WinterGreen Research, INC.

Energy Harvesters: Market Shares, Strategies, and Forecasts, Worldwide, 2013 to 2019

Mountains of Opportunity

Picture by Susan Eustis

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WinterGreen Research, INC.

Lexington, Massachusetts

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WINTERGREEN RESEARCH

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CHECK OUT THESE KEY TOPICS

Energy Harvesting: Users Harness Ambient, Low Level Heat and Vibration to Achieve Powering the Internet of Things

Energy Harvesting
Wireless Nodes
Microcontroller
Energy Harvesting
Vibration-Based Wireless Energy
Piezoelectric Energy Harvesters
Thermoelectrics
Generating Power From Heat
Smart Computing
Power Community
Energy Harvestings
Smart Cities
Smart Buildings
Military Remote Energy Applications
Off-Grid Special Energy
Energy harvesters

Powering Pipeline Monitoring Stations
Navigational aids energy
Spacecraft energy
Thermoelectric cooling
Automotive Energy
Lighting Community
Manganese dioxide
Nanoparticles
Nanotechnology Graphene
Self-assembly
Nanostructured Thin Films
Microgenerator Transforms
Mechanical Energy
Vibration Electricity
Pressure Of A Finger
Piezoelectricity
Solid State Technology
Microgenerator

Power Source Of Sensor
Sensor node
Vibration Energy Harvesting
Photovoltaics
Piezoelectrics
Thermovoltaics
Energy Scavenging
Power Harvesting
Capture Of Ambient Energy
Algorithmic Control
Energy Harvesters
Sensors Based On Magnetic Materials
Energy Harvesting
Economies of Scale
Internet of Things
IoT
Powering Current Sensors

Energy Harvesting: Economies of Scale Provide Growth Strategy

Energy Harvesting: Market Shares, Strategies, and Forecasts, Worldwide, 2013-2019

LEXINGTON, Massachusetts (December 19, 2013) – WinterGreen Research announces that it has published a new study Energy Harvesting Market Shares, Strategy, and Forecasts, Worldwide, 2013 to 2019. The 2013 study has 597 pages, 288 tables and figures. Worldwide markets are poised to achieve significant growth as the Energy Harvesting is used inside telemedicine systems and m-health initiatives as a way to implement ruggedized handset communications for all clinicians.

Advanced storage devices are emerging simultaneously. Storage devices can leverage the power captured by energy harvesting devices. Energy storage technologies of super-capacitors and thin-film batteries have become cost-effective. Energy harvesting devices have attained workable levels of efficiency. There are significant cost reductions. Many applications are related to smarter computing that depends on sensors capturing change in conditions and making adjustments to the environment based on measured change.

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Existing energy harvesting and storage applications include vibration-based wireless train measuring systems, wireless sensors distributed city wide to implement smart cities, oil field monitoring systems, windup laptops for use in remote regions, and wireless light switches for use in smart buildings. Wireless sensors are self-powering. They can be used to alert and monitor a range of environments and incidents, pollution and forest fires, robberies in a city, temperature in a building, and movement around a border fence.

Energy harvesting technologies include electrodynamics, photovoltaics, piezoelectrics, and thermovoltaics. Photovoltaic systems for solar energy are evolving at a slower pace. The energy harvesting and energy storage market factors implement light harvesting for small devices

Technological developments in the fields of low-power electronics and energy storage systems have allowed energy harvesting to become an increasingly viable technology. It is alternatively referred to as energy scavenging and power harvesting. Energy harvesting technology has become sophisticated and efficient.

According to Susan Eustis, the lead author of the team that created the study, "Converting ambient energy to useable electrical energy harvesting (EH) systems is a useful and compelling technology. The technologies offer an inexpensive and compact way to power portable electrical devices initially and to create stores of power in the long term."
Electronics tends to rely heavily on batteries. EH technology powers an increasing number of consumer and industrial products that are untethered or need to become disconnected from electrical outlets. As initial projects succeed and prove their worth, the technology is set to proliferate.

