

# **Batteryless Edge Devices Market Forecasts to 2032 – Global Analysis By Component (Energy Harvesters, PMICs, Ultra-Low-Power MCUs & Processors, Sensors, Wireless Communication Modules, and Storage Elements), Application and By Geography**

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## **Abstracts**

According to Statistics MRC, the Global Batteryless Edge Devices Market is accounted for \$2.9 billion in 2025 and is expected to reach \$9.6 billion by 2032 growing at a CAGR of 18.4% during the forecast period. Batteryless Edge Devices explores self-powered electronics operating at the network edge using energy harvesting technologies. These devices eliminate reliance on traditional batteries, lowering maintenance costs, and enhancing sustainability. Applications span IoT sensors, smart infrastructure, industrial automation, and wearable technology. The market is gaining momentum due to advancements in ultra-low-power semiconductors, demand for long-lasting devices, and green energy initiatives. By enabling maintenance-free connectivity, batteryless edge devices are emerging as transformative solutions in intelligent, energy-efficient ecosystems globally.

According to the International Energy Agency, energy efficiency markets are growing 10% annually, supporting adoption of batteryless sensors in smart infrastructure.

Market Dynamics:

Driver:

Sustainability and Environmental Concerns

Regulatory pressure to reduce e-waste, combined with corporate commitments to lower

carbon footprints, encourages adoption of devices that harvest ambient energy and operate without disposable batteries. Furthermore, end-users value longer operational lifecycles and reduced maintenance costs, prompting enterprises to deploy energy-autonomous sensors across industrial, agricultural, and smart-building applications. Consequently, demand for efficient energy-harvesting solutions and integrated low-power electronics is accelerating. This trend is reinforced by growing investor interest in green technologies and by government incentives that de-risk early deployments.

Restraint:

#### Limited Energy Storage Capacity

Energy harvesters often produce small, variable power bursts that must be buffered or used immediately, limiting continuous operation for power-hungry tasks. Additionally, miniaturized storage components such as supercapacitors or thin-film capacitors have lower energy density than conventional batteries, restricting device duty cycles and peak-power activities. This technical limitation slows broader deployment in applications requiring sustained high-throughput sensing.

Opportunity:

#### Advancements in Energy Harvesting Materials

Innovations in piezoelectrics, thermoelectrics, and flexible photovoltaics are bringing higher power densities and mechanical robustness to small-scale transducers. Moreover, novel nanomaterials and composites facilitate integration with textiles, implantables, and curved surfaces, expanding use cases in wearables, healthcare, and structural monitoring. As material science and manufacturing scale, costs fall and reliability increases, accelerating commercial adoption. Academic industry partnerships, targeted R&D funding, and startups translating lab breakthroughs into products will further catalyze market expansion.

Threat:

#### Security and Privacy Concerns

Security and privacy concerns pose a significant threat to the widespread deployment of batteryless edge devices, especially when sensors collect personal or sensitive

operational data. The limited energy budget restricts on-device encryption and continuous authentication, making nodes potentially vulnerable to interception or spoofing. Additionally, distributed, often unattended endpoints increase physical tampering risks. Regulatory scrutiny over data protection and customer apprehension about surveillance can slow procurement decisions and pilots.

#### Covid-19 Impact:

The COVID-19 pandemic accelerated interest in batteryless edge devices for contactless monitoring and remote diagnostics, driving pilots in healthcare and logistics while simultaneously disrupting supply chains and slowing manufacturing scale-up. Initial lockdowns delayed component deliveries and constrained field deployments, but heightened demand for low-maintenance, long-life sensors reinforced the long-term investment thesis. Overall, the pandemic both exposed supply vulnerabilities and highlighted use cases that boost the technology's strategic relevance.

The energy harvesters (Transducers) segment is expected to be the largest during the forecast period

The energy harvesters (Transducers) segment is expected to account for the largest market share during the forecast period because these components form the foundational layer enabling truly batteryless operation. Transducers including piezoelectric, thermoelectric, photovoltaic, and RF harvesters directly determine available power budgets, and improvements here expand feasible applications. Furthermore, system integrators prioritize devices that reduce downstream battery maintenance and replacement costs, boosting demand for integrated harvester modules. Supply-chain maturity, falling component costs, and modular designs that simplify deployment further reinforce this segment's dominant market position.

