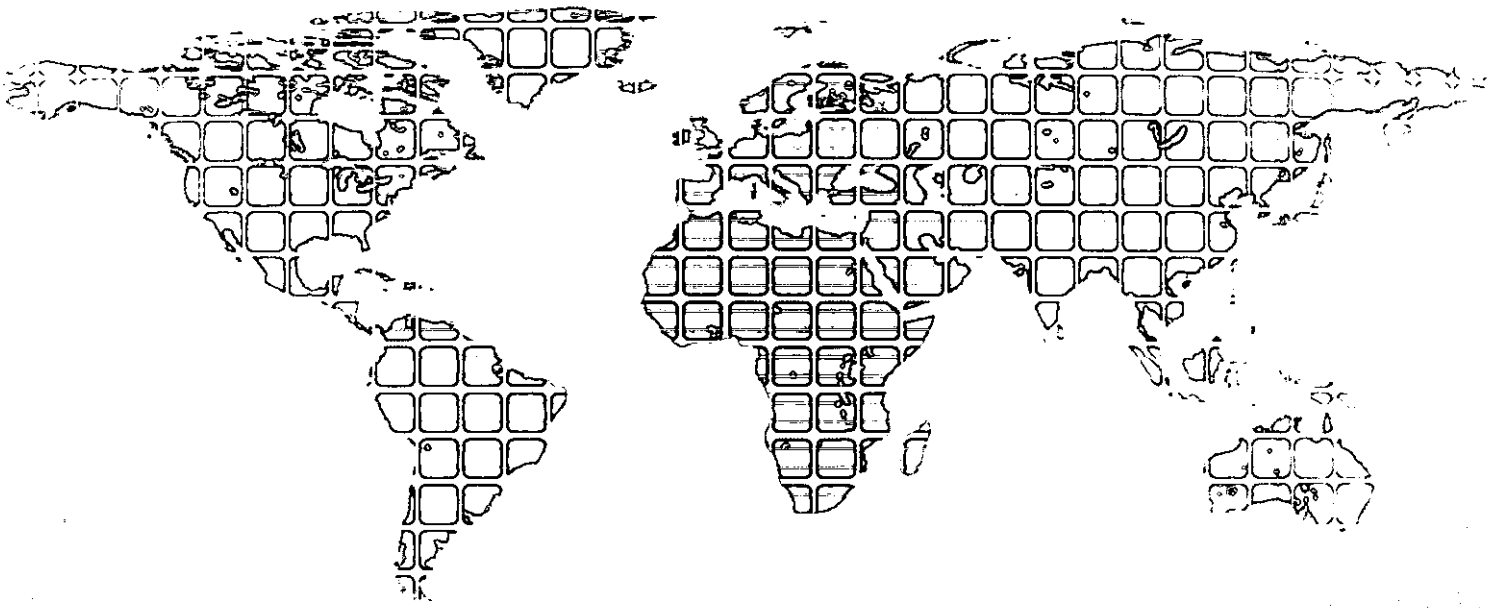
SPIRE ANNUAL REPORT 2007



A Global Solar Company

spire

Roger G. Little
Chairman and CEO

Dear stockholders, customers and employees:

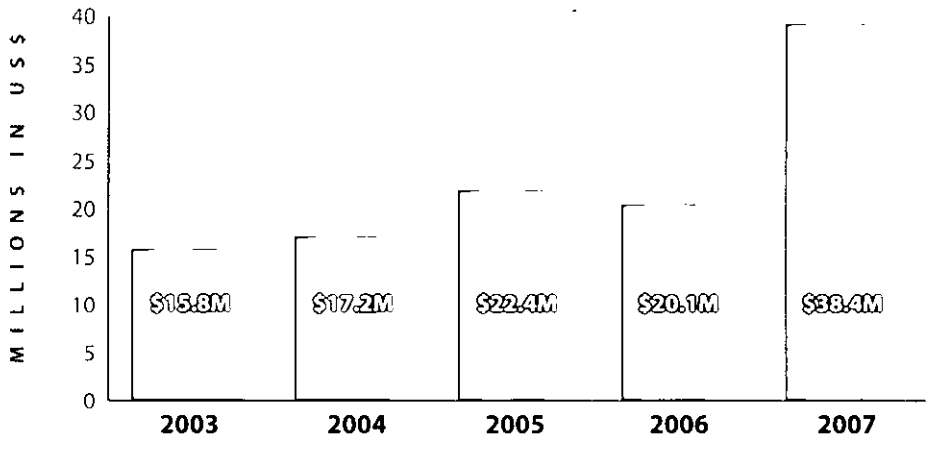
2007 was a defining year in the history of Spire Corporation. With the initiatives we put in place during the year, along with the remarkable market dynamics taking place in the solar photovoltaic (PV) market, I believe that Spire is well positioned for profitable growth more than any other time in our 38-year history.

During 2007, we solidified our worldwide leadership in developing and delivering turnkey factories for module energy manufacturing. Demand for these solar factories has been robust as manufacturers prepare for the coming, increased availability of solar-grade silicon, which is expected to spur market growth across the world.

We expanded to meet this demand by doubling the size of our facilities and employees, including contractual staff. We reorganized our Spire Semiconductor operation to better focus its expertise on the terrestrial solar-cell business and established our Gloria Spire Solar joint venture with one of Taiwan's leading solar manufacturers to capitalize on the high-growth domestic PV systems market. We delivered turnkey factories to customers around the globe. Currently, we are building the industry's most advanced, 50MW fully robotic module line.

Our business momentum was reflected in our four consecutive quarters of record revenue growth, resulting in annual revenues in 2007 of $38,423,000 a 91% increase from 2006. Net loss after extraordinary gain was $1,686,000, or $0.20 per share for 2007, compared with a net loss of $8,151,000, or $1.03 per share, for 2006. At year-end, we had $2.4 million in unrestricted cash and short-term investment.

