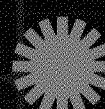




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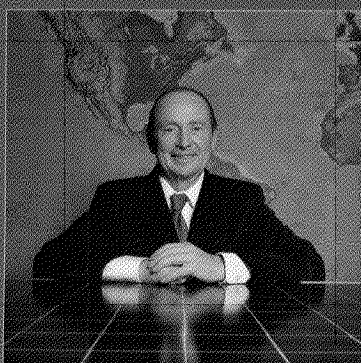
2008 ANNUAL REPORT

a global solar company



spire

Dear Employees, Customers, and Stockholders,



Roger G. Little
Chairman and CEO

Spire had a good year in 2008. Our revenues grew 85%, and we were profitable overall. Our growth and profitability were attributable almost entirely to our solar business.

Financially, we achieved another four consecutive quarters of revenue growth resulting in record revenues of \$68,652,000 in 2008, compared to \$37,068,000 in 2007. Gross margins improved to 29% compared to 19% in 2007. Net earnings were \$4,775,000, or 56 cents per diluted share, compared to a net loss after extraordinary gain of \$1,933,000, or 23 cents per diluted share in 2007. We ended 2008 with a strong backlog and with \$6 million in unrestricted cash, an improvement over to 2007.

Worldwide, the solar industry expanded 35% in 2008. This strong industry growth spurred our own growth at an even faster pace. Spire Solar sales grew to almost \$52 million compared with \$22 million in 2007, achieving a growth rate of 139%. We continued to sell globally, delivering over 10 module production lines in 2008 including lines to Asia, Europe, India, and Russia (our first), along with expansion sales to Europe, China, and the U.S.

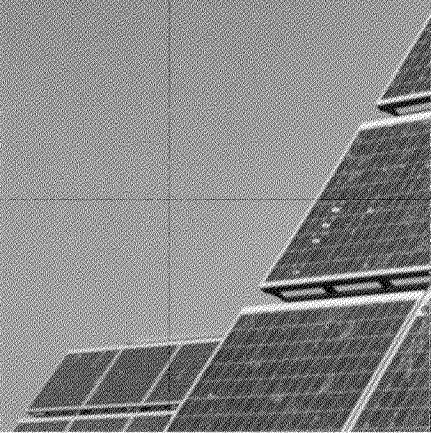
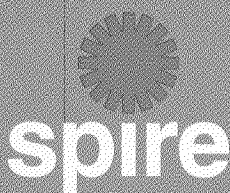
During the year, Spire further diversified its product portfolio, adding turnkey crystalline silicon line services and turnkey module lines for thin film companies. We are also developing concentrator solar cells at our Spire Semiconductor facility. In addition, Spire was awarded close to \$58 million in new U.S. government contracts to be delivered over the next two years, the majority for a solar cell supply contract from a module line customer. The solar cell contract is the largest in Spire's history.

Naturally, the situation with the world economy and the temporary flattening of growth in the solar market is impacting our business. The next year is likely to present some challenges. October 2009 will mark the 40th year of Spire's incorporation. During those years we have been challenged many times in many different ways and have always met the challenges. The outlook for the solar industry remains excellent, and most industry analysts predict a return to rapid growth in 2010 and beyond.

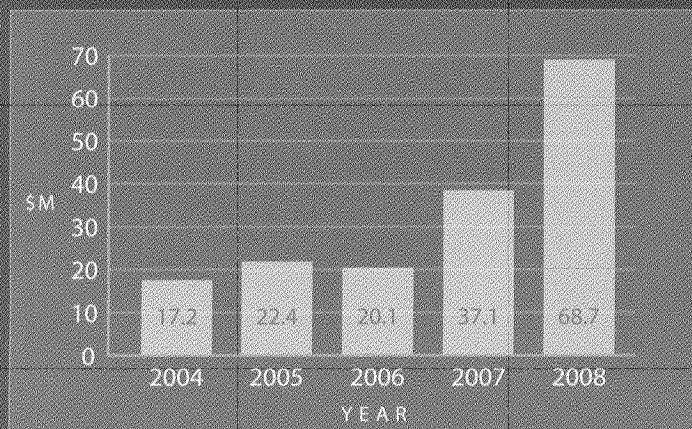
Additionally, the U.S. government's American Recovery and Reinvestment Act (ARRA) represents significant opportunity for us. Much of the stimulus bill resources are aimed at energy independence in America through renewable energy with associated job creation. To take full advantage of opportunities in the U.S. market, we have initiated an aggressive "Come to America" program. The program is aimed at providing turnkey factories to foreign manufacturers for U.S. installations. We are also expanding factories of current manufacturers. These factories have to be made in America to take advantage of U.S. stimulus bill funding.

With another year of record-setting growth behind us, and excellent prospects for continued growth, Spire's future is as bright as ever.

