J. v. G. technology GmbH
The DESERT company

India Solar Report

Prepared by J.v.G. Technology GmbH

J.v.G. Technology GmbH is a German engineering company specializing in turnkey solar module production lines and manufacturing consulting, with project experience ranging from 20 MW to 500 MW per production line, including multi-line and gigafactory projects exceeding this scale.

This Solar Report is part of the **PVKnowHow** Knowledge Network.
The data, analysis, and conclusions in this document are based on real research, consulting insights, and international solar market data.

Gain comprehensive insights into the statistics and metrics surrounding the solar production industry in India

KEY POINTS

All figures have been converted into USD

Yearly sunshine (sun hours per year)

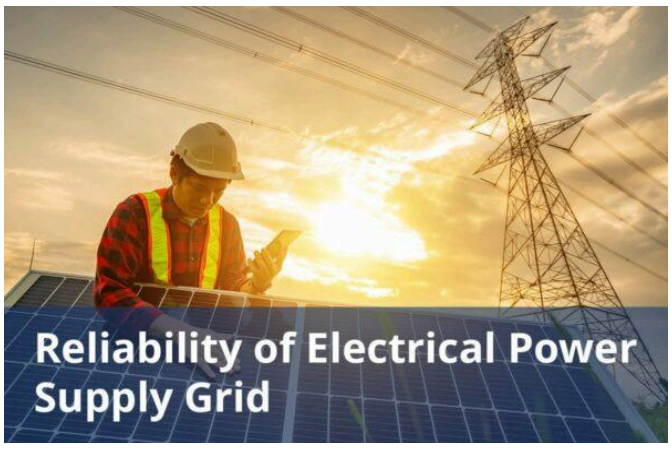
Residential Solar Energy Production:
- Average annual output: 1500 kWh/kWp
- Winter output: 100 kWh/kWp
- Summer output: 250 kWh/kWp

kWh per kWp installed

Energy Production:
- Winter: 100 kWh/kWp
- Spring: 200 kWh/kWp
- Summer: 250 kWh/kWp
- Fall: 150 kWh/kWp

Average cost per kWh from utility company

Cost of Energy:
- Average cost for residential consumption: $0.135/kWh
- Industrial average: $0.120/kWh
- Commercial rate: $0.145/kWh



Reliability of electrical power supply grid

System Reliability:
- Expected uptime: 98%
- Maintenance frequency: biennial




DETAILED INFORMATION

All figures have been converted into USD

Total solar panel production capacity (installed)

Installed Capacity:
- National total: 80 GW
- Residential installations: 30 GW
- Commercial installations: 25 GW

Total solar panel production capacity (projected)

Future Projections:
- Expected total by 2030: 120 GW
- Growth in installations: 8% per year

Average costs of various electricity generation sources (coal, natural gas, solar, etc)

Cost Breakdown:
- Average panel cost: $300 per panel
- Installation cost: $1.50 per watt

Percentages of various electricity generation sources (coal, natural gas, solar, etc)

Energy Sources:
- Solar: 20%
- Wind: 15%
- Natural Gas: 40%
- Nuclear: 25%

Average daily availability of electricity from the national grid (measured in hours)

Solar Availability:
- Average daily sunlight: 5 hours
- Peak production time: noon to 3 PM

Number of residential solar panel installations

Residential Systems:
- Average panels per home: 20
- Total homes with solar: 1 million

Total number of solar farms (installed and projected)

Solar Farms:
- Total number of farms: 150
- Average size per farm: 10 MW

Off-grid market demand for solar panels (current and projected)

Market Size:
- Mordor Intelligence estimates the off-grid solar energy market size in India to be 9.13 gigawatt in 2024.

Growth Projection:
- This market is projected to reach 13.12 gigawatt by 2029, indicating a Compound Annual Growth Rate (CAGR) of 7.51%.

On-grid market demand for solar panels (current and projected)

Current:
- India's installed solar PV capacity has witnessed exponential growth, reaching approximately 62.8 GW in 2022, and is expected to keep climbing.

Projected:
- The Indian government aims to achieve 280 GW of solar power capacity by 2030, a significant portion of its overall target of 500 GW for renewables.

