Global Modular Uninterrupted Power Supply (UPS) Market, Forecast to 2029

Data Centre Advancements Drive Market Penetration

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FROST & SULLIVAN

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Source: Frost & Sullivan

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Executive Summary

Key Findings

- The Global Modular UPS market was worth $1,663.2 and $1,805.1 million in 2022 and 2023. The market is still in its growth stage. The market is expected to grow at a high pace during the forecast period, almost three times as fast as the traditional UPS market. Growth rates are expected to decline slightly after 2025. Frost & Sullivan estimates the CAGR to be 13.3% between 2024 and 2029.
- North America (NA) and Europe accounted for 46.7% and 46.3% of the total market revenue in 2022 and 2023. However, Asia-Pacific (APAC), including China, was the single-largest revenue contributor, accounting for 44.2% and 45.3% in the same year. Europe and ROW are expected to register the lowest CAGR among all regions at 10.3% and 7.7% during the forecast period.
- Emerging markets are expected to grow at a faster rate than developed markets. China will be the fastest-growing region during the forecast period with 16.3% CAGR, followed by rest of APAC with 16.0% CAGR.
- The Internet Data Center(IDC) and Enterprise Data Center(EDC) segment accounted for a big majority of the total market revenue in 2023, with a share of 38.6% and 32.2%. The former is expected to be the fastest growing segment, with the BFSI(EDC) and Critical Power segments slightly lagging behind.
- In terms of power ranges, Modular UPS revenues are dominated by the high range (above 200 kVA), with a combined share of 49.8% and 51.7% in 2022 and 2023. The above 1500 kVA range is expected to be the fastest growing, with a CAGR of 27.7%.

Source: Frost & Sullivan

Market Engineering Measurements

Modular UPS Market: Market Engineering Measurements, Global, 2022&2023 Market Overview

Market Stage

Growth

Market Revenue

$1,663.2M
$1,805.6M

(2022&2023)

Market Size for Last Year of Study Period

$3,851.8M

(2029)

Base Year Market Growth Rate

4.0%
8.6%

(2022&2023)

Compound Annual Growth Rate

13.3%

(CAGR,2024–2029)

Decreasing Stable Increasing

Note: All figures are rounded. The base year is 2023. Source: Frost & Sullivan

Market Scope, Definitions, and Segmentation

Market Scope

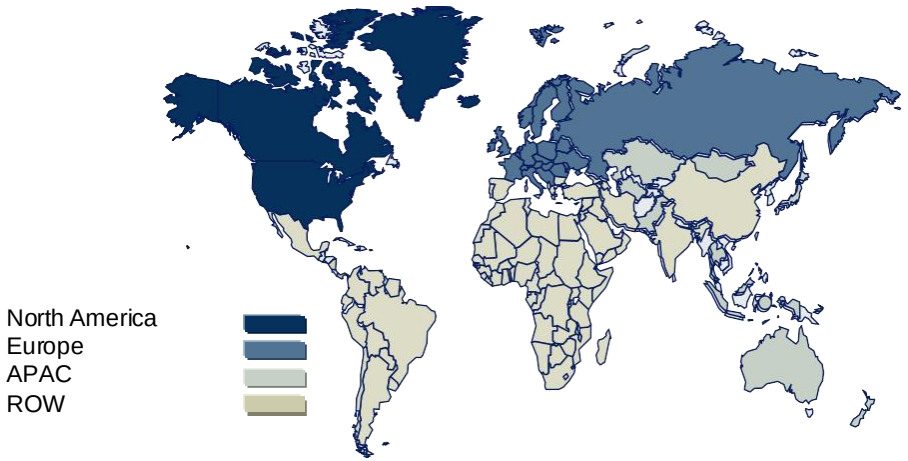
Modular UPS

A Modular UPS is one that can be built using several building blocks/individual UPS modules (where each individual module is a UPS in its own right). It features scalability, N+1 redundancy, and hot-swap capability which increase reliability and secure the backup-power unit during maintenance and repair.

