

Energy Harvesting System Market: Global Industry Trends, Share, Size, Growth, Opportunity and Forecast 2023-2028

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Report description:

Energy Harvesting System Market Overview:

The global energy harvesting system market size reached US\$ 480.6 Million in 2022. Looking forward, IMARC Group expects the market to reach US\$ 969.2 Million by 2028, exhibiting a growth rate (CAGR) of 12.6% during 2023-2028. The increasing focus on green energy solutions and reducing greenhouse gas emissions, advancement in technology and miniaturization of devices, growth of wireless sensor networks (WSNs), and the implementation of supportive government policies are some of the major factors propelling the market.

Energy harvesting systems refer to an innovative technology that converts ambient energy from the environment into electrical energy. These systems serve as self-sustainable power solutions for small electronic devices, eliminating the need for traditional batteries or wired power sources. They are comprised of several components, such as an energy transducer, storage units, and a power management circuit. Energy harvesting systems are widely used in wireless sensor networks (WSN), wearables, medical implants, remote monitoring instruments, and the Internet of Things (IoT) devices. They offer sustainable power solutions by harnessing renewable energy sources, thus reducing dependence on non-renewable resources and minimizing environmental impact.

The rapid urbanization across the globe, coupled with the subsequent demand for smart, energy-efficient infrastructure, is significantly boosting the market growth. Furthermore, the widespread system incorporation in smart homes and cities to power various sensors and systems responsible for automation and monitoring is positively influencing the market growth. Along with this, the rising system utilization in smart grid infrastructure to power distributed sensor networks and enhance energy distribution efficiency is acting as another growth-inducing factor. Moreover, the gradual shift towards Industry 4.0 and automation are facilitating system demand to power wireless sensors and IoT devices in industries that are used for predictive maintenance, quality control, and data collection. Besides this, the growing system adoption in the healthcare industry, owing to

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the increasing focus on the miniaturization of medical devices and implants, is positively influencing the market growth. Other factors, including rising system utilization in transportation systems, increasing investment in the development of advanced energy harvesting systems, and the growing numbers of smart city initiatives, are anticipated to drive the market growth.

Energy Harvesting System Market Trends/Drivers:

The increasing focus on green energy solutions and reducing greenhouse gas emissions.

The increasing push towards sustainable energy solutions, driven by climate change concerns and governmental policies, is fuelling the demand for energy harvesting systems. As these systems tap into renewable sources, such as solar, thermal, and kinetic energy, they are an integral part of the green energy portfolio. Furthermore, they minimize reliance on traditional energy sources, such as fossil fuels, that are known contributors to greenhouse gas (GHG) emissions. In addition, global initiatives, such as the Paris Agreement, compel nations to lower their carbon footprints, thus stimulating the deployment of energy-efficient technologies, such as energy harvesting systems. Moreover, governments worldwide offer incentives and subsidies to promote the use of renewable energy, which is further driving the market growth.

The advancement in technology and miniaturization of devices

The ongoing miniaturization trend in electronic devices is significantly driving the demand for energy harvesting systems. As devices shrink, the need for compact, efficient power solutions becomes paramount. This is evident in the case of the Internet of Things (IoT) and wearable technology applications, where devices must operate reliably, often in challenging environments, over extended periods. Moreover, the rapid advancements in technology enable the development of more efficient energy harvesters capable of providing sufficient power for these devices. Along with this, the innovations in nanotechnology have led to energy harvesters with improved performance characteristics and reliability, which are conducive to integrating into miniaturized devices. This evolution of technology and device miniaturization opens up a wide array of applications, stimulating the energy harvesting system market.

The growth of wireless sensor networks

The increasing adoption of wireless sensor networks (WSNs) across various industries is boosting the energy harvesting system market. These networks, comprising spatially distributed autonomous sensors, are used to monitor physical or environmental conditions and transmit their data through the network to a central location. WSNs are prevalent in a diverse range of sectors, including agriculture, oil and gas, and manufacturing. They are often deployed in remote and harsh environments, making it difficult to replace batteries. As a result, energy harvesting systems capable of converting ambient energy into electrical power have become invaluable. They ensure that these sensors can operate effectively over the long term without requiring manual intervention.

