✓ In-house services: consultation, design, installation, paperwork, and maintenance
- ✓ One-stop solution

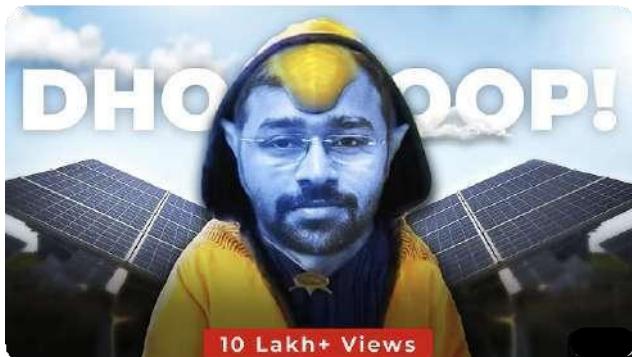


360° Solar Care Plan

360° holistic maintenance for 5 years

- ✓ Quarterly preventative maintenance visits
- ✓ Quarterly solar panel deep cleaning
- ✓ All spares/ repairs included
- ✓ Max solar performance ensured

Know more



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