Average monthly income of workers in solar industry (labor cost)

The average salary of workers in the solar industry is described below.
- Electrical Engineer: $500-$700
- Electrician: $150-$300

- Design Engineering Manager: $800-$1000
- Solar Energy System Installer: $200-$350
- Solar Energy / Solar Power Engineer: $450-$600
- Solar Installation Electrician: $250-$300
- Business Development Manager: $1000-$1500

Population of the country

The population of India is more than 1.4 billion.

Average overhead costs of solar panel production (with a brief breakdown)

The average overhead costs of solar panel production in India can be broken down into several key components:
- Raw Material Costs: The costs of raw materials such as silicon, aluminum, copper strips, and protective Glass cover, are significant and fluctuate based on global market conditions.
- Utilities and Energy Costs:
- Electricity Costs ranges from $0.08 to $0.09 per kWh.
- Water charges ranges from $5 to $10 per unit for commercial Sector.
- Labor Costs: Labor costs in India are relatively low compared to other countries, contributing to the overall cost-effectiveness of solar panel manufacturing in the country.
- Labor Costs ranges from $1 to $5 per day.
- Facility Maintenance Costs: This includes costs related to maintaining manufacturing facilities, including rent, equipment maintenance, and repairs.
- Major Cities: $10 to $15 per square meter per month.
- Tier-2 Cities: $5 to $8 per square meter per month.

A summary of the energy infrastructure

India is the world's third-largest energy-consuming country.
- 75% of energy demand is still being met by coal, oil, and solid biomass.
- To meet growth in electricity demand over the next twenty years, India will need to add a power system especially renewable energy generation i.e. solar and wind generation.

Some of the government regulations surrounding solar panel production

Re-regulations Regarding Climate Change:
- The Intended Nationally Determined Contribution (INDC), submitted in October 2015, confirmed the country's voluntary goal to reduce its greenhouse gas (GHG) emission intensity by 20-25% by 2020 and went further to pledge a reduction target of 33-35% by 2030.
- Integration of Different Power Sources: Integrating large shares of variable power generation requires planning, and developing a future grid and much of the additional renewable electricity generation deployed in REmap would be variable.
- Manufacturing Standards: The Indian government has established standards and specifications for solar panels to ensure quality and reliability.

Government initiatives in solar panel production (includes investments and subsidies)

To boost the usage of solar energy in the residential sector, India has a solar subsidy program in place.
- Solar energy systems with a capacity of up to 2 kW are eligible for a subsidy of up to $360/kW.

- For a system capacity up to 3kW, consumer can avail a subsidy of $216.
- For all system capacities exceeding 3kW, a fixed subsidy of $938 will be provided.

1. Production Linked Incentive (PLI) Scheme: In November 2020, the Indian government announced a PLI scheme for the solar sector.

2. Modified Special Incentive Package Scheme (M-SIPS): M-SIPS is a flagship scheme of the Government of India to promote large-scale manufacturing and attract investments in the electronics sector, including solar photovoltaic (PV) manufacturing.

Notable solar projects in the country (installed and projected)

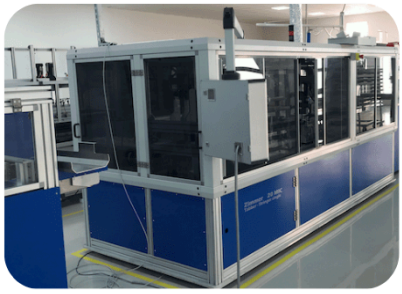
Following are the installed solar projects in India:
- Bhadla Solar Park – 2245MW
- Pavagada Solar Park – Nearly 2,050 MW
- Rewa Ultra Mega Solar – 750MW
- Ananthapuramu Ultra Mega Solar Park – 1,500 MW

Here are some notable solar projects that are projected in India:
- Gujarat Hybrid Renewable Energy Park: 30 gigawatts (GW) from both solar panels and wind turbines.
- Rewari Solar Park: approximately 3.9 GW.
- Dhanbad Solar Park: expected capacity of 1.5 GW.

Some of the notable solar companies (plus brief details on what they do)

Following are the lists of top solar companies in India:

- Tata Solar Power: provides solar panels to generate clean energy for residences, commercial & industrial and institutions.
- Adani Solar: offers mono facial & bifacial modules (in PERC Technology).
- Servotechpower Systems Limited: contributes to clean energy generation with meticulously engineered solar panels.
- Waree Energies: comprehends a manufacturing capacity of over 12GW.
- Vikram Solar: presence in more than 32 countries with an annual manufacturing capacity of 3.5 GW.