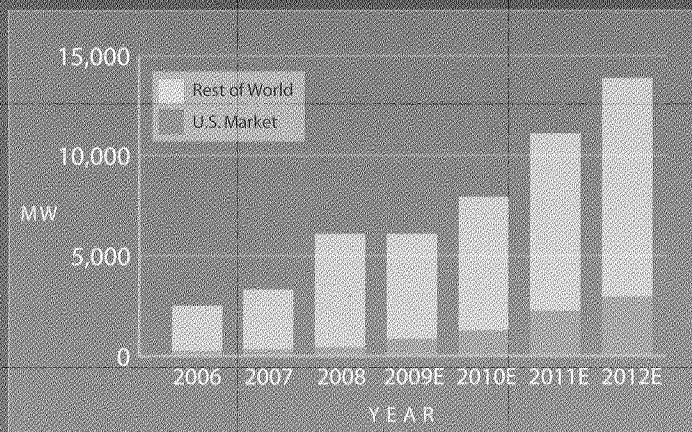
Roger G. Little
Chairman and CEO
Spire Corporation



SPIRE CORPORATION TOTAL ANNUAL REVENUES



PV MARKET PROJECTIONS



Source: Solarbuzz, RJ est (March 2009)

Received SEC

APR 13 2009

Washington, DC 20549

Spire: The Worldwide Turnkey Solar

a global solar company

We have an extensive international sales network supporting more than 200 customers in 50 countries worldwide. Greater than 90% of all solar manufacturing companies use Spire equipment in their production lines.



Factory Provider

A GLOBAL SOLAR COMPANY

The world is demanding access to renewable energy sources, and Spire's solar technology and turnkey factories offer viable solutions for companies ranging from start-ups to established market participants.

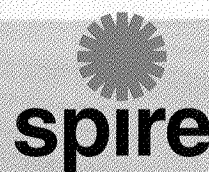
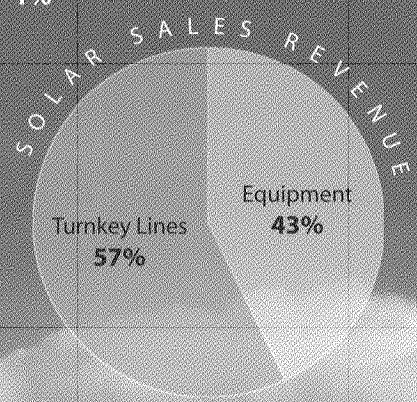
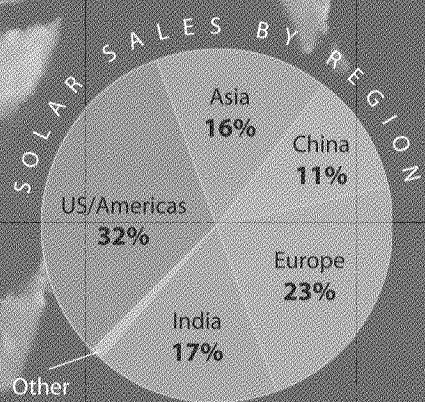
With 40 years of experience in the solar business and a focus on high-quality capital equipment, Spire enhanced its strong brand recognition and further established its unique position as "The Turnkey Solar Factory Company" during 2008.

The global solar photovoltaic (PV) market is growing at an unprecedented pace: internationally for certain, but market indications also predict that within the next five years the U.S. will be the fastest growing PV market— as the hub of both module production and ultimately sales. With the advent of both federal and state investment tax credits, domestic businesses will realize production cost savings that will be passed onto the end-user, encouraging market demand. Spire is uniquely positioned to both benefit from and support this growth opportunity.

Spire continues to be part of the PV industry's accelerated growth by offering comprehensive PV turnkey solutions for entrepreneurs interested in establishing a PV manufacturing business quickly, efficiently, and ready to compete within their unique market. Established manufacturers also continue looking to Spire for dynamic turnkey factory line solutions, including vertically integrated expansion, and as a resource for advisory and consulting services regionally, nationally, and internationally.

Today more than 90% of all solar manufacturing companies use Spire equipment in their production lines. With extensive international sales experience in 50 countries, we serve over 200 customers worldwide.

Spire provides everything needed to ensure success for all our customers – the new entrants and solar veterans. Our turnkey production lines include: state-of-the-art equipment, facility layout to maximize efficient operation, assistance with material procurement, job descriptions and training of key personnel, critical process knowledge in module design and production, and critical assistance in obtaining module certifications required for selling into the most lucrative regional markets. No other company provides the breadth and depth of services to "put you in the PV business and keep you there."



Informing the World

Focusing on the development of global communications in 2008, Spire Solar expanded its global reach with a multi-channel communications program that further enhanced its position as the solar partner of choice when starting, or growing a PV business.

Webcasts

The series of Webcasts presented by Roger Little generated new and energized interest in Spire Solar turnkey solutions. The "Success in Solar Manufacturing: Challenges and Opportunities" series sparked the interest of 1,626 solar industry enthusiasts of which nearly 800 prospective PV clients attended.