Essentially, if one of the units fails, the modular configuration allows modules to be replaced (hot-swapped) and also add in new modules to accommodate an increase in capacity in affordable, incremental steps, without interruption to the critical load.

Scope	
Geographic Coverage	Global
Study Period	2020–2029
Base Year	2023
Forecast Period	2024–2029
Monetary Unit	US Dollars

Segmentation by Region



Source: Frost & Sullivan

Market Definition

Segmentation by Power Range:

For the scope of this study, the global modular UPS market has been segmented based on the below power range:

- **Low Power:**
  - 0 to 20 kVA
- **Medium Power:**
  - 20 to 200 kVA
- **High/Large Power:**
  - 200 to 500 kVA
  - 500 to 800 kVA
  - 800 to 1500 kVA
  - Above 1500 kVA

Source: Frost & Sullivan

Market Definition

According to application scenarios, the Modular UPS Market can usually be divided into two segments: **Data Centers** and **Critical Power Supply**.

The Data Center segment can be further divided into **IDC** (including Cloud services, Colocation) and **EDC**, which refers to the data center built and used for digitalization of various industries (especially in highly digitized industries such as **Telecom, Government and BFSI**)

Especially, **the Telecom** segment includes IDC type data centers (Colocation), EDC type self use data centers, and communication station equipment power supply for Critical Power Supply type (such as antenna, BBU, microwave and other access equipment power supply for communication base stations). The Telecom in this report only refers to its EDC type self use data centers.

Segmentation by End-user Vertical:

- **Internet Data Center(IDC)** comprises cloud services, colocation, internet services and Web hosting, etc
- **Enterprise Data Center(EDC)** comprises the data centers used for digitalization of various industries, which are self built and self used data centers. It mainly includes:
  - **Telecom** includes all core telecommunications applications for telecom manufacturers' self built and self used data centers.
  - **Government** comprises EDC for government facilities, institutions, utilities, and other government sectors.
  - **BFSI** mainly comprises EDC for banking, financial services, and insurance industries, and so on.
- **Critical Power Supply** comprises applications for critical infrastructure in non data center scenarios, such as the power supply of precision manufactured lithography machines, medical surgical equipment, airport runway lights/gates/subway screen doors and other terminal equipment.

Source: Frost & Sullivan

Key Questions this Study will Answer

Is the market growing? How long will it continue to grow and at what rate?

What are the key growth drivers and restraints for the market?

How is the revenue system structured? Which segments are experiencing growth, and which are declining? What is the forecast for the next 5 years?

What are the key trends in the current market? What will be the impact of emerging trends in the future?

What companies are the major participants in this market, and what are their market shares? What does the competitive scenario look like?

What are the regional revenue and forecast breakdowns?

Source: Frost & Sullivan

Modular UPS Market Trends

Key Advantages and Benefits of a Modular UPS

Hot Swappable

- The flexible rack-mount setup allows users to replace a malfunctioning unit with a new one seamlessly, without disrupting the ongoing operations of the entire uninterruptible power supply (UPS).
- Modules can be safely inserted or removed without turning the power off.

Smaller Footprint

- Modern data centres prioritize optimizing the utilization of their available floor space.
- The Modular UPS, featuring a transformer-less architecture, provides a space-saving solution.
- Parallel rack mount modules offer reduction in weight.

Clean &Green Power

- Minimized thermal energy waste and diminished CO2 emissions..
- The total output power is more eco-friendly and efficient compared to a free-standing UPS.

Independent Modules

- Every module possesses a separate charging mechanism.
- Vital system elements are replicated and allocated across various modules.
- The number of modules can be adjusted or rendered excess based on specific needs.

Energy Efficiency &Power Density

- Energy efficiency is higher than the free-standing unit, offering more than 96% efficiency.
- Enhanced efficiency leads to substantial savings on energy and cooling expenses, thereby amplifying overall energy conservation.
- It also delivers higher power density within the cabinet space.