ABOUT THIS REPORT

This Solar Report is part of the PVKnowHow Knowledge Network, developed by J.v.G. Technology GmbH - a German engineering company, specializing in turnkey solar module production lines (ranging from 20 MW to 500 MW per production line, including multi-line and gigafactory projects exceeding this scale).

All market data, analysis, and conclusions follow JvG's internal consulting standards and international PV market research practices.

REFERENCES

All References

1. Makade, R. G., Chakrabarti, S., & Jamil, B. (2021). Development of global solar radiation models: A comprehensive review and statistical analysis for Indian regions. _Journal of Cleaner Production, 293_, 126208\.
<https://www.researchgate.net/publication/349071546%5FDevelopment%5Fof%5FGlobal%5FSolar%5FRadiation%5FModels%5FA%5FComprehensive%5FReview%5Fand%5FStatistical%5FAnalysis%5Ffor%5FIndian%5FRegions>
2. International Renewable Energy Agency. (2023). _India energy profile_.
<https://www.irena.org/-/media/Files/IRENA/Agency/Statistics/Statistical%5FProfiles/Asia/India%5FAsia%5FRE%5FSP.%20pd>
3. Statista. (2024). Average cost of state electricity supply in India from financial year 2010 to 2022\. Retrieved from <https://www.statista.com/statistics/808201/india-cost-of-state-electricity-supply/>
4. Statista. (2023). Public opinion on duration of power outage, daily in India in 2023\. Retrieved from [https://www.statista.com/statistics/1394678/india-opinion-on-duration-of-power-outage/.](https://www.statista.com/statistics/1394678/india-opinion-on-duration-of-power-outage/)
5. Ministry of New and Renewable Energy. (2023). Nearly 70.1 GW solar power capacity installed in the country: Union Minister for New & Renewable Energy and Power. Retrieved from <https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1947140>
6. Statista. (2024). Solar electricity generation in India from 2010 to 2022\. Retrieved from [https://www.statista.com/statistics/1401414/india-solar-power-generation/](https://www.statista.com/statistics/1401414/india-solar-power-generation/#:~:text=In%202022%2C%20the%20country%20produced,of%20280%20gigawatts%20by%202030.)

7. IRENA (2022). Renewable technology innovation indicators: Mapping progress in costs, patents and standards. <https://www.irena.org/publications/2022/Mar/Renewable-Technology-Innovation-Indicators>
8. U.S. Energy Information Administration. (2022). India, Retrieved from https://www.eia.gov/international/analysis/country/IND.
9. Economic Times. (2021). Retrieved from <https://energy.economictimes.indiatimes.com/news/power/rural-average-electricity-supply-at-22-17-hours-a-day-23-36-hours-in-cities-in-june-2021-power-ministry/85067788>
10. Ornate Solar. (2024). Solar subsidy in India explained. Retrieved from <https://ornatesolar.com/blog/state-wise-solar-subsidies-in-india-2021>
11. Council on Energy, Environment and Water. (2023). India has 637 GW of residential rooftop solar energy potential: CEEW report. Retrieved from <https://www.ceew.in/press-releases/india-has-637-gw-residential-rooftop-solar-energy-potential-for-over-25-crore-households.>
12. BYJU'S. (2024). List of largest solar power plants in India. Retrieved June 14, 2024, from [https://byjus.com/free-ias-prep/list-of-solar-power-parks-in-india/](https://byjus.com/free-ias-prep/list-of-solar-power-parks-in-india/#:~:text=List%20of%20Solar%20Power%20Plants%20In%20India.)
13. Arka360\. (2024). What is India's solar power target by 2030\. Retrieved from <https://arka360.com/ros/india-solar-energy-target-2030/>
14. Mordor Intelligence. (2024). Off-grid solar energy market size source. Retrieved from https://www.mordorintelligence.com/industry-reports/off-grid-solar-energy-market/market-size.
15. International Renewable Energy Agency. (2022). Off-grid renewable energy solutions. Retrieved from <https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2022/A