SPIRE CORPORATION TOTAL ANNUAL REVENUE



Overview

Spire principally develops, manufactures and markets customized solutions for the solar industry, including manufacturing equipment and full turnkey lines for cell and module production and testing, concentrator cell and LED fabrication, and PV system integration. We also operate an advanced biomedical applications business. The foundation for all our businesses is our industry-leading expertise in material technologies and surface treatment; this proprietary knowledge enables us to further develop our offerings in solar equipment, optoelectronics, and biomedical products and services.

We are one of the world's leading suppliers of the manufacturing equipment technology needed to produce solar photovoltaic power systems. Our manufacturing equipment components and our SPI-LINE™ integrated turnkey cell and module production lines are designed to meet the needs of all manufacturers, from the smallest companies who rely on mostly manual processes, to the largest photovoltaic manufacturing companies in the world.

In addition to our cell and module manufacturing solutions, we have a device fabrication facility (Spire Semiconductor) where we produce, under contract with our customers, gallium arsenide (GaAs) concentrator cells. This state-of-the-art semiconductor fabrication and foundry facility is the foundation of our solar cell process technology for silicon, polysilicon, thin film and GaAs concentrator cells.

Our biomedical operation capitalizes on our expertise in surface treatments to improve performance of our customers' medical devices. Our medical device business also develops, manufactures and sells premium vascular access products.

In 2007, we nearly doubled annual revenue and we believe the same trend will continue in 2008. We have equipment deployed in approximately 50 countries and enjoy the patronage of some of the worlds leading solar manufacturers including First Solar, BP Solar, Kyocera, Sharp, Hitachi, Evergreen and Solaria Energy and Environmental S.A.

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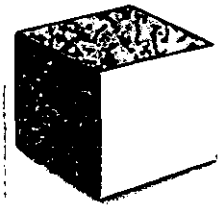
The Module Process

The process of producing crystalline solar cells and modules begins after taking quartz sand to make silicon, which is purified into polysilicon **(a)**, and then polycrystalline ingot growth occurs **(b)**, after which the ingots are sliced into wafers **(c)**, followed by cell production involving an etching, doping and coating process **(d)**, and ending with module assembly which includes cell testing, stringing, laminating, and framing into the final module **(e)**.

Quartz sand

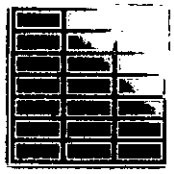
a. Polysilicon

b. Polycrystalline Ingot

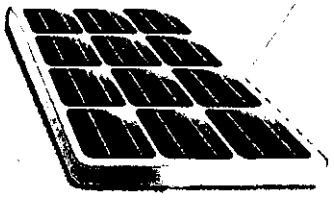


c. Wafer

d. Cell



e. Module



A Global Solar Company

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

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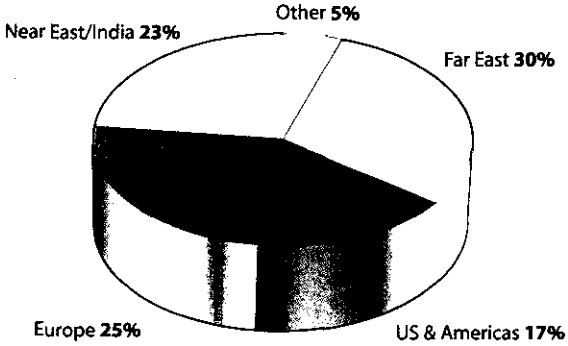
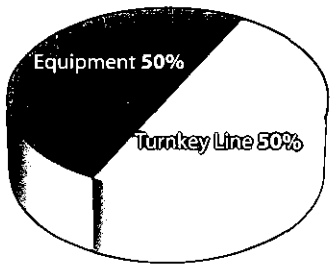
SOLAR SALES BY REGION



SOLAR SALES REVENUE



As a leading provider of equipment and turnkey manufacturing solutions, Spire has created a well-established, world-class customer base.

Discover Our Potential...

The global solar photovoltaic (PV) market is growing at an unprecedented pace, outstripping the annual growth rate of almost every other energy technology. *Spire is accelerating the photovoltaic industry's* growth by helping many new participants enter into the PV manufacturing business quickly, efficiently, and ready to compete. With over 30 years of experience in the solar business and a strong focus on the capital equipment segment, Spire's unique position as "The Turnkey Solar Factory Company" is proven by its high quality products and strong brand recognition.

Our distribution reach is global. During the year, we added crucial sales representation in Germany, Japan and China and installed equipment and solar factories in India, China, Taiwan, Spain, Japan, Germany and South Korea. This geographic breadth is a testament to the strength of Spire as a worldwide solar supplier and *recognition* of our position as the leader in turnkey solar factory solutions.

With technology that began as an outgrowth of our work in solar cell processing, our Spire Biomedical operation also achieved solid growth during the year. This was primarily driven by our medical device processing services, as well as the significant strides we made in penetrating the coated catheter market with our breakthrough product, Decathlon™ Gold, the industry's only End-Point™ Bonded, heparin-coated hemodialysis catheter.