High Reliability &Availability

- Faulty modules can be replaced within half an hour; provides convenient and low-cost maintenance.
- Reduced Mean Time To Repair (MTTR) and Mean Time Between Failure (MTBF); provides availability of 99.9999% (six nines).

Drivers and Restraints — Total Modular UPS Market

Market Driver

Total Modular UPS Market: Key Market Drivers, Global, 2024E – 2029E

Driver	1-2 Years	3-4 Years	5th Years
High flexibility and scalability promotes modular UPS market revenue	H	H	M
Lower total cost of ownership and operational benefits of a modular UPS drive market penetration	H	H	M
High growth in colocation and cloud services promotes modular data center market revenues	H	H	M
Increasing awareness of modular technology will drive market growth	H	M/H	M

Impact Ratings: H = High, M/H = Medium/high, M = Medium, M/L = Medium/low, L = Low

Source: Frost & Sullivan

Driver Explained

High Flexibility and Scalability Promotes Modular UPS Market Revenue

- Right sizing backup power has for long been an unmet need for end users. Businesses face the challenge of anticipating their growth over time, which eventually leads them to face issues with backup power requirement.
- There is a trend where end users tend to deploy a UPS system configured for a larger power range to accommodate future growth. In reality, there are 2 key challenges associated with this issue. The first is that they end up paying for the additional power they will not use initially. The second issue arises when they do not grow their businesses as anticipated. Modular UPS systems address these challenges effectively with their inherent flexibility and scalability.
- Data centers are the largest end-user vertical for modular UPS systems, accounting for more than 50% of the total revenue. Given the nature of data centers, it is also the segment that prefers this pay-as-you-grow model the most. This is a key factor driving modular UPS market revenue.
- End users are not only concerned about flexibility and scalability when a business grows and requires additional backup power, but they are also concerned about scaling down the backup power requirement if the need arises. This is another factor driving the adoption of modular UPS systems.
- Reduced footprint and space optimization also play a role in swaying end users towards modular UPS systems. Modular UPS takes a vertical-integration approach to expansion in an existing rack and takes only approximately 25% of space compared to a traditional system.

Source: Frost & Sullivan

Driver Explained(continued)

Lower Total Cost of Ownership and Operational Benefits of a Modular UPS Drive Market Penetration

- Total cost of ownership is an important driver for investment in this technology. Upfront costs become low when investments are phased. This means that initial spending can be capped while allowing room for further expansion when the customer chooses to expand operations.
- The other key aspect that enables lower total cost of ownership is the higher energy efficiency displayed by modular UPS systems. Higher energy efficiency not only provides cost savings but also increases the overall performance of the system throughout its lifetime.
- End users running mission-critical applications consider redundancy as one of the key aspects while deploying a UPS system. Modular UPS technology allows N+1 redundancy to be achieved at much lower costs compared to traditional UPS systems.
- The “hot - swappable modules” feature of a modular UPS has resonated well with end users. While utilising aparallel construction, hot swap capability becomes a key feature during maintenance. Insituations where sudden failures arise, the hot swap module enables a quick and easy change, once the problem is identified, thereby, reducing or minimising failure time on the load and MTTR.

Source: Frost & Sullivan

Driver Explained(continued)

High Growth in Colocation and Cloud Services Promotes Modular Data Centre Market Revenues

- Demand from pure-play cloud service providers to provision their services quickly and dynamically in strategic locations is adding a new revenue stream for retail colocation providers.
- Demand for colocation data centers is increasing as businesses move towards outsourcing in an effort to support offsite backup and recovery plans for on-premise data centers.
- North America is the largest market for data centers worldwide, where more than a quarter of the global footprint is outsourced. Investment in colocation and outsourcing in North America has been increasing steadily in the last five years.
- In addition, the high demand for colocation services is characterized by increasing cloud adoption, where public, private, and hybrid cloud offerings provide a diverse portfolio for end-user needs.
- Cloud-based data centers are growing phenomenally because of the multiple benefits offered by cloud-based services such as reduced spending on on-site infrastructure, easy accessibility, and more affordable options for small- and medium-sized businesses. On the other hand, large corporations are investing in cloud-based services to secure their own networks and provide an additional layer of backup for data.

