

On-Site Photovoltaic Solar Power for Data Centers Market Forecasts to 2030 – Global Analysis by Component (Solar Panels, Inverters, Mounting Systems and Monitoring and Control Systems), Data Center Type, Deployment Mode, Technology, Application and By Geography

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Abstracts

According to Statistics MRC, the Global On-Site Photovoltaic Solar Power for Data Centers Market is accounted for \$24.2 billion in 2024 and is expected to reach \$52.3 billion by 2030 growing at a CAGR of 13.7% during the forecast period. On-site photovoltaic (PV) solar power for data centers refers to the use of solar energy systems installed directly at data center facilities to generate electricity. These systems consist of solar panels, inverters, and battery storage solutions that convert sunlight into usable power, reducing reliance on grid electricity and fossil fuels. On-site solar helps data centers achieve energy efficiency, lower operational costs, and meet sustainability goals by cutting carbon emissions.

According to Cloudscene, as of 2022, the United States was the largest data centre market in the world, housing nearly 5375 data centres.

Market Dynamics:

Driver:

Rising Energy Demand from Data Centers

The rising energy demand from data centers is driving the on-site photovoltaic (PV)

solar power industry by raising the demand for cost-effective and sustainable energy solutions. Data centers must deal with rising electricity demand as cloud computing, artificial intelligence, and digital services grow. On-site solar energy provides a dependable, renewable substitute that lowers operating expenses and grid reliance. Data centers are also compelled to use solar energy due to environmental pledges and carbon reduction goals, which accelerates the market's expansion and uptake globally.

Restraint:

High Initial Investment

The expensive initial investment in on-site photovoltaic solar electricity for data centers is a key impediment to market expansion. Adoption is hampered by the high cost of installing solar panels, energy storage devices, and grid integration, particularly for smaller data centers. Alternative energy sources become more alluring as a result of this financial burden delaying return on investment. Furthermore, extended payback periods and financial limitations prevent widespread adoption, which slows market growth.

Opportunity:

Technological Advancements

Technological advancements drive the on-site photovoltaic (PV) solar power market for data centers by improving energy efficiency, reliability, and scalability. Innovations in high-efficiency solar panels, bifacial modules, and advanced inverters enhance power generation. Breakthroughs in battery storage, such as lithium-ion and solid-state batteries, ensure 24/7 energy availability despite solar intermittency. Smart grid integration and AI-driven energy management optimize consumption, reducing operational costs. These advancements are accelerating adoption among data centers aiming for sustainability and energy independence.

Threat:

Intermittency & Energy Storage Challenges

Intermittency and energy storage challenges hinder the adoption of on-site photovoltaic solar power for data centers. Solar energy generation fluctuates due to weather conditions, leading to inconsistent power supply. Limited and costly energy storage

solutions, such as batteries, make it difficult to ensure uninterrupted operations. These challenges increase reliance on backup power sources, reducing cost savings and sustainability benefits, thus slowing market growth and adoption.

Covid-19 Impact

The COVID-19 pandemic disrupted the on-site photovoltaic solar power market for data centers by delaying project installations due to supply chain disruptions, labor shortages, and lockdowns. However, the crisis accelerated digital transformation, increasing data center energy demands. Governments prioritized renewable energy in recovery plans, driving long-term solar adoption. Post-pandemic, rising sustainability commitments and energy security concerns further boosted investments in on-site solar power for data centers.

The cooling systems segment is expected to be the largest during the forecast period

The cooling systems segment is expected to account for the largest market share during the forecast period, as data centers require efficient cooling to prevent overheating, integrating solar power helps offset electricity consumption and reduce operational costs. Advanced cooling technologies, such as liquid cooling and AI-driven optimization, enhance energy efficiency, making solar adoption more viable. Additionally, the synergy between sustainable cooling and on-site PV systems supports carbon reduction goals, increasing market growth and investment in renewable-powered data centers.

The monocrystalline segment is expected to have the highest CAGR during the forecast period

Over the forecast period, the monocrystalline segment is predicted to witness the highest growth rate, because Monocrystalline panels maximize space utilization, making them ideal for data centers with limited rooftop or land availability. Their longer lifespan and better performance in low-light conditions enhance reliability, ensuring continuous power supply. Additionally, as data centers prioritize sustainability and cost savings, the declining cost of monocrystalline technology accelerates adoption, further boosting the market's growth and energy resilience.