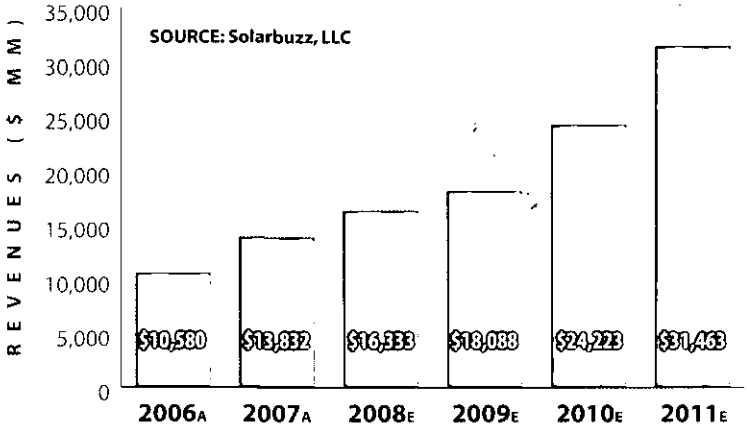
Overall, this was a year of accomplishment for Spire and we've set the stage for continued success in 2008. As illustrated in this annual report , we have developed a pipeline of products and services that manufacturers will need to address in a global solar market that is entering a period of unprecedented growth. Thanks to the efforts of our committed and dedicated employees around the world, Spire Corporation is thriving and we look forward to sharing our progress with you throughout 2008 and beyond.

Roger Little Competes in his 10th Ironman World Championship in Kailua-Kona, Hawaii, October 13, 2007.

"These races aren't getting any easier!"

Roger G. Little
Chairman and CEO
April 2008

GLOBAL SOLAR INDUSTRY REVENUE PROJECTIONS



Gloria Solar Ltd.

Spire has partnered with Gloria Solar Ltd., a Taiwan based photovoltaic (PV) module manufacturer, to establish a joint venture, Gloria Spire, in order to actively pursue the U.S. PV systems market. As part of the establishment of Gloria Spire, Spire has helped train Gloria Spire's employees and provided critical process knowledge with respect to the U.S. PV systems market. Moreover, Spire has also assisted with the certification of Gloria Solar's modules.

Solaria Energy and Environmental S.A.

Though a new entrant into the solar business for the module market, Solaria did have over 20 years experience in the energy market before it first contacted Spire for guidance in this new sector. When they purchased a 12MW output module line in 2005, Spire comprehensively trained their employees and assisted with module certification.

A progressive output expansion campaign was started in 2006 up to 25MW. Next in 2007, they grew to 50MW in the 2nd quarter and then to 90MW in the 4th quarter. By the 3rd quarter of 2008, Solaria will reach 150MW output.

Martifer Solar S.A.

Spire was awarded the Martifer Solar S.A. contract and has now made them capable of producing up to 50MW of modules, which is expandable to 100MW per year. Martifer Solar is part of Martifer Group that consists of four divisions: metallic construction, renewable energy systems, electricity generation and agriculture & biofuels. It has the first fully automated module line installed in Portugal, and it uses extensive robotic systems for material handling and processing and is one of the most advanced, state-of-the-art solar lines in the world.

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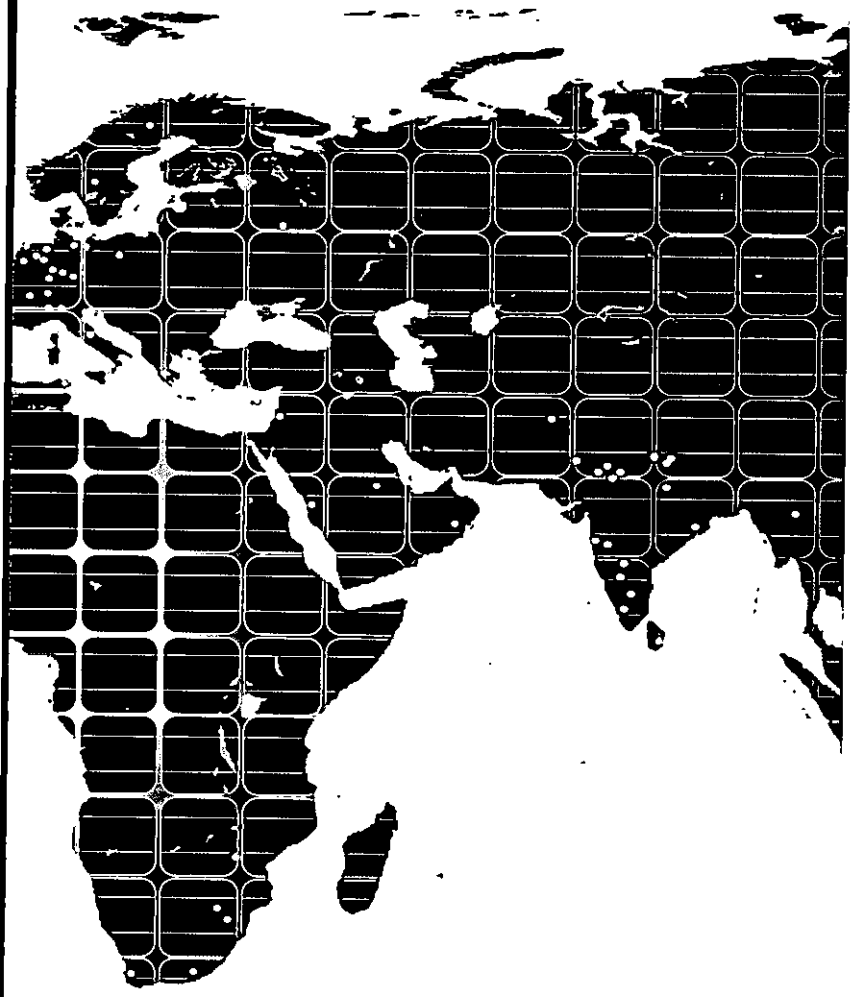


Our Longevity Is Justified.

Spire provides everything needed to ensure our customers' success, for both new entrants and solar veterans. Our turnkey production lines include: state-of-the-art equipment, facility layout to maximize efficient operation, assistance with materials 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". Today more than 90% of all solar manufacturing companies use Spire equipment in their production lines. We have an extensive international sales network with nearly 200 customers in 50 countries worldwide

A Spire Partnership Equals Thriving Customers . . . Introducing Just A Few:

As a leading provider of equipment and turnkey manufacturing solutions, Spire has created a well-established, world-class customer base. With Spire's assistance, over forty turnkey factories have been established or are underway throughout Europe and Asia. We have proven our ability to help new companies start, expand, and vertically integrate within the solar industry.