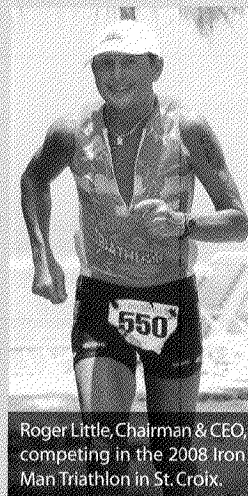
Starting with a comprehensive presentation highlighting how Spire supports solar start-ups as they become global competitors, each Webcast concluded with attendees' questions answered directly by Roger Little. This interaction created and established an open dialog of communication between potential customers and Spire Solar. In the coming year, Spire anticipates expanding the Webcast program to highlight advancements as they develop, keeping another channel open to demonstrate Spire's commitment towards prospective entrants and current customers into the PV market.

The Webcast was also published in the Renewable Energy World publication, which is U.S. based and has over 100,000 web and print subscribers worldwide.

Headline News

When the world press recognizes Spire's advancements, it's a confirmation of what is already known by those who work with, invest in, or are clients of Spire Corporation and why they are integral participants in its mission.

A sampling of print articles in 2008 includes the following: The Boston Business Journal recognized Spire as being one of the fastest-growing public companies in Massachusetts. They wrote again in an Executive Profile on Chairman and CEO, Roger Little, entitled "He's got the power," which was a play on Spire Solar as a source of solar energy and a testament to his drive both in the boardroom as a global businessman as well as on the track and field as a triathlete in the Ironman World Championships.



Roger Little, Chairman & CEO, competing in the 2008 Iron Man Triathlon in St. Croix.

Spire Corporation also made mention in a Forbes article about the mindset of business leaders who also train for major world sporting events. The Boston Globe highlighted the environmentally friendly and renewable energy aspects and benefits that Spire is promoting by placing companies in the PV business.

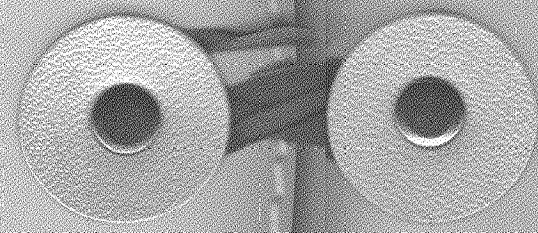
SecurityStockWatch.com conducted a one-on-one interview with Roger Little in which he discussed in part Spire's achievement of producing a fully automated 50 megawatts (MW) per year turnkey module production line.

"Spire is the Source of Confidence in the Photovoltaic Market."

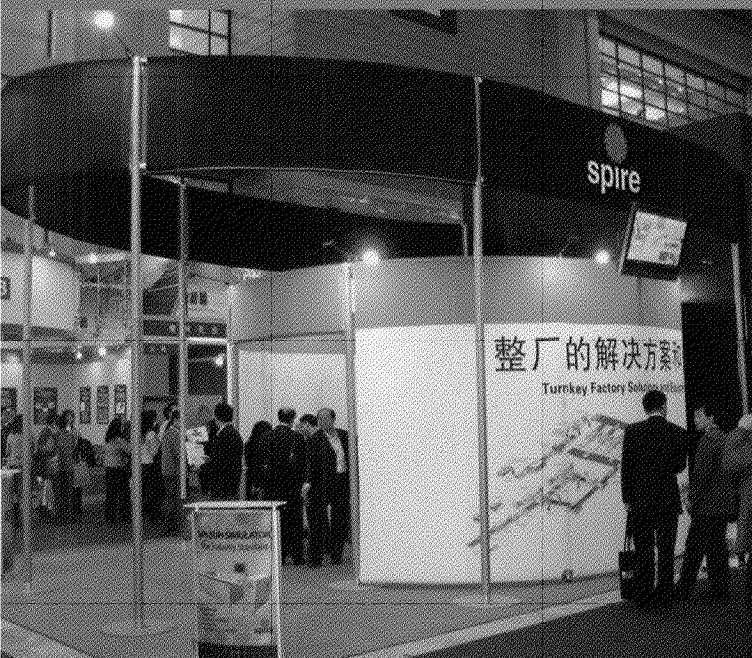
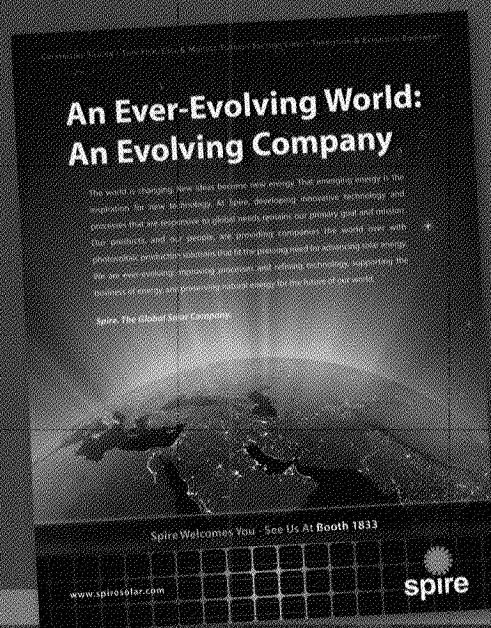
The Lowell Sun wrote a feature article on Spire Corporation focusing on the significant presence the Company has in the solar energy market as renewable energy is beginning to surge in popularity.



