

WINTERGREEN RESEARCH, INC.

**Worldwide Solar Technology Market Shares, Forecasts,
and Strategies, 2008-2014**

Solar Technology Achieves Parity with Fossil Fuels



Picture by Susie Eustis

MOUNTAINS OF OPPORTUNITY

**WinterGreen Research, Inc.
Lexington, Massachusetts**

www.wintergreenresearch.com

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CHECK OUT THESE KEY TOPICS

SOLAR TECHNOLOGY
PHOTOVOLTAICS MANUFACTURING
SOLAR ELECTRIC MANUFACTURING
POLYSILICON
CIGS
THERMAL SOLAR
SOLAR CONCENTRATORS
SOLAR CARBON NANOTUBES
SOLAR NANOTECHNOLOGY
PV SYSTEMS
BACKUP POWER SOLAR
THIN FILM SOLAR
PV CELLS
PV MODULES
BIPV
Silicon Solar Panels (Mono And Poly Crystalline)
Global Warming Drives Solar Energy Adoption
Solar Capacity Market Forecasts
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OPPORTUNITY ABOUNDS

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Solar Technology: Market Shares, Forecasts, and Strategies, 2008-2014

Efficiency of different solar technologies is improving rapidly. Innovation is occurring all over the world. Even German medium-sized companies are actively contributing when it comes to exploring new markets for PV production plants. The single most significant economic factor driving adoption of solar initiatives is the prospect of carbon use surcharges. As coal, gas, and oil usage are taxed to help prevent pollution and stimulate use of renewable energy sources, solar energy becomes more attractive to the utility grid electricity providers. The environmental impact of energy use choices promises to be an ongoing factor in energy grid supply.

The speed with which solar system can be put in place by a utility company is a major factor in deciding what kinds of systems to put up. Solar utility systems can be put in place within six months.

The ability to create an operational system in six months instead of 20 years for nuclear systems is significant. Just the cost of capital weighs heavily in favor of solar utility installations. The advantage brought by having paying customers sooner is a major factor supporting implementation of solar systems for generation of utility grid electricity.

A technique for making solar panels is to melt silicon powder on a cheap conducting substrate. In this manner companies are productionizing technologies that by-pass some of the inefficiencies of the crystal growth/casting and wafer sawing route. One route is to grow a ribbon of silicon, either as a plain two-dimensional strip or as an octagonal column, by pulling it from a silicon melt. These processes may bring with them other issues of lower growth/pulling rates and poorer uniformity and surface roughness.

Each c-Si cell generates about 0.5V, so 36 cells are usually soldered together in series to produce a module with an output to charge a 12V battery. The cells are hermetically sealed under toughened, high transmission glass to produce highly reliable, weather resistant modules that may be warrantied for up to 25 years.

Selected materials that are strong light absorbers need to be 1micron thick. Materials costs are significantly reduced. The most common materials are amorphous silicon (a-Si, still silicon, but in a different form), or the polycrystalline materials: cadmium telluride (CdTe) and copper indium (gallium) diselenide (CIS or CIGS). Each of these three is amenable to large area deposition (on to substrates of about 1 meter dimensions) and hence high volume manufacturing. The thin film semiconductor layers are deposited on to either coated glass or stainless steel sheet.

The semiconductor junctions are formed in different ways, either as a p-i-n device in amorphous silicon, or as a hetero-junction (e.g. with a thin cadmium sulphide layer) for CdTe and CIS. A transparent conducting oxide layer (such as tin oxide) forms the front electrical contact of the cell, and a metal layer forms the rear contact. Thin film technologies are all complex. They have taken at least twenty years, supported in some cases by major corporations, to get from the stage of promising research (about 8% efficiency at 1cm² scale) to the first manufacturing plants producing early product.

Modules are designed to meet rigorous certification tests set by international standards agencies. [Click here for more details on PV module certification.](#)

According to Susan Eustis, principal author of the study, "adoption of solar energy has a simple market driving force. If people do not adopt solar energy, the planet will become unfit for human habitation. The fossil fuels are warming the planet at an exponentially increasing rate that makes life unsustainable if something does not change. Global warming drives solar markets."