Positioned as the leading global solar company with a long history in the industry, we are uniquely positioned to take advantage of the anticipated large growth of the photovoltaic market.

10 Reasons to "Let Spire Put You in the PV Business"

1. **Spire** has over 25 years *experience* putting people into the business successfully.
2. **Spire** is a leader in developing the *technology* needed to manufacture quality products.
3. **Spire** manufactures all the key components of *equipment* necessary for high volume, low cost production.
4. **Spire's** equipment has demonstrated its *performance in more than 150 factories worldwide.*
5. **Spire** guarantees not just equipment performance but *product performance and UL listing.*
6. **Spire's training** teaches your staff all aspects of production processes and product testing.
7. **Spire** provides *systems engineering* design services to help you address the market.
8. **Spire** provides all the necessary *materials and supplies* to fabricate quality PV modules.
9. **Spire's** research team keeps you in the forefront of *advanced technology.*
10. **Spire** will be there to *expand* your capacity or help you to *vertically integrate* into cells and wafers.

"You can count on our more than 25 years of experience and dedication to put you in a leadership position."

Roger G. Little
Chairman and CEO

Solar is in Our Genes. Innovation: Our Makeup

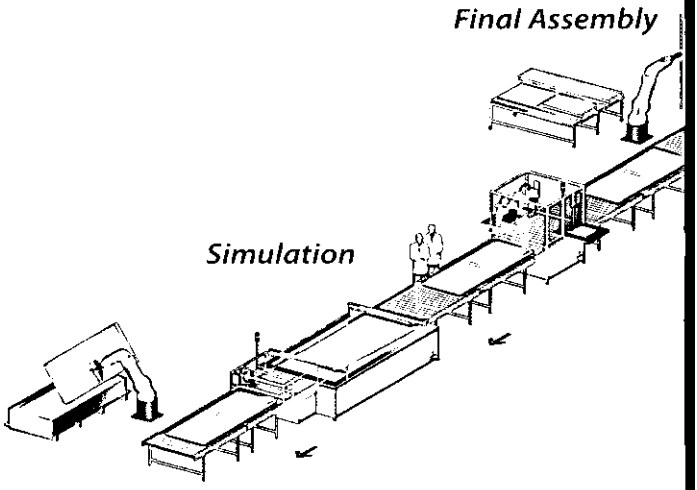
Today's photovoltaic manufacturers are demanding more efficient and larger scale production facilities. These facilities include key equipment with high-yield throughput and the ability to automate both material flow and process steps. Spire has partnered with a leading industrial robotic firm to develop the most advanced, fully automated solar module line in the world. The addition of robotics to our proven PV manufacturing process will allow Spire to provide manufacturers with highly automated, turnkey factories with annual outputs up to 100MW and beyond.

Spire's manufacturing equipment and SPI-LINE™ integrated turnkey wafer, cell, and module production lines span the full photovoltaic module fabrication process. The fabrication of photovoltaic modules uses solar cells and module materials as input and produces functional photovoltaic modules, ready for use. Key process steps include:

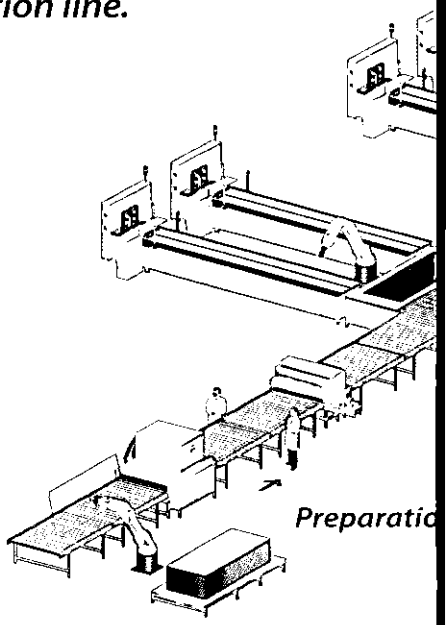
- Sorting cells into performance groups
- Assembling and soldering strings of cells
- Completing the module's circuit by soldering bus ribbons to connect the strings
- Laminating the module assembly
- Performing high voltage isolation test
- Electrically testing the module performance

Spire produces the equipment and automation for module assembly and combines this with the system design and engineering services provided by a highly experienced team of professionals who offer complete project design, management, installation coordination, and customer service.

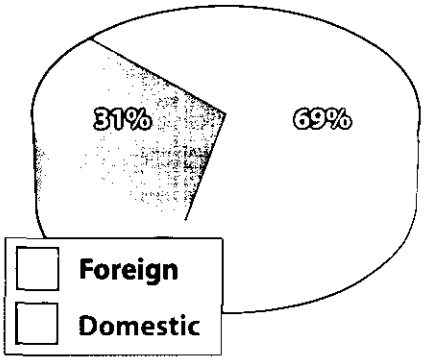
Spire is further driving industry growth by helping manufacturers vertically integrate their module, cell and wafer production lines and reduce their total cost of production. Spire is currently quoting integrated module, cell and wafer lines for production up to 250MW per year.



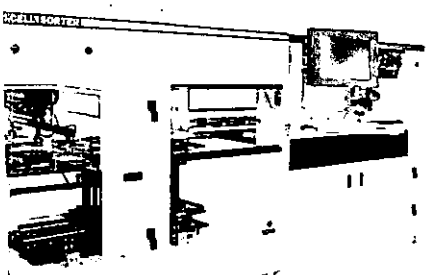
SPI-LINE™ – our fully automated robotically controlled 100 megawatts per year production line.