SPIRE CASE STUDIES



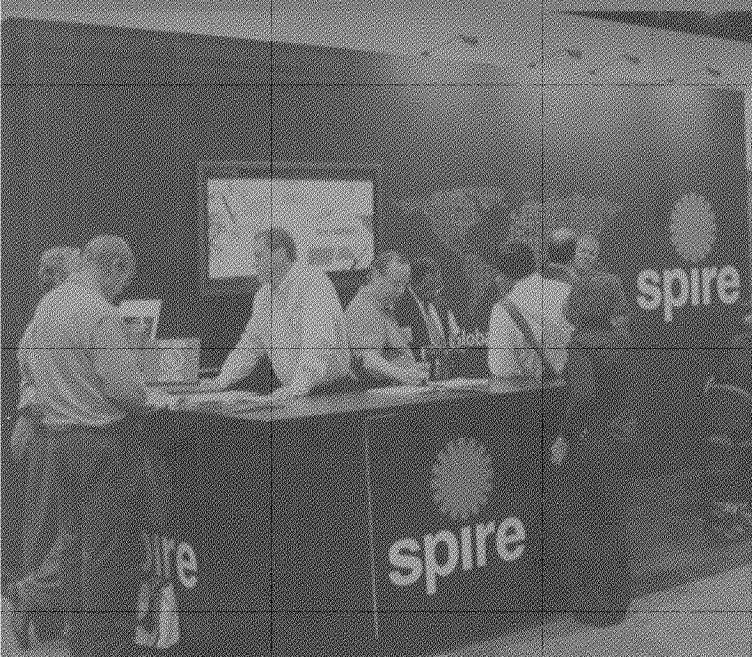
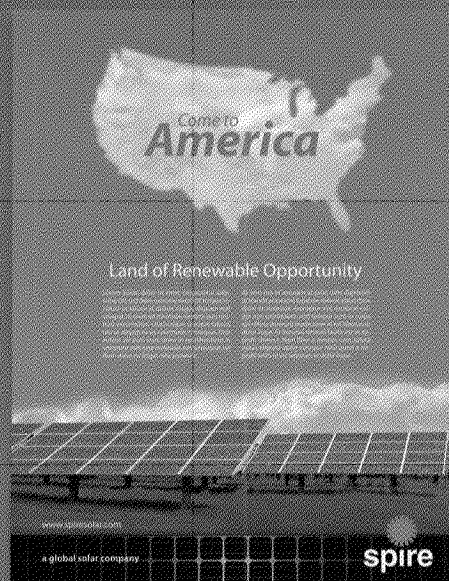
Spire's Proactive Participation in Solar Exhibitions Preceded Global Popularity in Renewable Energy



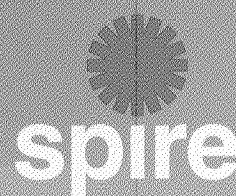
While only part of our multi-channel approach to impact the world market, trade show, exhibition, and conference participation remains an integral element in Spire's growth strategies. By participating in major PV industry trade shows, we have the opportunity to establish relationships and then continue a dialog with interested parties on an international scale. Our attendance helps maintain Spire's global presence and reinforces the message that Spire is the ideal resource and working partner to place entrepreneurs or established companies into the PV energy business – providing turnkey factory plans specific to their unique goals and market demographics.

Spire continues to channel its message of being the solar turnkey factory provider, using traditional trade publication advertising to maintain brand authority and recognition. The "Push The Button" series of advertisements brought significant awareness in U.S. and European solar trade magazines. This was followed by prospective customer recall at our tradeshow booths, which also carried the theme.

"Because the world's challenges are ever-changing, Spire's strategies are ever-evolving."



Our message is clear: although growth in Europe and Asia continues to evolve, America is the world's next destination for installing quality turnkey PV lines. New incentives and existing guidelines will secure the U.S. as the next location of choice for emerging and existing PV company growth. Combined with Spire's unsurpassed 40 years of experience in the industry and deep knowledge of the U.S. market, the growth of the domestic solar industry represents significant new opportunities for us.



CUSTOMER SUCCESSES

Globally Focused. Locally Customized.

The world PV market is looking towards America and choosing Spire Solar for reliable and customized solar module technology, products, leadership, and localized marketing know-how.

Adding to the more than 40 previously supported solar companies, Spire last year significantly assisted 16 new or repeat clients in entering or expanding within the PV market. Because of Spire's experience, solar entrepreneurs have detailed plans to successfully launch into the module market, and well-established PV companies smoothly expanded their yearly megawatt production capacity.

For the past year Spire, with the aid and support of our regional partners and advisory teams, has reached out far across the globe to new clients while cultivating and strengthening ties with long-term customers.