Solar is perceived as the best, perhaps the only widespread solution to global warming. Every large enterprise has adopted a social responsibility strategy that makes a nod toward solving the issues of global warming and embraces renewable energy. Every person in the world is aware of the problems that global warming is bringing.

Utility vendor electricity solar equipment markets at \$10 billion in 2007 are anticipated to reach \$78.7 billion by 2014. Growth is a result of using utility electricity solar systems to power the grid. With .3% of the grid powered by solar in 2007, huge growth is set to occur as 6% of the grid power is anticipated to come from solar by 2014, with rapid shifts to solar energy after that. This will come through massive trillion dollar investments in grid capable solar energy systems that are financed throughout the life of the solar installation.

Growth comes not only because solar power is the cheapest power source which it will be in many cases, but because it fulfills a variety of convenience needs, not the least of which is a way to attack global warming. Every large enterprise has adopted a green strategy in response to public demand for better energy solutions.

Companies Profiled

Market Leaders

Q-Cells
Kyocera
Sharp Solar
Schott
BP Solar
First Solar
Isofoton
Sanyo
SolarWorld
SunPower
Suntech
Yingli Green Energy

Market Participants

AES
Akuo Energy
Colorado Instruments / SolarWorld
Concentrix
Cypress Semiconductor / Sunpower
Dyesol Limited
Evergreen Solar
Flisom
GE
Global Solar Energy
Hitachi America Ltd.

**Hoku Scientific
Isofoton
Kyocera
LDK Solar Co LTD
Mitsubishi
Nanosolar
PrimeStar Solar
Q-Cells AG
Sanyo
SatCon
Signet Solar
Siemens
Solaire Direct
Solarfun Power Holdings Co, Ltd.
Solar Integrated
SolarWorld AG
Solartech
Solon
Spectra Watt / Intel
Tenesol
Urbasolar
Yingli Green Energy**

Solar Technology Market Strategies, Shares, and Forecasts 2008-2014

REPORT METHODOLOGY

THIS IS THE 394TH REPORT IN A SERIES OF MARKET RESEARCH REPORTS THAT PROVIDE FORECASTS IN COMMUNICATIONS, TELECOMMUNICATIONS, THE INTERNET, COMPUTER, SOFTWARE, TELEPHONE EQUIPMENT, HEALTH EQUIPMENT, AND ENERGY. 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. 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 PARTICIPATION 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. INTERVIEWING KEY INDUSTRY PARTICIPANTS, EXPERTS AND END-USERS. OUR RESEARCH INCLUDES ACCESS TO LARGE PROPRIETARY DATABASES. LITERATURE SEARCH INCLUDES ANALYSIS OF TRADE PUBLICATIONS, GOVERNMENT REPORTS, AND CORPORATE LITERATURE.

YOU MUST HAVE THIS STUDY

Solar Technology Market Opportunities, Strategies, and Forecasts, 2008 to 2014

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SOLAR TECHNOLOGY POSITIONING

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SOLAR TECHNOLOGY COMPANY LISTS

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ABOUT THE COMPANY

WINTERGREEN RESEARCH, HAS A UNIQUE RESEARCH STRATEGY THAT RELATES TO IDENTIFYING MARKET TRENDS THROUGH READING AND INTERVIEWING OPINION LEADERS. BY READING THE ELECTRONIC EQUIVALENT OF 40 FEET OF PAPER, WINTERGREEN RESEARCH SENIOR ANALYSTS CAN LEARN A LOT MORE ABOUT MARKETS, A LOT FASTER THAN CAN BE LEARNED THROUGH EXPENSIVE SURVEYS AND FOCUS GROUPS. 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.

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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, 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. SHE HAS NEW PATENT APPLICATIONS IN FORMAT VARYING, MULTIPROCESSING, AND ELECTRONIC VOTING. SHE IS THE AUTHOR OF RECENT STUDIES OF THE REGIONAL BELL OPERATING COMPANIES' 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.

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