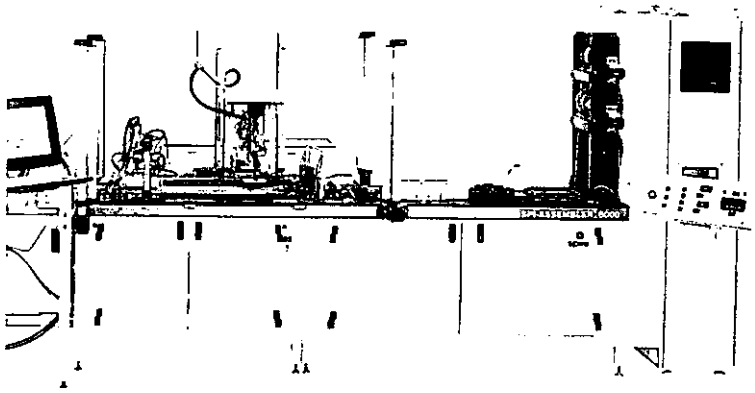
FOREIGN VS. DOMESTIC SOLAR SALES



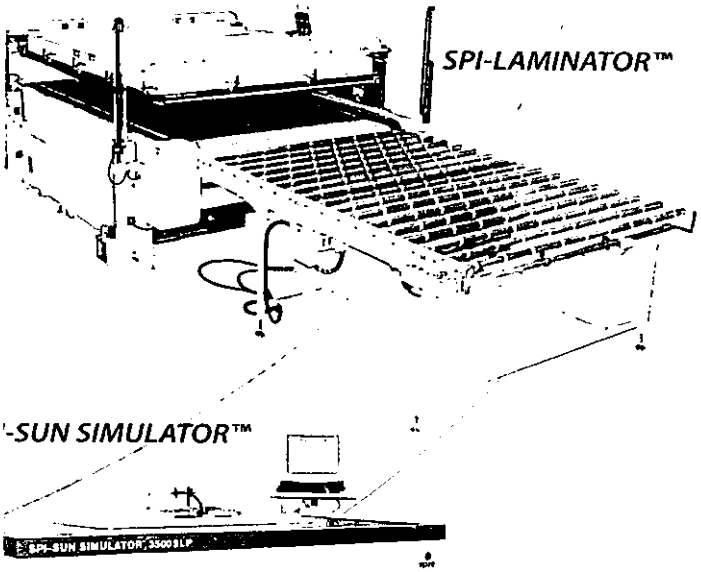
SPI-CELL SORTER™



SPI-ASSEMBLER™



SPI-LAMINATOR™



-SUN SIMULATOR™

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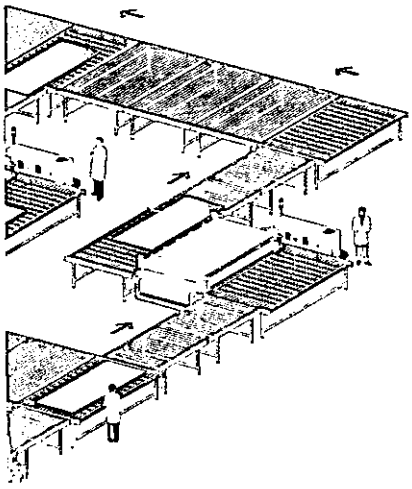
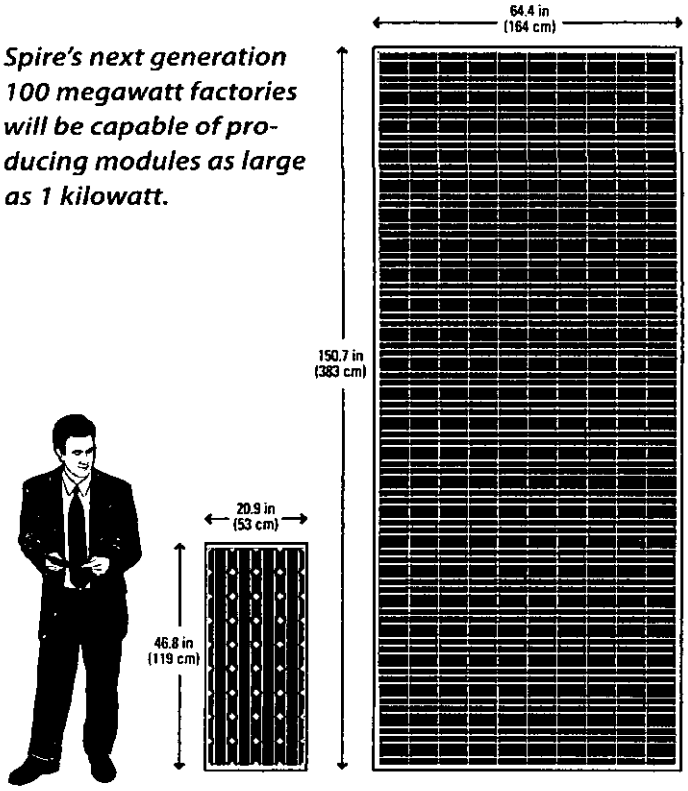
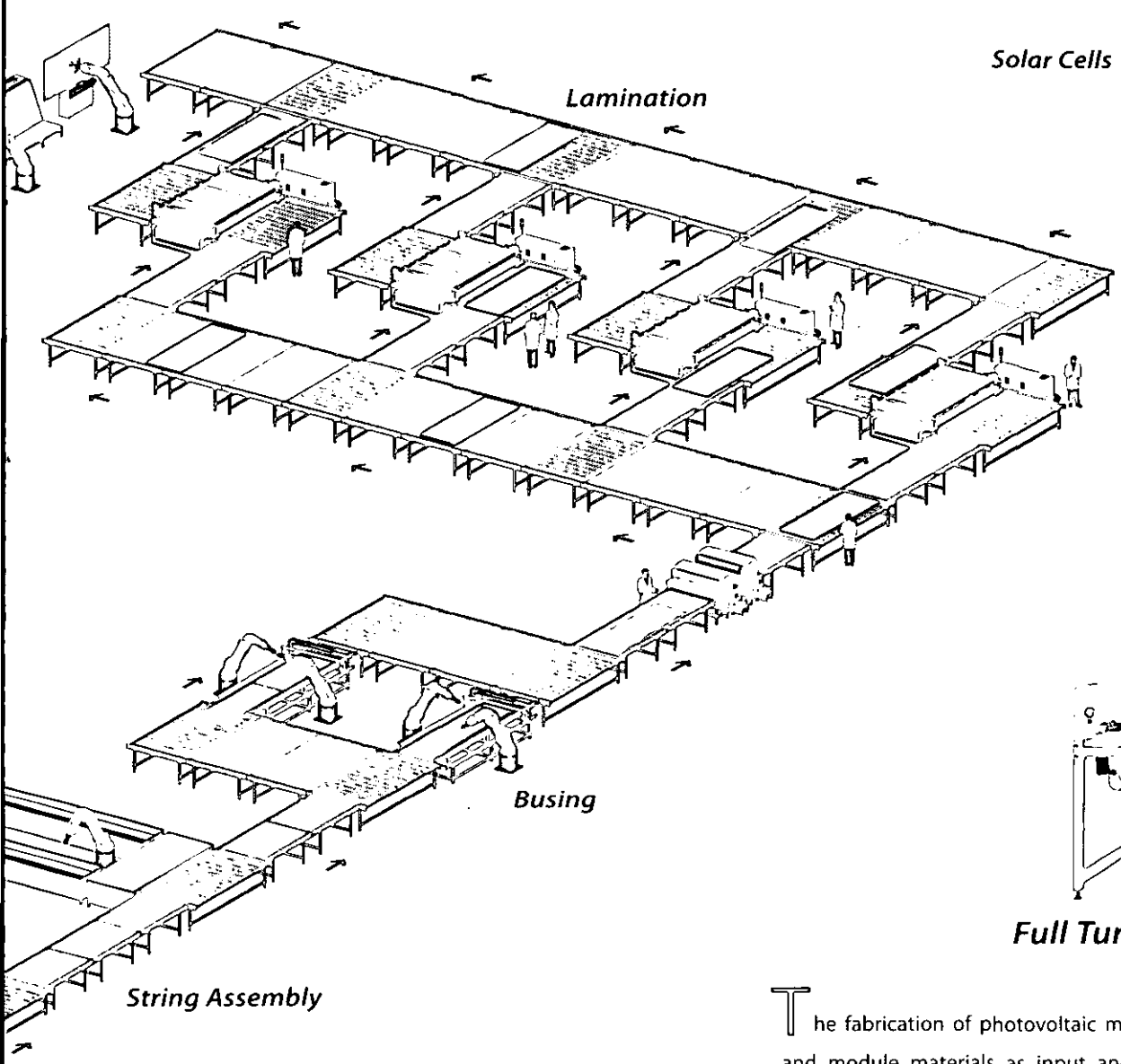
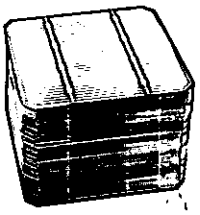
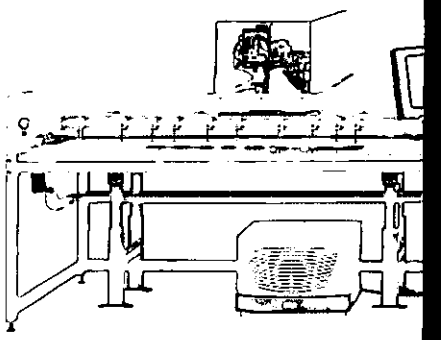


Spire's next generation 100 megawatt factories will be capable of producing modules as large as 1 kilowatt.



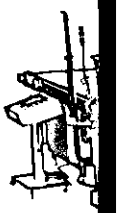






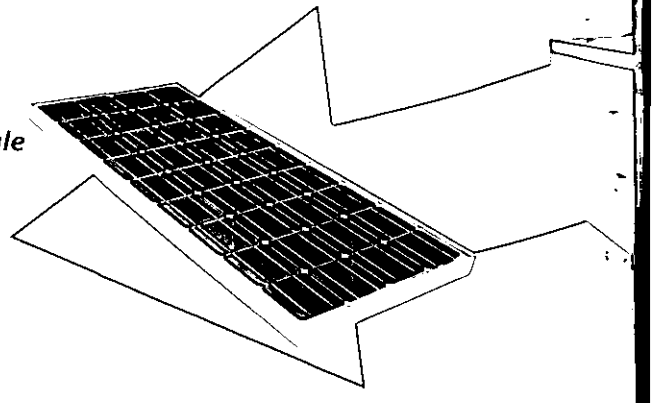
Full Turnkey Solution

The fabrication of photovoltaic modules uses solar cells and module materials as input and produces functional photovoltaic modules, ready for use. We provide the necessary equipment and training for implementing these process steps as individual equipment items and as fully integrated *production* lines. We also provide the necessary materials to support the manufacturing activities of our customers on an ongoing basis. Our business is primarily a system design and engineering service comprised of a highly experienced team of professionals who provide complete project design, management, installation coordination, and customer service.



Our Experience Yields Ingenuity

After a decade of growth, the PV market has finally reached the critical mass necessary for sustained high growth. With the coming increased availability of silicon feedstock material, PV manufacturing equipment is the next horizon for industry growth. With its rich history, process knowledge, technology foundation and experience, Spire is uniquely positioned to add comprehensive value to manufacturers and to help enable the growth of this exciting market.