Fluitemik S.A. SPAIN

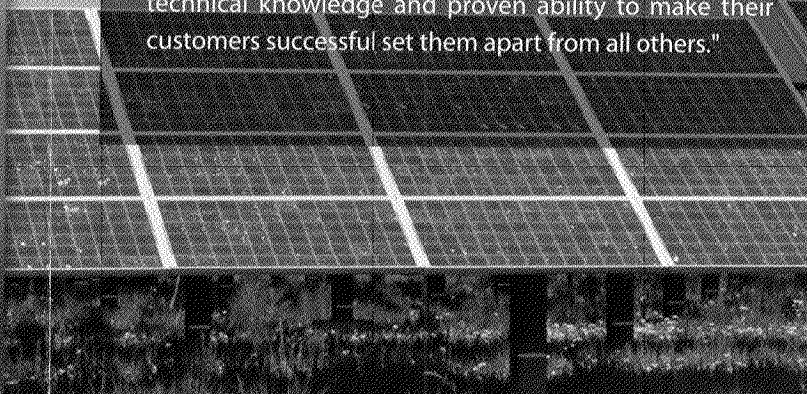
After the successful completion of a 12MW PV line at their factory in the Dominican Republic, Fluitemik S.A. gave Spire a second contract for a 20MW semi-automated crystalline module manufacturing line. Fluitemik's previous ten years of experience in the renewable energy market focused exclusively on wind energy, but with process technology and training assistance from Spire, Fluitemik expects to make a favorable impact on the solar energy market as well.

"Spire's ability to deliver a turnkey facility and provide the support necessary to qualify the finished modules under international standards is unique and an important competitive advantage to our firm," said Alberto Madoz, General Manager of Fluitemik S.A.

Hanwha Chemical Corporation **SOUTH KOREA**

Hanwha entered the solar market with one of the most modern cell factories in South Korea when it awarded Spire a contract to provide the Spi-Line™ 30C – an automated batch cell line complete turnkey factory to produce up to 30MW per year of high efficiency solar cells using either mono- or multi-crystalline wafers.

Spire also will provide in-depth training, factory layout, facilities and on-site support. Hanwha will be self-sufficient and able to operate the line without assistance after a ramp and qualification period. The solar cell line is scalable, allowing Hanwha to easily increase capacity beyond 30MW once the line is fully qualified and meeting production goals. Hanwha plans for large-scale production of solar cells by the end of 2009, then gradually expand its offers to polysilicon, ingot, and wafers. "They [Spire] represent the best choice as a partner for this turnkey factory," said a Hanwha senior officer. "Their deep technical knowledge and proven ability to make their customers successful set them apart from all others."



Capacity is Teaming with Limitless Potential

Ryazan Metal Ceramics Instruments Plant RUSSIA

Ryazan Metal Ceramics Instruments Plant JSC is an enterprise in Russia's electronics industry. Spire provided Ryazan with a semi-automated module manufacturing line capable of producing up to 12MW per year, which has made Ryazan the largest module supplier in Russia.

"This attests to the strength of Spire as a global equipment supplier, with added capability and manufacturing know-how to share with our clients, enabling them to quickly enter the mainstream market," said Roger Little, Chairman and CEO of Spire Corporation.

Mr. Karabanov S.M, Director General of Ryazan, said, "The project for the organization of solar module production, with a 12MW yield, using Spire equipment, is the beginning of a large program in solar energy development. Spire's equipment and technology will make it possible to produce reliable, quality products that will be in constant demand."

Trina Solar Limited CHINA

A wholly owned subsidiary of Changzhou Trina Solar Energy Co. Ltd., Trina Solar Limited is a manufacturer of high quality solar PV modules founded in 1997 as a pioneering system installation company. Spire entered into agreement with Trina Solar to supply them with multiple Spi-Sun Simulator™ 4600 Single Long Pulse systems, which are the world's leading solar simulation system.

"Trina is a leader not only in China but in the world market, and we are very excited to work with them on expanding their capability," said Roger Little, Chairman and CEO of Spire Corporation. Jifan Gao, Chairman and CEO of Trina Solar remarked, "We have developed a beneficial relationship with Spire and hope to continue using their high quality products to help us achieve our goals."

UNICOR U.S.A.

UNICOR is a self-sustaining, self-funded corporation established in 1934 by executive order to create a voluntary, real world work program to train federal inmates.

UNICOR awarded Spire a contract to supply solar cells and a contract for the Spi-Line 25 MW Turnkey Photovoltaic Module Factory located at the Federal Correctional Institution (FCI) in Otisville, New York. The Spi-Line at FCI Otisville is to be operated by inmates of the federal prison system who will be trained to find employment in the growing domestic solar market. Modules manufactured at FCI Otisville will be sold for government installations. The contract tasked Spire with engineering a custom factory layout and the development of unique solutions accommodating inmate training, equipment usage, and security issues. Successful performance of the factory may lead to similar factories at other UNICOR locations.

Todd Baldau, Public Information Officer for UNICOR said, "It is important to enter the market quickly and have the factory running, staff and inmates trained, and certification completed. We are excited to be working with Spire, a United States based company who is a global leader in this field."

