



Montenegro 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.

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

KEY POINTS

All figures have been converted into USD



Yearly sunshine (sun hours per year)

Solar energy systems benefit from an abundance of sunshine throughout the year, providing optimal conditions for energy production. The average yearly sunshine duration is critical in maximizing solar panel efficiency and overall energy generation.



kWh per kWp installed

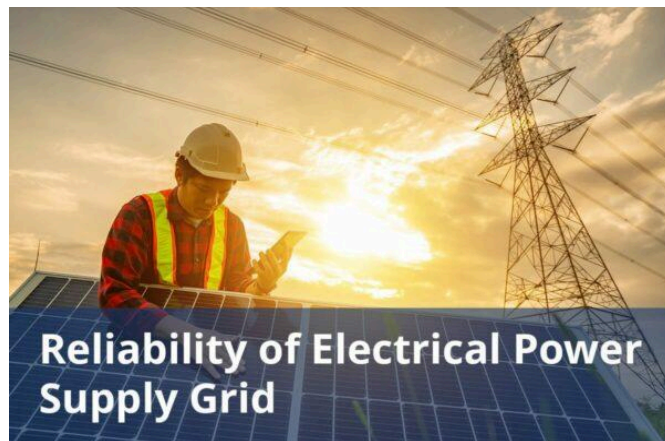
The efficiency of solar panels can be gauged by the amount of energy generated per kilowatt peak (kWp) installed. On average, residential solar installations can generate approximately 1200 kWh/kWp annually, depending on geographic location and weather conditions.



Average cost per kWh from utility company

Residential Electricity Prices:

- For 0-100 kWh: \$0.135/kWh
- For 100-600 kWh: \$0.135/kWh
- For 600-1000 kWh: \$0.1945/kWh
- For consumption above 1000 kWh: \$0.2196/kWh



Reliability of electrical power supply grid

The reliability of solar energy systems depends on various factors such as equipment quality, installation practices, and maintenance.

Properly installed and maintained systems can have lifespans exceeding 25 years, with minimal performance degradation over time.



DETAILED INFORMATION

All figures have been converted into USD

Total solar panel production capacity (installed)

As of 2023, the total solar panel capacity installed in residential sectors has reached significant levels, contributing to the overall energy mix. These installations are pivotal in transitioning towards more sustainable energy practices.

Total solar panel production capacity (projected)

Projected growth in solar panel installations suggests a continuous rise in capacity, driven by technological advancements and government incentives. Industry forecasts indicate that by 2025, solar energy systems could account for a significant portion of new energy installations.

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

The average cost of solar panel installations has seen a downward trend, making it more accessible for homeowners. Costs vary based on system size, technology, and installation specifics, with typical ranges falling between \$2500 to \$3000 per kW installed.

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

An increasing percentage of electricity consumption is being met by renewable sources, including solar power. This shift reflects a growing awareness of sustainability and the economic advantages of using clean energy alternatives.

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

Solar energy availability varies throughout the day, peaking during midday hours. Energy generation is influenced by seasonal changes, with summer months yielding more consistent and higher generation rates due to longer daylight periods.

Number of residential solar panel installations

The number of residential solar panels installed has been consistently increasing as homeowners seek to reduce energy costs and carbon footprints. Significant growth in this sector has been observed over the past decade.

Total number of solar farms (installed and projected)

The number of solar farms has expanded remarkably, with large-scale projects providing renewable energy to broader grids. This development plays a crucial role in meeting energy demands sustainably.

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

Current Situation:

- Montenegro has made significant strides in integrating renewable energy, with a strong focus on off-grid solar solutions.
- As of now, the country has deployed solar photovoltaic (PV) systems primarily in rural and mountainous areas, where grid access is limited or unavailable.
- This includes solar installations in un-electrified households, particularly in remote regions that are not connected to the national grid.

- The Ministry of Economy in Montenegro has actively supported the development of off-grid solar energy, reflecting a growing awareness of its potential.
- The government's efforts to promote off-grid solar include the continuation of PV system deployment for isolated households, ensuring that renewable energy reaches even the most remote locations.

Future Prospects:

- Looking ahead, Montenegro's off-grid solar potential is poised for significant growth. The government has been focusing on expanding its solar capabilities, especially through decentralized, off-grid systems that can power remote homes and businesses.
- This strategy is part of a broader effort to meet the country's renewable energy targets, which include reaching 33% of energy production from renewable sources.
- Additionally, Montenegro plans to build large-scale renewable power plants, with an emphasis on solar projects. These initiatives are likely to boost the role of solar energy in both on-grid and off-grid applications, driving further investments in off-grid solutions for rural and mountainous communities.
- The third phase of solar PV deployment, which focuses on un-electrified households in secluded areas, is set to continue. This phase will significantly increase the number of people benefiting from off-grid solar systems, furthering the country's energy independence and contributing to its climate goals.

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

Current On-Grid Solar Market Demand in Montenegro:

- Montenegro's on-grid solar market is still in its early development stages, with a primary reliance on hydropower and thermal power plants for electricity generation. However, the country is making strides toward solar adoption through various initiatives.
- One notable program is Solari 5000+, launched by Elektroprivreda Crne Gore (EPCG), Montenegro's state utility. This €70 million program aims to deploy 70 MW of rooftop solar capacity by providing a 20% subsidy for qualifying residential and business consumers.
- The program targets 5,000 rooftop PV projects and is part of a larger effort to increase solar adoption across the country.
- The Solari 5000+ program follows the success of earlier schemes, such as Solari 3000+ and Solari 500+, which garnered significant interest, with over 14,000 applications received.