Expect Innovation From Spire . . .
Just as You Expect Energy from the Sun

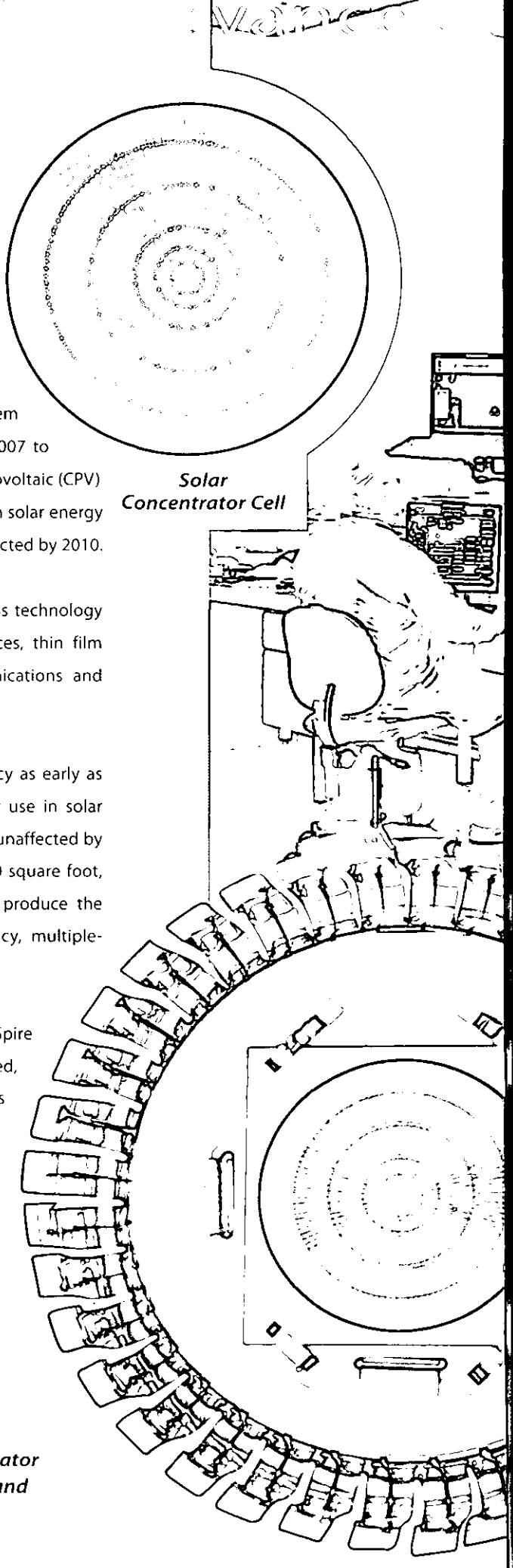
With nearly three decades of expertise and a renowned intellectual property portfolio, Spire Semiconductor is one of the most experienced and respected manufacturers of high-efficiency gallium arsenide solar cells.

An early pioneer in using GaAs for both concentrator solar arrays and space system solar cells, this operation was renamed from Bandwidth Semiconductor in 2007 to refocus its industry-leading expertise on the GaAs terrestrial concentrator photovoltaic (CPV) solar cell market. CPV technologies are one of the most exciting growth areas in solar energy today, with more than 400 gigawatts (GW) of installed capacity worldwide projected by 2010.

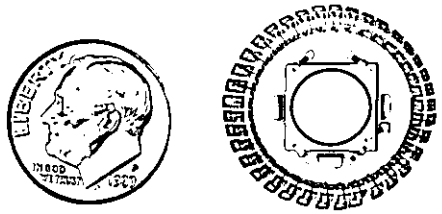
This operation also has provided Spire with crystalline silicon solar-cell process technology and has allowed us to specialize in high-end wafer epitaxy, foundry services, thin film products, and device fabrication for the defense, biomedical, telecommunications and consumer products markets.

Spire developed and fabricated GaAs solar cells with record levels of efficiency as early as 1985. As a compound semiconductor, GaAs possesses unique properties for use in solar concentrator cells. They produce high levels of photovoltaic efficiency and are unaffected by the extreme heat produced in CPV solar arrays. Spire Semiconductor's 50,000 square foot, state-of-the-art operation in Hudson, New Hampshire, has the capacity to produce the equivalent of approximately 50MW of 500 sun concentration, high-efficiency, multiple-junction concentrator cells.