PLG Power Limited INDIA

Midway through 2008, Spire completed an agreement with PLG Power Limited (a division of PLG Group) to provide a semi-automated crystalline module manufacturing line with a potential of 25MW of solar modules per year in India. Through Spire's direction, PLG achieved rapid module certification within one month of setting up their facility and expanded to a 50MW line by Dec 2008. PLG Group is one of India's leading corporations with interests spanning a number of industrial sectors – including plastic manufacturing, flour mills, oil refineries and farm houses – and is now looking to Spire to assist them in entering the renewable energy market. "Spire offers us an excellent path to expansion and future vertical integration," said Punit K. Goyal, Chairman and Managing Director of PLG Group. "This flexibility is important to our business plan and will allow us to grow rapidly."

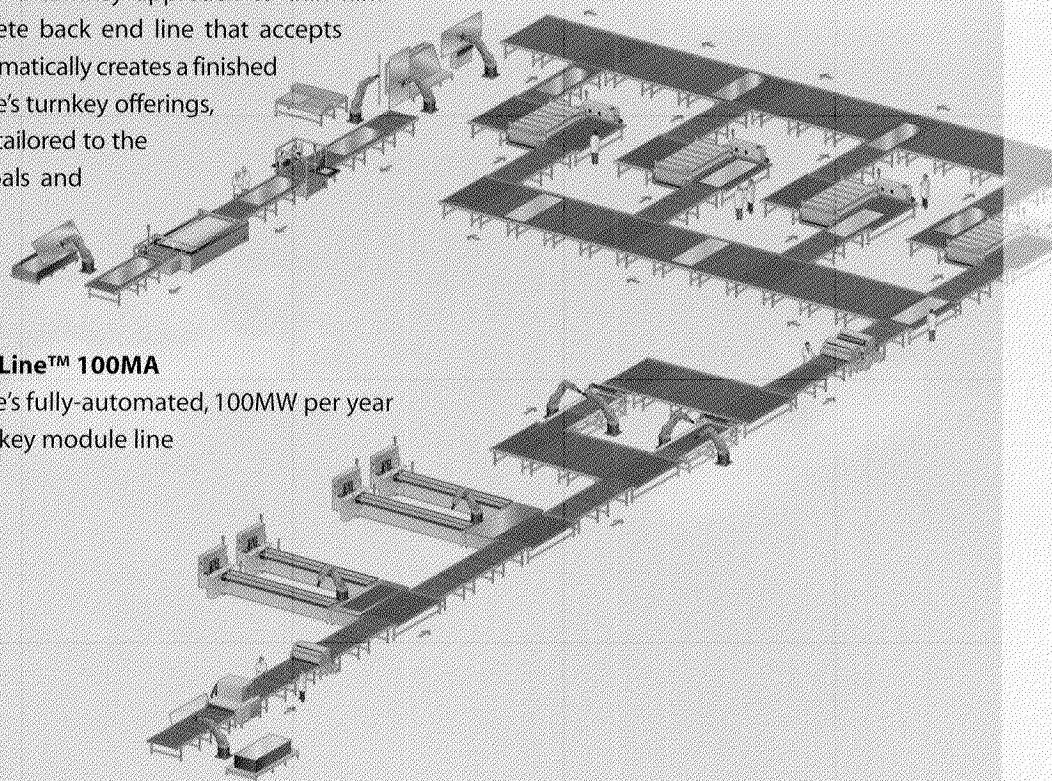
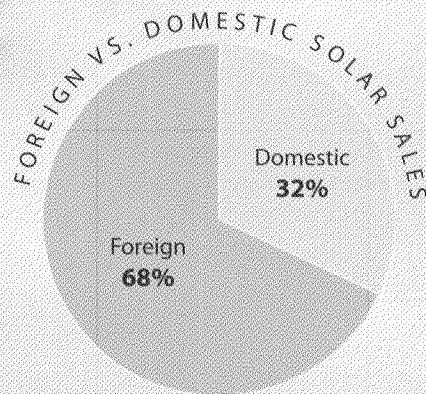


spire

Spire Solar

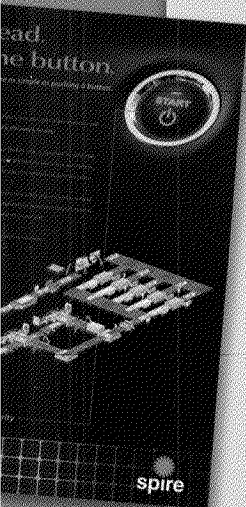
The PV market has been expanding at exponential rates worldwide, and throughout 2008 Spire Solar continued to respond to the production demands of the growing solar industry. With expanded capacity and refinements to its product line, Spire Solar has secured many additional contracts from new and repeat clients, ranging from individual equipment for vertical integration, to installation of custom-designed, fully-automated Turnkey Module Lines.

Spire Solar offers a range of PV cell and module manufacturing lines including the Spi-Line™ 100MA with up to 100MW per year production capacity, the Spi-Line™ 60C Inline Automated Cell Production Line, capable of up to 60MW per year, and the Spi-Line™ 30TF, which utilizes advanced, next generation technology to produce up to 30MW per year of thin film modules. Spire also offers a turnkey approach to thin film production with a complete back end line that accepts various substrates and automatically creates a finished module. As with all of Spire's turnkey offerings, each of these lines can be tailored to the client's specific output goals and other requirements.