Source: Frost & Sullivan

Driver Explained(continued)

Increasing Awareness of Modular Technology Will Drive Market Growth

- Awareness about modular UPS and its benefits has been on the rise in the last three years. This has led to its increased adoption. The awareness level among end users in emerging economies has increased significantly in the last 3 years.
- The ratio of modular UPS to traditional UPS has been higher in Europe compared to North America. However, penetration in NA is increasing steadily due to increasing awareness levels.
- There has been a significant improvement in awareness levels in the Asia-Pacific region, especially in China, which has caused a surge in modular UPS revenue.
- The Rest of the World still ranks low in awareness levels, especially Africa. However, end users in LATAM and the Middle East have started realising the potential advantages and benefits of a modular UPS, and they will be driving growth in this region.
- The overall awareness about modular UPS technology is expected to increase during the forecast period ultimately driving growth rates across the world.

Source: Frost & Sullivan

Market Restraints

Total Modular UPS Market: Key Market Restraints, Global, 2024E – 2029E

Restraints	1-2 Years	3-4 Years	5th Years
Preference for lower-cost substitute products (traditional free standing UPS) hinders modular UPS sales	H	M	M/L
End-user misconception about modular technology and lack of product knowledge have a negative impact on market revenue	H	M	L

Impact Ratings: H = High, M/H = Medium/high, M = Medium, M/L = Medium/low, L = Low

Source: Frost & Sullivan

Restraints Explained

Preference for Lower Cost Substitute Products (Traditional Free Standing UPS) Hinders Modular UPS Sales

- Cost plays an important role when it comes to UPS buying decision, even in medium-to-large power ranges. This, therefore, impedes market acceptance of modular technology, which may be higher in cost compared to a cheap unbranded traditional UPS product.
- The impact of this restraint is expected to reduce over time, as the awareness level is expected to increase. Even though the increasing awareness level, especially on lower total cost of ownership is not expected to completely offset this restraint, it will have a significant impact in the long term.

Source: Frost & Sullivan

Restraints Explained(continued)

End-user Misconception About Modular Technology and Lack of Product Knowledge Have a Negative Impact on Market Revenues

- When it comes to backup power deployment, the trend is still towards using well-proven technologies (e.g., traditional free-standing UPS) which has caused a slowdown in the adoption of innovative new solutions (e.g., modular UPS systems). This is mainly due to the lack of product knowledge and end-user misconception about modular technology.
- Given that modular UPS is still in its early stages of growth and has not proved its tangibility to its full extent, end users display a certain degree of scepticism and a preconceived notion regarding aspects such as reliability, complexity, paralleling capability, and so on. This is one of the key factors restraining the market. The impact of this restraint is, however, expected to decrease overtime.
- One other important reason for this is that some manufacturers in the industry market their products as modular UPS, when in reality they are not truly modular solutions. This creates a sense of dissatisfaction among end users, creating a negative word of mouth and ultimately, creating a negative impact on market adoption.

Source: Frost & Sullivan

Forecasts and Trends — Total Modular UPS Market

Market Engineering Measurements

Total Modular UPS Market: Market Engineering Measurements, Global, 2022&2023 Market Overview

Measurement Name	Measurement	Trend
Market stage	Growth	-
Market revenue (2022&2023)	$1,663.2M; $1,805.1M	▲
Market size for last year of study period (2029)	$3,851.8 M	▲
Base year market growth rate	4.9%; 9.0%	
Compound annual growth rate (CAGR, 2024-2029)	13.3%	-
Market concentration (% of base year market controlled by top 3 competitors)	72.4%; 73.3%	▲

Trend: Decreasing ▼ Stable ● Increasing ▲

Note: All figures are rounded. The base year is 2023. Source: Frost & Sullivan

Forecast Assumptions

Forecasts are based on the factors listed below:

- Impact of global gross domestic product (GDP) growth
- Macroeconomic trends, such as resource availability, government regulations, and political stability
- Mega Trend analysis and impact assessment
- Technology evolution and its impact
- Impact of market drivers and restraints during the forecast period
- Data center expansion/new build trends
- Data center investment trends
- Data center application trends
- End-user vertical trends

Source: Frost & Sullivan

Revenue Forecast Discussion

- The global modular UPS market is still in its growth stage, registering a market size of $1,663.2 and $1,805.1 million in 2022 and 2023, with a lot of potential for penetration in the future.
- While the overall UPS market has been experiencing a slump in growth rates, in the last 2 years, modular UPS growth rates have been healthy. The market grew at 8.6% in 2023 and is expected to clock a CAGR of 13.3% from 2024 to 2029. This CAGR is more than triple that of the traditional UPS market.
- From a regional perspective, Asia Pacific is the fastest-growing market, with China having the highest growth rate and a projected growth rate of 16.3% within the forecast period. Next are North America and Europe, while other regions such as the Middle East and Africa are constrained by relatively backward economic development and infrastructure construction, resulting in slower growth rates.
- The growth rate of modular UPS will mainly be driven by power ranges of 500 to 800 kVA and above, meeting the needs of the vast majority of data centers while maintaining high efficiency and flexibility. Driven by cloud computing and AI, the construction of large data centers has increased, and there is a clear trend of expanding the power range of modular UPS in the future.
- From an End-user Vertical segment perspective, Internet Data Centers(IDC) clearly dominate the market, accounting for 37.4%&38.6% of the revenue in 2022&2023 and are expected to drive market revenue during the forecast period.

Source: Frost & Sullivan

Revenue Forecast by Region Discussion

North America

- The Modular UPS market in North America has experienced significant growth driven by increased investment in data center expansion, edge computing and renewable energy integration, which accounted for 23.8% and 23.9% of the global market in 2022 and 2023.
- This is mainly due to the surge in large-scale and hosted data centers in the United States, especially those from major tech companies such as Amazon, Google, and Microsoft. Secondly, the demand for low latency applications such as 5G and the Internet of Things has led to the rapid expansion of edge computing facilities and the demand for modular and compact UPS systems.

Europe

- The European Modular UPS market accounted for a share of 22.9% and 22.4% in 2022 and 2023, at a growth rate of 2.7% and 6.2%. This share is expected to come down to 19.1% by the end of the forecast period.
- The main growth countries are Germany, the United Kingdom, and Nordic countries. The digitalization of German industry and the government's advocacy for renewable energy, as well as the continuous expansion of data center construction capacity in London, UK (including London data centers), are driving the growth of the modular market in the coming years.

Source: Frost & Sullivan

Revenue Forecast by Region Discussion

Europe (Continued)

- In Central and Eastern Europe, it is expected is expected to witness positive growth in white space volume, in both enterprise and third-party service providers.

China

- China is the single-biggest country in the world for modular UPS revenue. It accounted for 30.4%, 31.4% of the global revenue and 68.6%, 69.2% of the entire APAC region in 2022 and 2023. It is also expected to be the fastest growing region, and its revenue share is expected to increase from 31.4% in 2023 to 37.0% in 2029, registering a CAGR of 16.3% during this period.
- The Chinese data center market is experiencing high growth and is one of the fastest growing markets globally. This will lead to data centers emerging as one of the fastest growing end-user segments in China.

Source: Frost & Sullivan

Revenue Forecast by Region Discussion

ROAPAC

- Rest of APAC is expected to be the second-fastest growing market worldwide, increasing its revenue from $230.6 million in 2023 to $618.8 million in 2029. It is expected to grow at a CAGR of 16.0% during this period, and growth rates are expected to increase significantly after 2023.

ROW

- ROW is a relatively small region with a revenue share of 9.1% and 8.4% in 2022 and 2023. It is also expected to register a relatively low share globally at 6.0% in 2029. The growth in this region is expected to be driven by the Middle East, especially Dubai and the United Arab Emirates (UAE), and LATAM.

