SKYNXT TECHNOLOGIES

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.

Questions, answered by experts at Skynxt Technologies.

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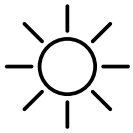

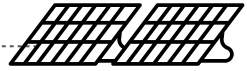

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Part 1

Rooftop solar made simple

Why should I consider switching to solar?

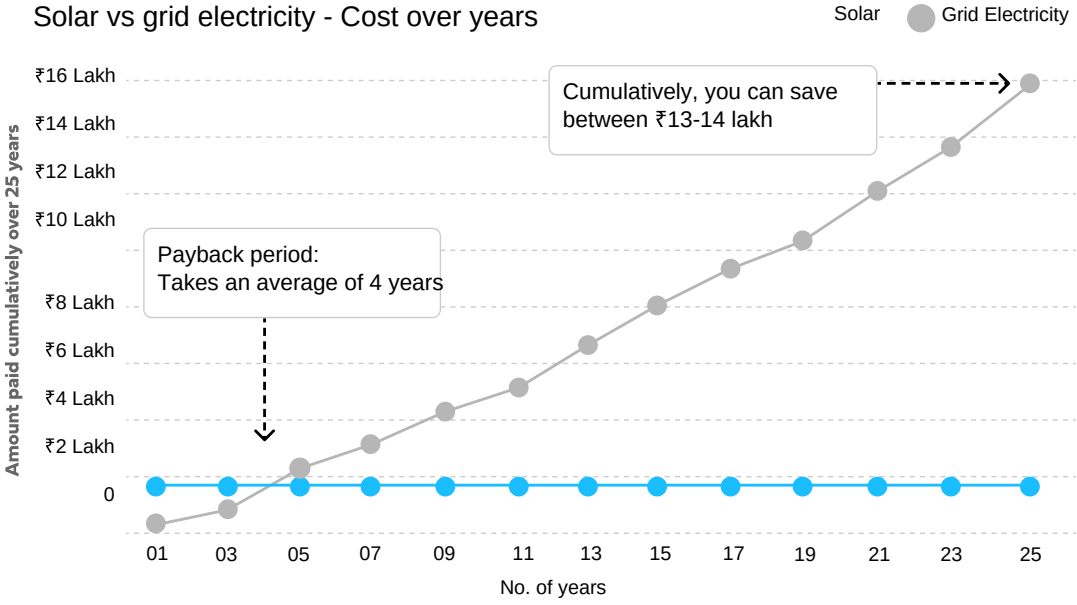
In short, to save over 90% on your electricity bills every month!

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?



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?

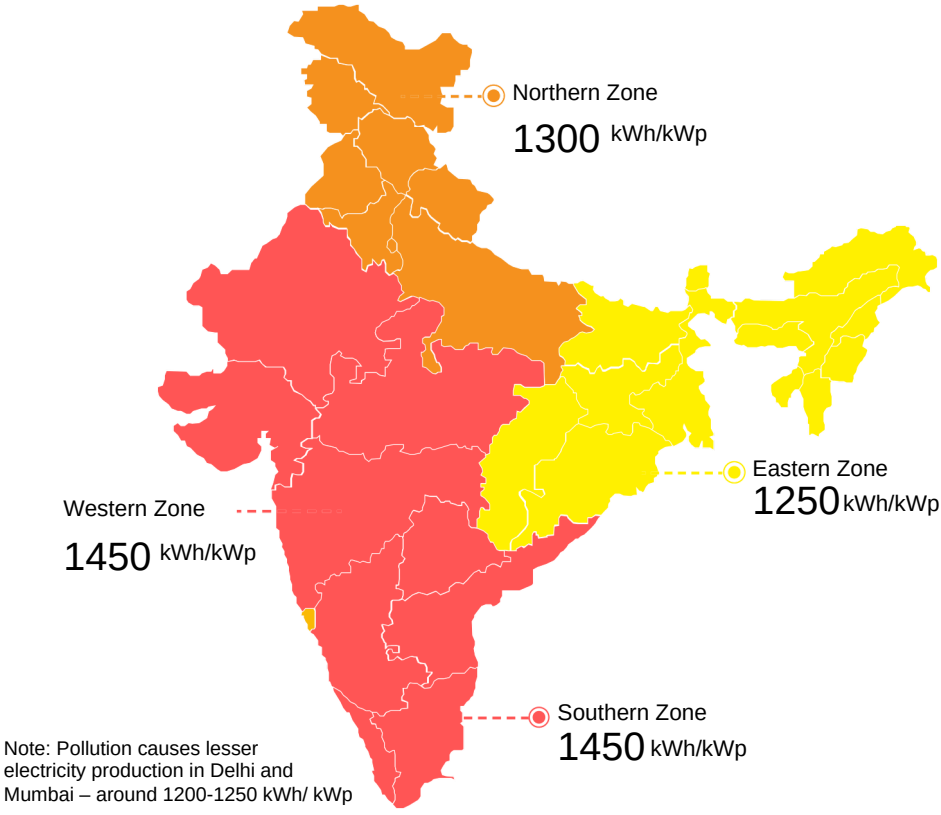
Electricity bills are expected to double for an average Indian family in the next 5 years because of increasing electricity rates, global warming and heat waves across the country, as reported by ET Money in March 2023.