Energy Harvesters markets at $131.4 million in 2012 are projected to increase to $4.2 billion in 2019. Growth is anticipated to be based on demand for micro power generation that can be used to charge thin film batteries. Systems provide clean energy that is good for the environment. Growth is based on global demand for sensors and wireless sensor networks that permit control of systems.

At some point energy harvester markets will shift from simple growth to rapid growth measured as a penetration analysis. This will happen as markets move beyond the early adopter stage. Eventually energy harvesters will be used as fuel to power batteries for electronic devices and smart phones. The energy is manufactured from vibration and thermal differentiation that is ambient in the environment. Energy harvesters have become more feasible as the technology evolves.

WinterGreen Research is an independent research organization funded by the sale of market research studies all over the world and by the implementation of ROI models that are used to calculate the total cost of ownership of equipment, services, and software. The company has 35 distributors worldwide, including Global Information Info Shop, Market Research.com, Research and Markets, Electronics.CA, Bloomberg, and Thompson Financial.

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WinterGreen Research is positioned to help customers face challenges that define the modern enterprises. The increasingly global nature of science, technology and engineering is a reflection of the implementation of the globally integrated enterprise. Customers trust WinterGreen Research to work alongside them to ensure the success of the participation in a particular market segment.
WinterGreen Research supports various market segment programs; provides trusted technical services to the marketing departments. It carries out accurate market share and forecast analysis services for a range of commercial and government customers globally. These are all vital market research support solutions requiring trust and integrity.

Companies Profiled

Market Leaders

Northrop Grumman
Boeing
KCF Technologies
Marlow Industries
Cymbet
Micropelt
EnOcean
Silicon Laboratories
Perpetuum
Arveni
Infinite Power Solutions (IPS)

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Market Participants

ABB
Adaptive Materials Technology / Adaptamat Ltd
Alphabet Energy
Arrow Electronics
American Elements, USA
Australian Defence Science & Technology Organisation (DSTO)
Arveni
Avnet
BAE Systems
Boeing
BYD

CST
Cymbet
Digi International
Dust Networks
EnOcean GmbH
Finmeccanica
Flexible Electronics Concepts
Ferro Solutions
Fraunhofer Institute for Integrated Circuits IIS
General Electric Company
GE Energy Wireless Condition Monitoring System /
Perpetuum Electromagnetic Vibration Energy Harvesting Device
GMZ
Honeywell
Infinite Power Solutions
Inventec
IO
ITN Lithium Technology
II-VI incorporated / Marlow Industries
JonDeTech
KCF Technologies Inc
Kelk
Levant Power
LORD Corporation
MacSema
MicroGen Systems
Micropelt
Millennial Net
Modern Water
Nature Technology
Nextreme
Northrop Grumman
OMRON
Planar Energy Devices – Perpetua
Perpetuum
Phononic Devices
Polatis Photonics
Primus Power
PS
Schneider Electric
Severn Water / Modern Water / Cymtox Limited
Silicon Labs
Syngenta Sensors UIC
Teledyne / Rockwell Scientific
Texas Instruments (TXN:NYSE)
Trophos Energy
University of California, Berkeley
University of Michigan
University of Michigan's Department of Electrical Engineering and Computer Science Nano-Thin Sheets Of Metal
Vishay Precision Group
KELK integration
Zarlink Semiconductor AB
US Department of Energy's Advanced Research Projects Agency-Energy (ARPA-E) Seed Funding

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Report Methodology

This is the 583rd report in a series of primary market research reports that provide forecasts in communications, telecommunications, the Internet, computer, software, telephone equipment, health equipment, and energy. Automated process and significant growth potential are priorities in topic selection. The project leaders take direct responsibility for writing and preparing each report. They have significant experience preparing industry studies. Forecasts are based on primary research and proprietary data bases.