Spi-Line™ 100MA

Spire's fully-automated, 100MW per year turnkey module line



Spire Solar continues setting itself apart from other PV production companies by offering in-depth training and knowledge transfer for running and maintaining its module lines. Through its network of representatives, Spire offers comprehensive marketing plans and support for their clients tailored to the unique demographics of each market and relative to the company's individual goals.

Spire's proactive and evolving approach to individual market segments continues to be a deciding factor for new companies interested in establishing turnkey factory line operations. The added value provided by guiding companies into the PV market and making sure they stay there has proven an important differentiator in marketing the Company's products and brand.

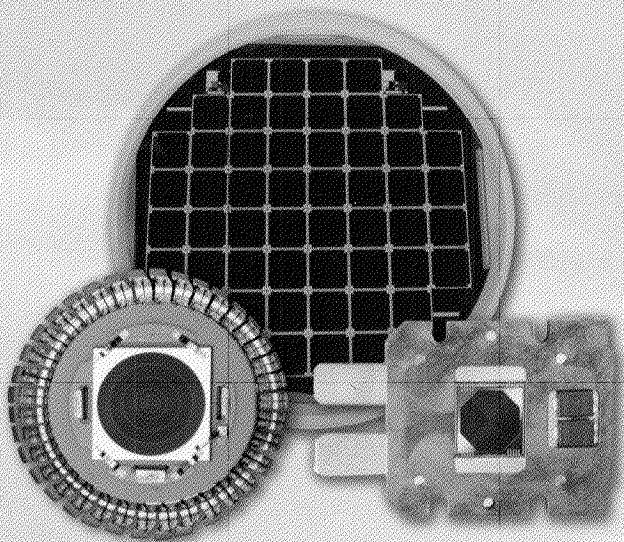
Spire's global presence and market recognition continues to expand in breadth, in part because of worldwide partnerships that integrate seamlessly with its U.S. headquarter operations. Spire's network of partnering companies provide local assistance and customer support, and includes Electronic Production Partners GmbH, Four-C-Tron, Asflex International and UST Technology PTD Ltd., among others.

Spire Semiconductor

With close to 30 years of expertise, Spire Semiconductor continues to be one of the most experienced and respected manufacturers specializing in wafer epitaxy, foundry services, thin film products, and device fabrication for the defense, biomedical, telecommunications, consumer products, and solar markets. Applying our extensive experience in compound semiconductor epitaxy and device processing, the scientists, engineers and technicians at Spire Semiconductor work with clients to design and fabricate components that give our clients' products an edge in the marketplace.

Spire Semiconductor is a cost-effective, reliable manufacturing and product development partner and service provider. Working together, we develop custom solutions for our customers, enabling higher product differentiation. We seek to form strong partnerships with our customers, taking products quickly and efficiently through development and into cost effective manufacturing.

Spire Semiconductor has recently received an award from the Department of Energy, under the PV incubator program of the Solar America Initiative (SAI). This award will enable the development of an ultra high efficiency concentrator photovoltaic (CPV) cell. The program will enable Spire Semiconductor to leverage our extensive epitaxial growth and foundry capabilities, as well as assist with the rapid growth of the CPV market both in the U.S. and abroad.



A Spire custom-made
GaAs-based concentrator PV cell

Spire Biomedical

Spire Biomedical continues to be a leader in surface engineering services for medical device material enhancements. Spire's family of customized surface treatments improves the performance of orthopedic and cardiovascular devices, enhancing such properties as wear resistance, infection resistance, tissue and bone integration, and radiopacity.

Our ongoing and evolving research and development programs for advanced surface treatment technologies and processes uniquely qualify Spire as a complete, competitive, and responsive resource for all surface modification needs. Highly trained application specialists work with customers from concept to full production to ensure that surface treatments meet the design criteria and specific requirements of the medical device industry.

Spire's advanced surface modification technologies include ion implantation and Ion Beam Assisted Deposition (IBAD) – each developed and designed to improve the surface characteristics and performance of medical devices, all in a GMP-compliant, ISO-certified environment.



Surface treatment solutions reduce articulating surface
wear on orthopedic implant components

Executive Officers

Christian Dufresne, Ph.D.
Chief Financial Officer and Treasurer

Stephen J. Hogan
Executive Vice President and
General Manager, Spire Solar

Rodger W. LaFavre
Chief Operating Officer

Mark C. Little
Chief Executive Officer,
Spire Biomedical

Roger G. Little
Chairman of the Board,
Chief Executive Officer
and President

Certain matters described in this annual report, including those relating to Spire's prospects for growth, constitute forward-looking statements under the federal securities laws. The discussion of forward-looking information requires management of the Company to make certain estimates and assumptions regarding the Company's strategic direction and the effect of such plans on the Company's financial results. These forward-looking statements are subject to risks and uncertainties that could cause actual results to differ materially from those indicated in the forward-looking statements. Such risks and uncertainties include, but are not limited to, the risk of dependence on market growth, competition and dependence on government agencies and other third parties for funding contract research and services, as well as other factors described in the Company's Form 10-K and other periodic reports filed with the Securities and Exchange Commission. Forward-looking statements contained in the annual report speak only as of the date of this annual report. Subsequent events or circumstances occurring after such date may render these statements incomplete or out of date. The Company undertakes no obligation and expressly disclaims any duty to update such statements.