Source: Frost & Sullivan

Revenue Forecast by End-user Vertical Segment Discussion 2022&2023

- When it comes to modular UPS systems, end-user segments that require capacity expansion over time are the primary targets for UPS manufacturers. The pay-as-you-grow model of modular UPS systemsuits well those businesses that require additional capacity over time, especially mission-critical applications (e.g., data centers).
- Data centers (including IDC and EDC) remain the largest market for modular UPS systems, driven by hyperscale expansions, colocation facilities, and edge computing. Data center end users find it difficult to anticipate their future power needs and are more inclined towards modular solutions, ultimately driving market growth. Internet Data centers account for 37.4%&38.6% of the total market revenue in 2022 &2023 and are also expected to be one of the fastest-growing segments during the forecast period, growing at 17.5% CAGR from 2024 to 2029.
- Historically, UPS manufacturers have been facing difficulty penetrating other end-user verticals that do not require power capacity expansion and are non-mission critical. However, this trend is changing.The awareness level about modular technology is increasing, and there has been a considerable amount of traction among other end-user verticals in the last 2 to 3 years.

Source: Frost & Sullivan

Revenue Forecast by End-user Vertical Segment Discussion 2022&2023

- For the **Enterprise Data Center(EDC)** segment:
  - **The Telecom(EDC)** segment is also an important niche market, accounting for 12.3% and 12.1% of the total market revenue in 2022 and 2023 . It is expected to grow at 8.9% CAGR from 2024 to 2029 but has shown lowest growth compared to IDC and the other scenarios. The main reason is that telecom operators are gradually transforming their business towards colocation, as well as market saturation slows growth.
  - **The Government(EDC)** segment is seeing robust growth in modular UPS adoption, driven by public infrastructure modernization, smart city and disaster recovery needs.It is expected to register the CAGR between 2024 and 2029, growing at 9.3%, which slightly behind the Critical Power segment.
  - **The BFSI(EDC)** segment still accounts for a portion of the total market of 9.9% and 10.1% in 2022 &2023 and is expected to register a CAGR of 12.7% during the forecast period. This is mainly due to the demand for settlement centers with high operating speeds and short update cycles.
- **The Critical Power** supply scenario is a very important segment, accounting for 30.2% and 29.3% in 2022 and 2023. With the increasing demand for high energy efficiency, high load capacity, and high reliability in medical surgical equipment, laboratory precision instruments, production automation equipment, etc., the need for backup power protection of modular UPS has also increased accordingly.

Source: Frost & Sullivan

Revenue Forecast by Power Range Discussion

- Modular UPS systems are dominated by medium(20 to 200 kVA) and large power ranges above 200 kVA. They account for 89.6% and 90.3% of the total market revenue in 2022 and 2023. The 20 to 200 kVA range is the most attractive segment in the medium power range; this segment accounts for 39.8% and 38.6% of the total revenue in 2022 and 2023.
- The above 1500kVA range is expected to be the fastest growing segment with a CAGR of 27.7% from 2024 to 2029. This will be followed by the 500 to 800 kVA range with 19.1% CAGR during the same period. This is also the segment that offers high growth opportunities.
- The smaller power ranges (0 to 20kVA) essentially include both single-phase modular systems and three-phase systems. The main growth driver for this segment is expected be edge data centers, especially in the long term.
- Historically, end-user preference for a modular UPS was significantly lower in the larger power ranges. However, this trend is changing. UPS manufacturers are starting to focus on large-power modular systems, mainly due to increasing demand from the data center vertical and the increasing end-user awareness level on both operational and technical advantages.
- For the under 200 kVA segment is expected to continue on relatively slow growth trend, which the 0-20kVA and 20-200kVA segment register a CAGR of 5.4% and 8.1% during the forecast period, driving by small and medium data centers, especially colocation and enterprise-class data centers.

Source: Frost & Sullivan