The primary research is conducted by talking to customers, distributors and companies. The survey data is not enough to make accurate assessment of market size, so WinterGreen Research looks at the value of shipments and the average price to achieve market assessments. Our track record in achieving accuracy is unsurpassed in the industry. We are known for being able to develop accurate market shares and projections. This is our specialty.

The analyst process is concentrated on getting good market numbers. This process involves looking at the markets from several different perspectives, including vendor shipments. The interview process is an essential aspect as well. We do have a lot of granular analysis of the different shipments by vendor in the study and addenda prepared after the study was published if that is appropriate.

Forecasts reflect analysis of the market trends in the segment and related segments. Unit and dollar shipments are analyzed through consideration of dollar volume of each market participant in the segment. Installed base analysis and unit analysis is based on interviews and an information search. Market share analysis includes conversations with key customers of products, industry segment leaders, marketing directors, distributors, leading market participants, opinion leaders, and companies seeking to develop measurable market share.

Over 200 in depth interviews are conducted for each report with a broad range of key participants and industry leaders in the market segment. We establish accurate market forecasts based on economic and market conditions as a base. Use input/output ratios, flow charts, and other economic methods to quantify data. Use in-house analysts who meet stringent quality standards.

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Interviewing key industry participants, experts and end-users is a central part of the study. Our research includes access to large proprietary databases. Literature search includes analysis of trade publications, government reports, and corporate literature.

Findings and conclusions of this report are based on information gathered from industry sources, including manufacturers, distributors, partners, opinion leaders, and users. Interview data was combined with information gathered through an extensive review of internet and printed sources such as trade publications, trade associations, company literature, and online databases. The projections contained in this report are checked from top down and bottom up analysis to be sure there is congruence from that perspective.

The base year for analysis and projection is 2010. With 2010 and several years prior to that as a baseline, market projections were developed for 2011 through 2017. These projections are based on a combination of a consensus among the opinion leader contacts interviewed combined with understanding of the key market drivers and their impact from a historical and analytical perspective. The analytical methodologies used to generate the market estimates are based on penetration analyses, similar market analyses, and delta calculations to supplement independent and dependent variable analysis. All analyses are displaying selected descriptions of products and services.

This research includes reference to an ROI model that is part of a series that provides IT systems financial planners access to information that supports analysis of all the numbers that impact management of a product launch or large and complex data center. The methodology used in the models relates to having a sophisticated analytical technique for understanding the impact of workload on processor consumption and cost.

WinterGreen Research has looked at the metrics and independent research to develop assumptions that reflect the actual anticipated usage and cost of systems. Comparative analyses reflect the input of these values into models.

The variables and assumptions provided in the market research study and the ROI models are based on extensive experience in providing research to large enterprise organizations and data centers. The ROI models have lists of servers from different manufacturers, Systems z models from IBM, and labor costs by category around the world. This information has been developed from WinterGreen research proprietary data bases constructed as a result of preparing market research studies that address the software, energy, healthcare, telecommunicatons, and hardware businesses.

WinterGreen Research, INC.

Energy Harvesters: Market Shares, Strategies, and Forecasts, Worldwide, 2013-2019

Table of Contents

Energy harvesting devices create power from ambient energy that can be used to charge batteries for electronic devices, significantly extending the life of the battery. Advanced energy harvesting technologies are associated with emerging Internet of Things sensors. Technologies that make energy harvesting feasible are closely associated with smaller, lighter, more feature loaded electronics and sensors.

Energy Harvesting Executive Summary

The study is designed to give a comprehensive overview of the Energy Harvesting device market segment. Research represents a selection from the mountains of data available of the most relevant and cogent market materials, with selections made by the most senior analysts. Commentary on every aspect of the market from independent analysts creates an independent perspective in the evaluation of the market. In this manner the study presents a comprehensive overview of what is going on in this market, assisting managers with designing market strategies likely to succeed.