Board of Directors

Udo Henseler, Ph.D., CPA
Principal/ Owner
Management Services International
(Business development services for
biotechnology and life sciences firms)

David R. Lipinski, CFA
Consulting Engineer
WorleyParsons Limited
(Provider of professional services to the energy,
resource and complex industries)

Mark C. Little
Chief Executive Officer, Spire Biomedical
Spire Corporation

Roger G. Little
Chairman of the Board, Chief Executive Officer and President
Spire Corporation

Michael J. Magliochetti, Ph.D.
President, CEO, and Director
Claros Diagnostics, Inc.
(A point-of-care diagnostic technology firm)

Guy L. Mayer
President (Retired) and Director
RTI Biologics, Inc.
(A leader in the preparation of human donated tissue and
bovine tissue for transplantation with a commitment to
advancing science, safety and innovation)

Roger W. Redmond, CFA
Vice President and Senior Investment Manager
Wells Fargo & Company
(A financial services firm)

INDEPENDENT REGISTERED PUBLIC
ACCOUNTING FIRM
Vitale, Caturano & Company, P.C. - Boston, MA

GENERAL COUNSEL
Greenberg Traurig, LLP - Boston, MA

TRANSFER AGENT AND REGISTRAR
American Stock Transfer and Trust Company
New York, NY

STOCK EXCHANGE INFORMATION
The Company's common stock is traded on the
NASDAQ Stock Market under the symbol "SPIR."
On March 27, 2009, the common stock was held
by 179 persons or entities of record including
significant amounts of stock held in "street
name." The Company did not pay any cash
dividends during 2008 and currently does not
intend to pay dividends in the foreseeable future
so that it may reinvest its earnings in the
development of its business.

ANNUAL MEETING
The 2009 Annual Meeting of Stockholders is
scheduled to be held at 10:00 a.m. on Thursday,
May 21, 2009 at Spire Corporation, One Patriots
Park, Bedford, Massachusetts.

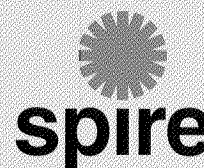
INVESTOR RELATIONS
For further information about the Company or
additional copies of this Annual Report, Form
10-K or other information, visit the Company's
website at www.spirecorp.com. The Company will
provide to any person without charge, upon
request, a copy of the Form 10-K. Any person
wishing a copy should write to Spire Corporation,
Investor Relations, One Patriots Park, Bedford,
Massachusetts 01730-2396.

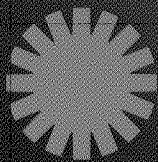
The Company's Form 10-K for the year ended
December 31, 2008 filed with the Securities and
Exchange Commission, contains an audited
consolidated balance sheet of Spire Corporation
and subsidiaries as of December 31, 2008 and the
related consolidated statements of operations,
stockholders' equity and comprehensive loss and
cash flows for each of the years in the two-year
period ended December 31, 2008.

FINANCIALS

Selected Financial Data

Years Ended December 31	2008	2007	2006	2005	2004
	(in thousands, except per share amounts)				
Consolidated Statements of Operations:					
Net sales and revenues	\$68,652	\$37,068	\$20,125	\$22,422	\$17,278
Gain on sale of licenses/trademark	–	2,735	–	6,320	3,000
Gain on termination of contract	6,761	–	–	–	–
Earnings (loss) before income taxes and extraordinary gain	5,045	(4,111)	(8,151)	44	(4,120)
Income tax benefit (expense)	(270)	877	–	–	–
Extraordinary gain, net of taxes	–	1,301	–	–	–
Net income (loss)	4,775	(1,933)	(8,151)	44	(4,120)
Basic income (loss) per share of common stock	\$ 0.57	\$ (0.23)	\$ (1.03)	\$ 0.01	\$ (0.60)
Diluted income (loss) per share of common stock	0.56	(0.23)	(1.03)	0.01	(0.60)
Weighted average number of common and common equivalent shares outstanding – basic	8,329	8,272	7,898	6,975	6,809
Weighted average number of common and common equivalent shares outstanding – diluted	8,465	8,272	7,898	7,237	6,809
Consolidated Balance Sheets:					
Working capital	\$6,835	\$ 2,587	\$ 3,938	\$ 5,270	\$ 3,996
Cash and cash equivalents	5,971	2,372	1,536	3,630	3,337
Total assets	68,018	48,687	27,684	17,952	20,105
Stockholders' equity	13,518	8,455	9,463	9,255	7,892





spire

a global solar company

Spire Corporation

One Patriots Park
Bedford, MA 01730-2396 U.S.A.

T: +1.781.275.6000

F: +1.781.275.7470

www.spirecorp.com