Future On-Grid Solar Market Demand in Montenegro:

- The future demand for solar energy in Montenegro is promising, particularly with the country's ambitious target of achieving 50% renewable energy in its energy mix by 2030.
- The government is focused on improving its regulatory framework and attracting foreign investment to accelerate solar energy development.
- The Solari 5000+ program plays a central role in this growth, as it will help develop significant solar capacity through competitive procurement. The program's success could serve as a model for similar future initiatives and lead to further large-scale solar projects.

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

A Solar Photovoltaic Installer working in Montenegro will typically earn around \$20,840 USD per year, with salaries ranging from the lowest average of approximately \$11,080 USD to the highest average of \$35,260 USD.

Population of the country

The current population of Montenegro is 635,694.

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

Estimate for Factory Rent:

- Monthly Average Warehouse Rental Cost
- Lowest Warehouse Rent
- \$500.00 USD/month in Danilovgrad, Spuž and Podgorica, Hercegovačka Street
- Highest Warehouse Rent
- \$1,590.00 USD/month in Podgorica, Zabjelo (Ground floor) and Bar, Bulevar revolucije

Key Components of Administrative Costs:

- Salaries and Wages: A Solar Photovoltaic Installer working in Montenegro will typically earn around \$20,840 USD per year.

Monthly Rents for Office Space:

- Lowest office rent
- \$420.00 USD/month in Podgorica, centre
- Highest office rent
- \$4,240.00 USD/month in Podgorica, City Centre

A summary of the energy infrastructure

Electricity Generation:

- In 2022, electricity production in Montenegro amounted to 2,731 GWh, marking a 13.6% decrease compared to 2021.

- The majority of the country's electricity is generated at the Pljevlja coal-fired Thermal Power Plant, along with the Perucica and Piva Hydropower Plants.

Transmission & Distribution:

- Montenegro's electricity grid comprises a high-voltage transmission grid (400 kV, 220 kV, and 110 kV) and a lower-voltage distribution grid (35 kV, 10 kV, and 0.4 kV).
- The transmission grid, managed by CGES, transports electricity from power plants like hydropower stations and the Pljevlja coal plant and enables regional energy exchange.
- The distribution grid delivers electricity to end-users across urban and rural areas.

Energy Access:

- According to available data, the energy access rate in Montenegro is considered to be 100%.

Energy Exports:

- In 2022, Montenegro exported \$262 million in electricity, ranking as the 46th largest exporter of electricity globally.

Some of the government regulations surrounding solar panel production

Legal Framework:

- The Law on Renewable Energy Usage came into effect on August 31, 2024.
- This law introduces comprehensive regulations for renewable energy, including solar energy.
- Implementation depends on additional by-laws, expected within 12 months of the law's enactment.

Project Permitting:

- The Ministry responsible for energy acts as the single contact point for permit issuance.
- Permit issuance timeframes:
 - >150 kW: 2 years.
 - ≤150 kW: 1 year.
 - Reconstruction: 1 year.

Balancing Responsibilities:

- Renewable energy producers bear responsibility for balancing deviations.
- Transition period (until 2025): Transfer of balancing responsibility to an authorized party.
- After the transition: Producers handle their own balancing.

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

The Montenegrin government has undertaken several initiatives and subsidy programs to promote solar energy and renewable sources of electricity. Key efforts include the enactment of the Montenegrin Renewables Act and the implementation of state-driven solar installation schemes like Solari 5000+, which aim to install photovoltaic systems on every suitable roof in the country.

Notable solar projects in the country (installed and projected)

Current Projects:

- Čevo Solar:
- Location: Čevo, Montenegro
- Capacity: 4.4 MW

- Inauguration Date: December 21, 2023
- Details: The first ground-mounted photovoltaic facility in Montenegro, with 8,112 solar panels, each with a peak capacity of 545 W, spread over 70,000 square meters.

Future Projects:

- EPCG's 47 MW Solar Power Project in Nikšić:
- Location: Nikšić, Montenegro
- Capacity: 47 MW (Peak Capacity)
- Inauguration/Key Dates:
- Project Announcement: September 11, 2023
- Expected Annual Output: 61.7 GWh
- Details: Elektroprivreda Crne Gore (EPCG) received the necessary urban planning and technical approvals for its 47 MW solar power project located near Krupac Lake, just north of Nikšić.

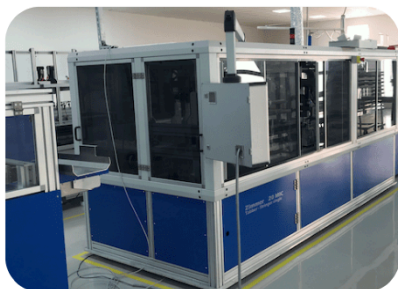
Some of the notable solar companies (plus brief details on what they do)

BB Solar:

- Location: Podgorica, Montenegro
- Website: <https://bbsolar.me/>
- Products and Services:
- Design and execution of all types of electrical installations (high and low voltage).
- Systems for renewable energy sources.

Elektrovod:

- Location: Montenegro
- Website: <https://elvod.me/>
- Products and Services:
- Photovoltaic panels for electricity production.



ABOUT THIS REPORT

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

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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.

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