Energy Harvesting System Industry Segmentation:

IMARC Group provides an analysis of the key trends in each segment of the global energy harvesting system market report, along with forecasts at the global, regional, and country levels from 2023-2028. Our report has categorized the market based on technology, component and application.

Breakup by Technology:

Light Energy Harvesting

Vibration Energy Harvesting

Electromagnetic/Radio Frequency (RF) Energy Harvesting

Thermal Energy Harvesting

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Others

Light energy harvesting dominates the market

The report has provided a detailed breakup and analysis of the market based on the technology. This includes light energy harvesting, vibration energy harvesting, electromagnetic/radio frequency (RF) energy harvesting, thermal energy harvesting, and others. According to the report, light energy harvesting represented the largest market segment.

Light energy harvesting is dominating the market as it is the most abundant and accessible renewable energy source on earth. It is easily available making it a highly scalable solution for various applications, such as IoT devices, consumer electronics, and industrial automation. Furthermore, the rapid technological advancements in photovoltaic cells have resulted in increased efficiency and reduced costs, which enhances the feasibility of solar energy harvesting, making it a preferred choice for many applications. Apart from this, sunlight is relatively predictable and consistent, ensuring a reliable and steady energy supply. Moreover, the implementation of supportive government policies and incentives to promote the adoption of light energy harvesting through subsidies and tax benefits is contributing to the market growth.

Breakup by Component:

Transducers

Power Management IC (PMIC)

Storage Unit

Transducer dominates the market

The report has provided a detailed breakup and analysis of the market based on the component. This includes transducer, power management IC (PMIC), and storage unit. According to the report, transducer represented the largest market segment.

The transducer dominates the market due to its fundamental role in energy harvesting systems. It is responsible for transforming ambient energy sources, such as light, heat, or mechanical vibration, into electrical energy. Moreover, the recent advancement and diversification of transducer technologies, which enabled energy harvesting systems to exploit a broader range of energy sources, is positively influencing the market growth. Along with this, the continuous innovations in piezoelectric, thermoelectric, and photovoltaic transducers, which improved the efficiency of energy conversion and have broadened their applicability, are boosting the market growth. Moreover, they are highly durable and reliable components, as they can operate in challenging environments and can withstand various conditions while maintaining high performance.

Consequently, the crucial role of transducers in energy conversion, their technological progression, and their contribution to system miniaturization make them a dominating component in the energy harvesting system market.

Breakup by Application:

Consumer Electronics

Building and Home Automation

Transportation

Healthcare

Others

Building and home automation dominate the market

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The report has provided a detailed breakup and analysis of the market based on the application. This includes consumer electronics, building and home automation, transportation, healthcare, and others. According to the report, building and home automation represented the largest market segment.

Building and home automation dominate the market due to the increasing global emphasis on energy efficiency and sustainability in buildings. Energy harvesting systems aid in converting ambient energy into usable electricity, which contributes significantly to reducing energy consumption and carbon footprints. Furthermore, the introduction of favorable regulations and incentives by several governments across the globe to promote sustainability and encourage the adoption of green building practices is favoring the market growth. Additionally, the rapid proliferation of IoT devices in building and home automation is facilitating the demand for energy harvesting systems to provide an efficient and self-sustaining power solution. Moreover, the shifting trend towards smart homes and cities, where various sensors and devices interact to automate and optimize building operations, such as managing lighting, heating, ventilation, and air conditioning (HVAC) systems, and security, are contributing to the market growth.