ug/IRENA%5FIOREC%5Foutcomes%5Freport%5F2022.pdf?rev=b876f936739242ef8c1c3a9bfc475772>
16. Sify Technologies. (2024). Sify data centers to invest in over 200 MW of green power. Retrieved from <https://www.sifytechnologies.com/news/sify-data-centers-to-invest-in-over-200-mw-of-green-power>
17. PayScale. (2024). Salary for skill: Solar energy / solar power. Retrieved from <https://www.payscale.com/research/IN/Skill=Solar%5FEnergy%5F%2F%5FSolar%5FPower/Salary>
18. World Bank. (2024). The World Bank in India. Retrieved from <https://www.worldbank.org/en/country/india#:~:text=With%20a%20population%20of%20more,been%20accompanied%20by%20economic%20growth>
19. World Economic Forum. (2019). Solar panel production: India is now producing the world's cheapest solar power. Retrieved from <https://www.weforum.org/agenda/2019/06/india-is-now-producing-the-world-s-cheapest-solar-power/>
20. International Energy Agency. (2021). India energy outlook 2021\. Retrieved from <https://www.iea.org/reports/india-energy-outlook-2021>
21. Council on Energy, Environment and Water. (2017). REmap renewable energy prospects for India. <https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2017/May/IRENA%5FREmap%5FIndia%5Fpaper%5F2017.pdf>
22. Press Information Bureau. (2023). A number of initiatives taken for incentivizing solar PV manufacturing in India: Union Power & NRE Minister Shri R. K. Singh. Retrieved from <https://pib.gov.in/Pressreleaseshare.aspx?PRID=1909955>
23. Solar Insure. (2024). Top 5 largest solar power plants of the world. Retrieved from <https://www.solarinsure.com/largest-solar-power-plants>

24. (2023). Rewa Ultra Mega Solar. Retrieved from <https://en.wikipedia.org/wiki/Rewa%5FUltra%5FMega%5FSolar>
25. Land Conflict Watch. (2023). Ananthapuramu solar power park oustees demand higher compensation for their land. Retrieved from <https://www.landconflictwatch.org/conflicts/ananthapuramu-solar-power-park-oustees-demand-higher-compensation-for-their-land>
26. Wikipedia. (2024). Gujarat Hybrid Renewable Energy Park. Retrieved from https://en.wikipedia.org/wiki/Gujarat_Hybrid_Renewable_Energy_Park.
27. Bluebird Solar. (2023, November 28). Home solar panel installation cost in India 2023\. Retrieved from <https://bluebirdsolar.com/blogs/all/solar-panel-installation-cost-in-india>
28. Power Technology. (2024). Power plant profile: GIPCL Raghanesda Solar PV Park, India. Retrieved from <https://www.power-technology.com/data-insights/power-plant-profile-gipcl-raghanesda-solar-pv-park-india/?cf-view>
29. Servotech. (2024). List of top 10 solar panel manufacturers in India. Retrieved from <https://www.servotech.in/blog/top-solar-panel-manufacturers-in-india>
30. PV Magazine. (2024). India is seeing record demand for rooftop solar systems. Retrieved from <https://www.pv-magazine-india.com/2024/04/02/india-is-seeing-record-demand-for-rooftop-solar-systems>
31. India Briefing, Minimum Wages and Salary Structures in India retrieved from <https://www.india-briefing.com/doing-business-guide/india/human-resources-and-payroll/minimum-wage>
32. Factory for rent, Real estate India, retrieved from <https://www.realestateindia.com/delhi-property/factory-for-rent.htm>
33. Indeed website, salaries of solar installer in India; retrieved from <https://in.indeed.com/career/solar-installer/salaries>

34. Water Charges in India
[https://www.ocwindia.com/consumer_corner/water_charges_tariff#](https://www.ocwindia.com/consumer%5Fcorner/water%5Fcharges%5Ftariff)

For a detailed list of references and additional information, please visit our website with the current report at:
https://www.pvknowhow.com/solar-report/india/

About J.v.G. Technology GmbH

J.v.G. Technology GmbH is a European engineering and advisory specialist for solar production lines and manufacturing equipment, supporting investors and operators with market, location and production-focused decision frameworks.
www.jvg-thoma.com

Contact & Further Information

For further discussion or clarification of manufacturing-related aspects, please contact:

J.v.G. Technology GmbH
www.jvg-thoma.com
info@jvg-thoma.com

Created with the support of
JVGLABS
AI Automation for Marketing & Sales
www.jvglabs.com