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.



Note: Pollution causes lesser electricity production in Delhi and Mumbai – around 1200-1250 kWh/ kWp

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
2,800	kW (2,800/1,400) 3
4,200	kW (4,200/1,400) 4
5,600 ⚡	kW (5,600/1,400) 5
7,000 ⚡	kW (7,000/1,400) 10
14,000 ⚡⚡	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.

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.

#1Evaluate 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.

#2Have 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.

#3Find 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.

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.

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.

#6Install solar panels

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

#7Connect 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.

#8Enjoy 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

- Solar panels must be made in Indi
- Panels must comply with ALMM specification
- 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)
2kW	₹1,85,000	₹60,000	₹1,25,000
3kW	₹2,10,000	₹78,000	₹1,32,000
4kW	₹2,70,000	₹78,000	₹1,92,000
5kW	₹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

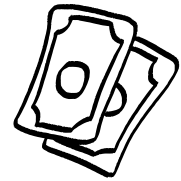
- Made-in-India bi-facial monocrystalline panel
- Mounting on metallic shed
- No maintenance package/contrac
- String inverters and installation charges

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

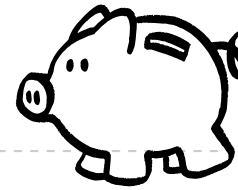
Personal loan

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.



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%

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
10kW	₹10	₹5,02,000	14,000 units	₹1,40,000

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

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.

Part 2

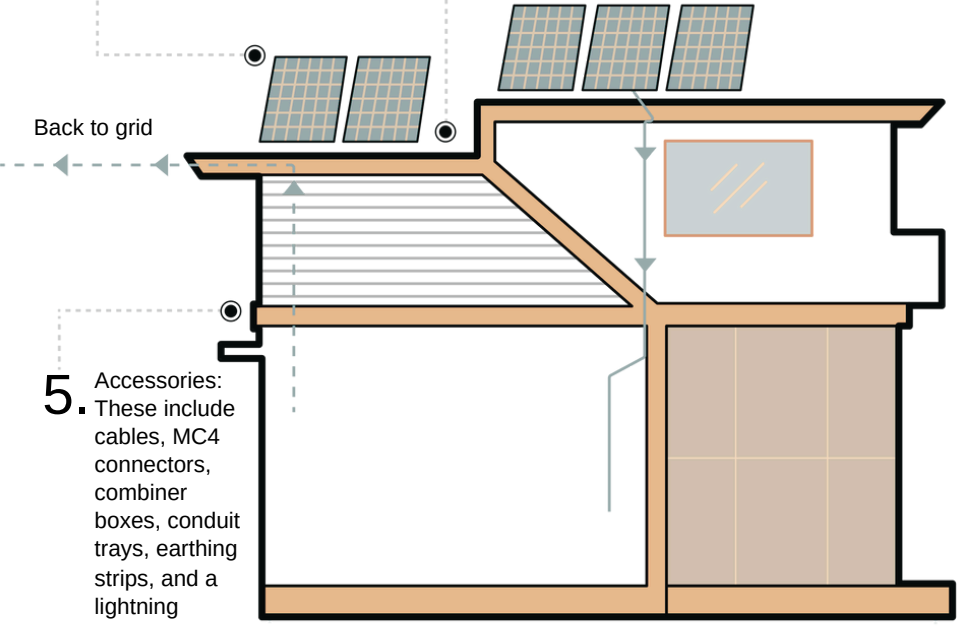
Major things to know before you switch to solar

How does rooftop solar work?

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

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

2. 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.



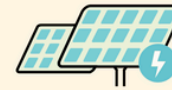
5. Accessories: These include cables, MC4 connectors, combiner boxes, conduit trays, earthing strips, and a lightning arrester to help the system run smoothly

3. 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.

4. 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.

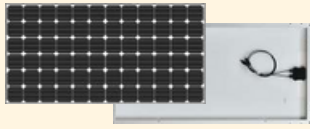
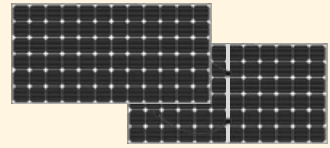
What type of solar system is best suited for my home?

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.

 On-grid solar system	VS.	 Off-grid solar system
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

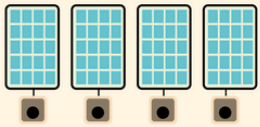
Which type of solar panel should I choose for my home?

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 monocrystalline panels and bifacial panels.

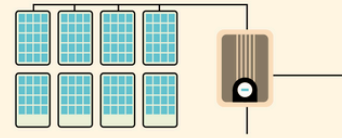
 Monocrystalline panels	VS.	 Bifacial panels
Single silicon crystal	Composition	Two silicon cells facing opposite directions
One side	Sunlight collection	Both sides
500-watt	Nominal maximum power	540-watt
0.55%	Degradation rate/ year	0.45-0.50%
20%	Module efficiency	21.6%

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.



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



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.

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