Breakup by Region:

North America

United States

Canada

Asia Pacific

China

Japan

India

South Korea

Australia

Indonesia

Others

Europe

Germany

France

United Kingdom

Italy

Spain

Russia

Others

Latin America

Brazil

Mexico

Others

Middle East and Africa

North America exhibits a clear dominance in the market, accounting for the largest energy harvesting system market share

The report has also provided a comprehensive analysis of all the major regional markets, which includes North America (the United States and Canada); Asia Pacific (China, Japan, India, South Korea, Australia, Indonesia, and others); Europe (Germany, France, the United Kingdom, Italy, Spain, Russia, and others); Latin America (Brazil, Mexico, and others); and the Middle East and

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Africa. According to the report, North America represented the largest market segment.

North America is dominating the energy harvesting system market due to the presence of a strong technological infrastructure. Furthermore, the region is home to numerous leading tech and energy companies actively investing in research and development (R&D) of energy harvesting technologies. Additionally, the implementation of supportive governmental policies in North America to promote the adoption of renewable energy and energy-efficient technologies through incentives, grants, and tax breaks is strengthening the market growth. Moreover, the widespread application of the Internet of Things (IoT) devices across different sectors, such as industrial, healthcare, and consumer electronics, in North America is driving the demand for energy harvesting systems to provide a sustainable power solution, particularly in remote or difficult-to-access locations. Apart from this, the significant growth of smart cities and home automation in the region is acting as another growth-inducing factor.

Competitive Landscape:

The top companies in the energy harvesting market are actively engaged in research and development (R&D) to enhance the performance and reliability of their energy harvesting solutions. In line with this, they are improving the efficiency of photovoltaic cells, enhancing piezoelectric and thermoelectric materials, and developing novel techniques for energy conversion. Furthermore, several key players are focusing on expanding their product portfolios, improving energy conversion efficiency, and exploring new applications for energy harvesting systems. Additionally, the increasing collaboration between leading companies and academic and research institutions to explore new energy sources and optimize energy harvesting systems for specific applications by conducting feasibility studies, prototyping, and testing of energy harvesting technologies is positively influencing the market growth. Apart from this, key market players are working closely with clients and partners to tailor energy harvesting systems to specific requirements and integrate them seamlessly into existing or emerging technologies and applications.

The report has provided a comprehensive analysis of the competitive landscape in the global energy harvesting system market. Detailed profiles of all major companies have also been provided. Some of the key players in the market include:

ABB Ltd.
Analog Devices Inc.
Cymbet
Cypress Semiconductor Corporation (Infineon Technologies AG)
EnOcean GmbH
Fujitsu Limited (Furukawa Group)
Honeywell International Inc.
Microchip Technology Inc.
Powercast Corporation
STMicroelectronics SA
Texas Instruments Incorporated

Recent Developments:

In Jan 2023, Cypress Semiconductor Corporation (Infineon Technologies AG) partnered with NuCurrent to deploy market-leading smart lock and energy harvesting technology.

In June 2021, EnOcean GmbH announced the launch of the EnOcean IoT Connector, which will link energy harvesting sensors and IoT applications to facilitate easier integration of EnOcean products.

In February 2022, Honeywell International Inc. announced that it will supply Energy Storage System (ESS) to Hecate Energy for a solar project located in Northern New Mexico

Key Questions Answered in This Report:

How has the global energy harvesting system market performed so far, and how will it perform in the coming years?

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What are the drivers, restraints, and opportunities in the global energy harvesting system market?
 What is the impact of each driver, restraint, and opportunity on the global energy harvesting system market?
 What are the key regional markets?
 Which countries represent the most attractive energy harvesting system market?
 What is the breakup of the market based on technology?
 Which is the most attractive technology in the energy harvesting system market?
 What is the breakup of the market based on the component?
 Which is the most attractive component in the energy harvesting system market?
 What is the breakup of the market based on the application?
 Which is the most attractive application in the energy harvesting system market?
 What is the competitive structure of the global energy harvesting system market?
 Who are the key players/companies in the global energy harvesting system market?

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