Region with largest share:

During the forecast period, the North America region is expected to hold the largest

market share due to rising energy demands, sustainability initiatives, and government incentives. Tech giants and cloud service providers prioritize solar energy to reduce carbon footprints and operational costs. Federal and state policies, including tax credits and renewable energy mandates, further accelerate adoption. Additionally, advancements in solar technology and energy storage improve reliability, making on-site PV a viable solution for ensuring energy independence and grid stability in data center operations.

Region with highest CAGR:

Over the forecast period, the Asia Pacific region is anticipated to exhibit the highest CAGR, because of rapid digitalization, rising energy demands, and strong support for renewable energy. Countries like China, India, and Japan are promoting solar adoption through incentives and sustainability mandates. The region's abundant solar resources, declining panel costs, and advancements in energy storage enhance feasibility. Additionally, hyperscale data centers and cloud providers are investing in on-site solar to reduce carbon footprints, ensuring long-term cost savings and energy security.

Key players in the market

Some of the key players profiled in the On-Site Photovoltaic Solar Power for Data Centers Market include AirTrunk, Amazon, Apple Inc, CentralAxis, Cloverleaf Infrastructure, CtrlS Datacenters, CyrusOne Inc, Fujitsu Limited, Google, IBM Corporation, Intersect Power, Microsoft, NextDC Limited, NGP Energy Capital, Oracle, Sandbrook Capital, SunSource Energy, Tencent Holdings Ltd., TPG Rise Climate and WAAREE Energies.

Key Developments:

In February 2025, IBM and Lenovo announced a planned expansion of their strategic technology partnership designed to help scale the impact of generative AI for clients in the Kingdom of Saudi Arabia.

In January 2025, Telefonica Tech and IBM announced a collaboration agreement to develop and deliver security solutions that address security challenges posed by future cryptographically relevant quantum computers.

In January 2025, e& has collaborated with IBM to deploy a pioneering, end-to-end, multi-model Artificial Intelligence (AI) and Generative AI governance solution.

Components Covered:

Solar Panels

Inverters

Mounting Systems

Monitoring and Control Systems

Data Center Types Covered:

Hyperscale

Colocation

Enterprise

Edge

Deployment Modes Covered:

On-Site

Off-Site

Technologies Covered:

Monocrystalline

Polycrystalline

Thin-Film

Applications Covered:

Power Supply

Cooling Systems

Lighting

Energy Storage

Backup Power

Peak Load Management

Carbon Footprint Reduction

Other Applications

Regions Covered:

North America

US

Canada

Mexico

Europe

Germany

UK

Italy

France

Spain

Rest of Europe

Asia Pacific

Japan

China

India

Australia

New Zealand

South Korea

Rest of Asia Pacific

South America

Argentina

Brazil

Chile

Rest of South America

Middle East & Africa

Saudi Arabia

UAE

Qatar

South Africa

Rest of Middle East & Africa

What our report offers:

- Market share assessments for the regional and country-level segments
- Strategic recommendations for the new entrants
- Covers Market data for the years 2022, 2023, 2024, 2026, and 2030
- Market Trends (Drivers, Constraints, Opportunities, Threats, Challenges, Investment Opportunities, and recommendations)
- Strategic recommendations in key business segments based on the market estimations
- Competitive landscaping mapping the key common trends
- Company profiling with detailed strategies, financials, and recent developments
- Supply chain trends mapping the latest technological advancements

Free Customization Offerings:

All the customers of this report will be entitled to receive one of the following free customization options:

Company Profiling

Comprehensive profiling of additional market players (up to 3)

SWOT Analysis of key players (up to 3)

Regional Segmentation

Market estimations, Forecasts and CAGR of any prominent country as per the client's interest (Note: Depends on feasibility check)

Competitive Benchmarking

Benchmarking of key players based on product portfolio, geographical presence, and strategic alliances

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Note: Tables for North America, Europe, APAC, South America, and Middle East & Africa Regions are also represented in the same manner as above.

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