Energy Harvesting Market Description and Market Dynamics

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Energy Harvesting Market Shares and Market Forecasts

This section selectively describes market shares, forecasts, segments, and regional revenue. Numbers are the result of primary research in all cases. Selected companies are described from an independent analyst perspective with a thumbnail sketch or analysis of their market numbers or commentary on their strengths and weaknesses. Some of the analysis is focused on looking at the topic segment by segment, including company descriptive analyses by segment and subsegment.

Energy Harvesting Product Description

This section describes selected companies and selected products. **Products for this market segment are described with attention to the most significant aspect of features and functions in this category of product. The juxtaposition of a range of different product descriptions from a single market category provides a really good way to access market directions and achieve market competitive analysis. This section is arranged products. Company products are described in the appropriate sections, meaning a company is mentioned several times in the chapter in different places.**

Energy Harvesting Technology

Energy Harvesting Company Profiles

This section selectively describes company strategies, partners, acquisitions, and revenue by segment and regional revenue when available. Companies are described by looking at what is most interesting about that company. The descriptions collectively give a sense of market directions within the industry segment. The alphabetical listing of company thumbnail sketches provides an accessible way to find out what is going on in any particular company.

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List of Tables and Figures

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About The Company

WinterGreen Research, research strategy relates to identifying market trends through reading and interviewing opinion leaders. By using analysis of published materials, interview material, private research, detailed research, social network materials, blogs, and electronic analytics, the market size, shares, and trends are identified. Analysis of the published materials and interviews permits WinterGreen Research senior analysts to learn a lot more about markets. Discovering, tracking, and thinking about market trends is a high priority at WinterGreen Research. As with all research, the value proposition for competitive analysis comes from intellectual input.

WinterGreen Research, founded in 1985, provides strategic market assessments in telecommunications, communications equipment, health care, Software, Internet, Energy Generation, Energy Storage, Renewable energy, and advanced computer technology.

Industry reports focus on opportunities that expand existing markets or develop major new markets. The reports access new product and service positioning strategies, new and evolving technologies, and technological impact on products, services, and markets. Innovation that drives markets is explored. Market shares are provided. Leading market participants are profiled, and their marketing strategies, acquisitions, and strategic alliances are discussed. The principals of WinterGreen Research have been involved in analysis and forecasting of international business opportunities in telecommunications and advanced computer technology markets for over 30 years.

The studies provide primary analytical insight about the market participants. By publishing material relevant to the positioning of each company, readers can look at the basis for analysis. By providing descriptions of each major participant in the market, the reader is not dependent on analyst assumptions, the information backing the assumptions is provided, permitting readers to examine the basis for the conclusions.

About The Principal Authors

Ellen T. Curtiss, Technical Director, co-founder of WinterGreen Research, conducts strategic and market assessments in technology-based industries. Previously she was a member of the staff of Arthur D. Little, Inc., for 23 years, most recently as Vice President of Arthur D. Little Decision Resources, specializing in strategic planning and market development services. She is a graduate of Boston University and the Program for Management Development at Harvard Graduate School of Business Administration. She is the author of recent studies on worldwide telecommunications markets, the top ten internet equipment companies, the top ten contract manufacturing companies, and the Top Ten Telecommunications market analysis and forecasts.

Susan Eustis, President, co-founder of WinterGreen Research is a senior analyst. She has done research in communications and computer markets and applications. She holds several patents in microcomputing and parallel processing. She has the original patents in electronic voting machines where she was featured in People Magazine in 1976. She has new patent applications in format varying, mulitprocessing, and electronic voting. She is the author of recent studies of the Solar Renewable Energy, Wind Energy, Thin Film Batteries, Business Process Management marketing strategies, Internet equipment, biometrics, a study of Internet Equipment, Worldwide Telecommunications Equipment, Top Ten Telecommunications, Digital Loop Carrier, Web Hosting, Web Services, and Application Integration markets. Ms. Eustis is a graduate of Barnard College. Susan Eustis was named as top female executive of the year by Who's Who Worldwide in 2012. She was named page one of the top 100 Industry leaders in Who's Who Worldwide in 2013.

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