The healthcare and wearable devices segment is expected to have the highest CAGR during the forecast period

Over the forecast period, the healthcare and wearable devices segment is predicted to witness the highest growth rate as medical monitoring and consumer health applications increasingly demand low-maintenance, unobtrusive sensing. Wearable's that harvest body heat, motion, or ambient light eliminate repeated battery replacements, improving patient compliance and enabling continuous biometric tracking. Moreover, ageing populations and remote-care trends create strong reimbursement and procurement incentives for robust, maintenance-free devices. Startups and incumbents are investing

in miniaturized transducers and certification pathways, accelerating commercialization and scaling across clinical and consumer channels.

Region with largest share:

During the forecast period, the North America region is expected to hold the largest market share driven by strong enterprise adoption, robust R&D ecosystems, and established supply chains for low-power electronics and sensors. The region benefits from early adopter customers in industrial IoT, smart buildings, and healthcare who prioritize reduced maintenance OPEX and sustainability goals. Additionally, supportive standards bodies, venture capital availability, and partnerships between universities and startups accelerate technology maturation. Favorable procurement frameworks and pilot-friendly regulations further encourage deployments, consolidating North America's leadership position in the market.

Region with highest CAGR:

Over the forecast period, the Asia Pacific region is anticipated to exhibit the highest CAGR due to rapid industrial digitization, expanding manufacturing bases, and strong adoption of smart-city initiatives. Cost-competitive manufacturing and growing local supply chains are lowering barriers to entry for novel hardware, while large-scale pilot programs in China, India, and Southeast Asia are proving the viability of batteryless sensing at scale. Furthermore, rising healthcare penetration and wearables adoption amplify consumer markets. Government incentives for IoT deployments and increasing venture funding further accelerate regional growth rates.

Key players in the market

Some of the key players in Batteryless Edge Devices Market include Everactive, Wiliot, EnOcean, e-peas, Powercast, Murata, STMicroelectronics, Texas Instruments, NXP Semiconductors, Nordic Semiconductor, Impinj, Microchip Technology, Renesas Electronics, Ambiq, ROHM Semiconductor, and Nowi.

Key Developments:

In February 2025, Shoplogix, a leader in Smart Factory platforms for digital production performance transformation, announced today the acquisition of the Industrial Monitoring Services (IMS) division of Everactive, a pioneer in low-power silicon. This strategic asset sale marks a significant step forward in Shoplogix's mission to redefine

the manufacturing industry by empowering manufacturers to visualize, integrate, and act on production performance in real-time, uncovering hidden shop floor potential.

In April 2025, STMicroelectronics a global semiconductor leader serving customers across the spectrum of electronics applications, will exhibit at electronica China 2025(Booth N5.601)on April 15-17. Under the theme of “Our technology starts with You”, ST will exhibit a wide array of innovative solutions across the end markets of Automotive and Industrial, based on its state-of-the-art Enabling Technologies. In total, over 50 interactive demos and advanced solutions will be showcased, each tailored to meet the changing demands of our customers and the market.

In April 2023, Everactive announced a partnership with Rockwell Automation to integrate Everactive’s batteryless condition-monitoring sensors with Rockwell’s FactoryTalk analytics / monitoring platforms, enabling “wireless condition monitoring without the concern of interruption from having to replace batteries.

#### Product Types Covered:

Energy Harvesters (Transducers)

Power Management Integrated Circuits (PMICs)

Ultra-Low-Power Microcontrollers (MCUs) and Processors

Sensors

Wireless Communication Modules

Storage Elements

#### Applications Covered:

Smart Building and Home Automation

Industrial IoT and Predictive Maintenance

Agriculture and Environmental Monitoring

Asset Tracking and Supply Chain Management

Healthcare and Wearable Devices

Retail and Automation

Smart Cities

Other Emerging 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 2024, 2025, 2026, 2028, and 2032

- 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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