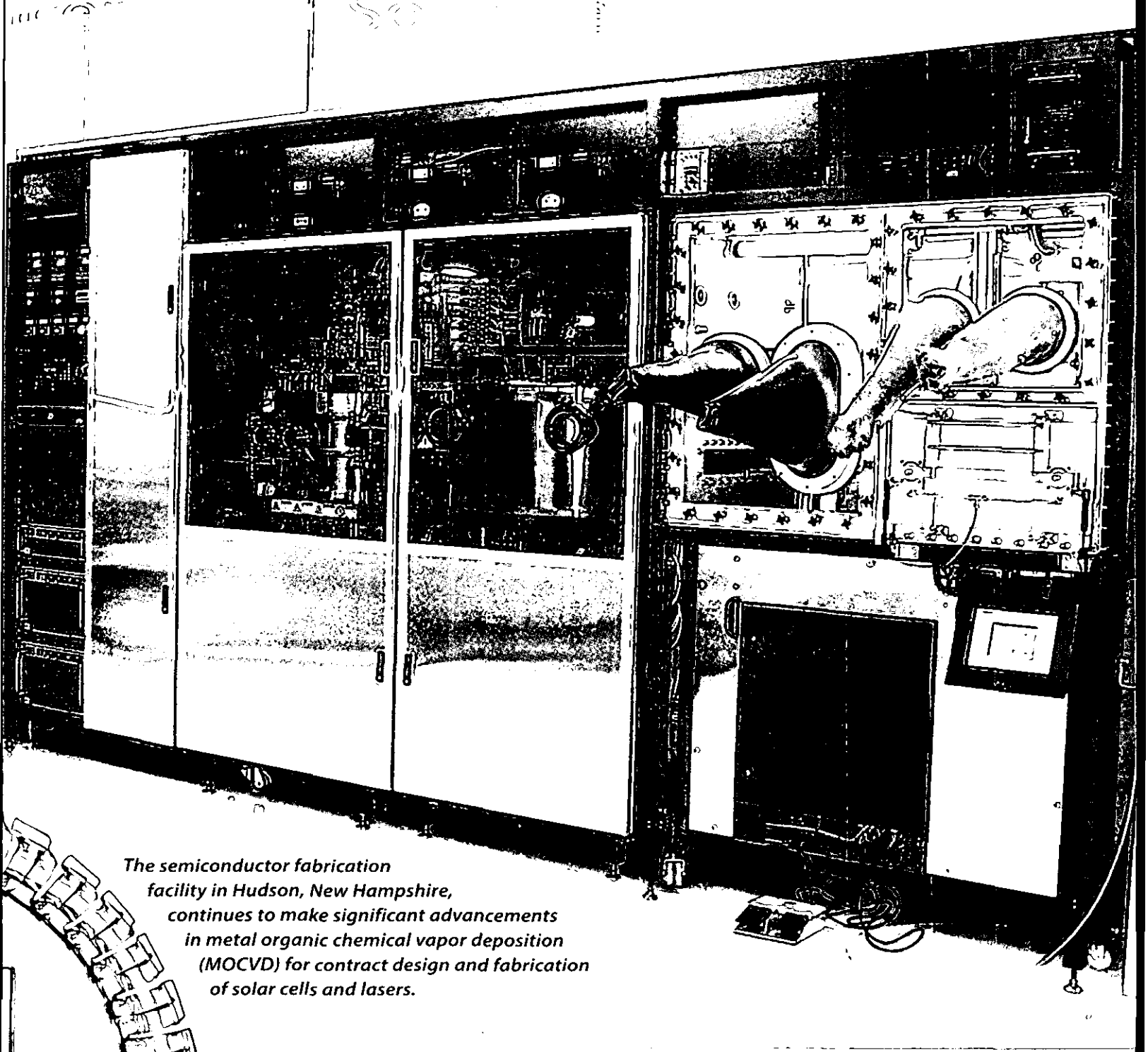
Taking advantage of this capacity and industry-leading experience, in 2007, Spire Semiconductor initiated a merchant *capacity program* to provide dedicated, contract design and manufacturing capabilities to solar system integrators around the world. This service can offer partners the benefits of an optimized design and manufacturing process with the potential for large-scale contract production based on their individual needs.



Solar Concentrator Cell



A Spire custom-made GaAs-based concentrator cell is relative to the size of a dime, above, and is enlarged to show detail, right.



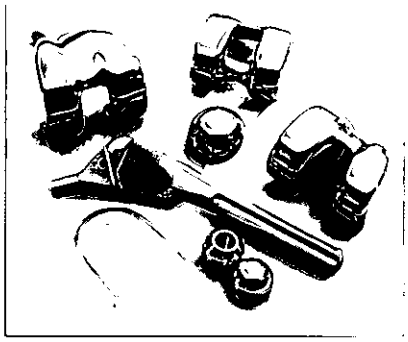
The semiconductor fabrication facility in Hudson, New Hampshire, continues to make significant advancements in metal organic chemical vapor deposition (MOCVD) for contract design and fabrication of solar cells and lasers.

Spire Semiconductor also operates a complete compound semiconductor device line focused on developing custom devices, as well as prototyping, pilot production and volume manufacturing. Custom and production wafer processing capabilities at Spire Semiconductor include photolithographic processing of GaAs and indium phosphide epitaxial cell structures and deposition of broadband, dual-layer anti-refection (AR) coatings.

During the past year, research contracts from the National Aeronautics and Space Administration, the Department of Energy and the Air Force were performed through this facility to develop advanced GaAs cells for both terrestrial and space applications. And with its renowned solar cell intellectual property portfolio, we expect continued innovation from Spire Semiconductor.

Our Medical Device Treatments Don't Even Scratch the Surface...

For nearly 20 years, Spire's Biomedical subsidiary has been a market leader in surface treatments for improving the performance of orthopedic and cardiovascular medical devices. The advanced ion-implant technology – which Spire originally developed for ultra-high efficiency solar cells – can enhance the properties of a wide variety of materials used in medical devices. This is accomplished by treating just the first few millionths of an inch on the surface with high-energy ions. Device properties that can be improved using Spire's processes include wear resistance, infection resistance, thrombus reduction, and enhanced tissue and bone growth on orthopedic alloys.



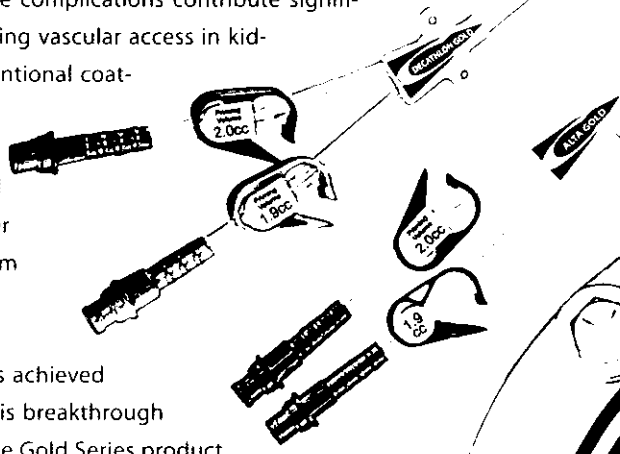
DECATHLON™ GOLD Split-Tip Dialysis Catheter

...Yet Their Applications are Countless

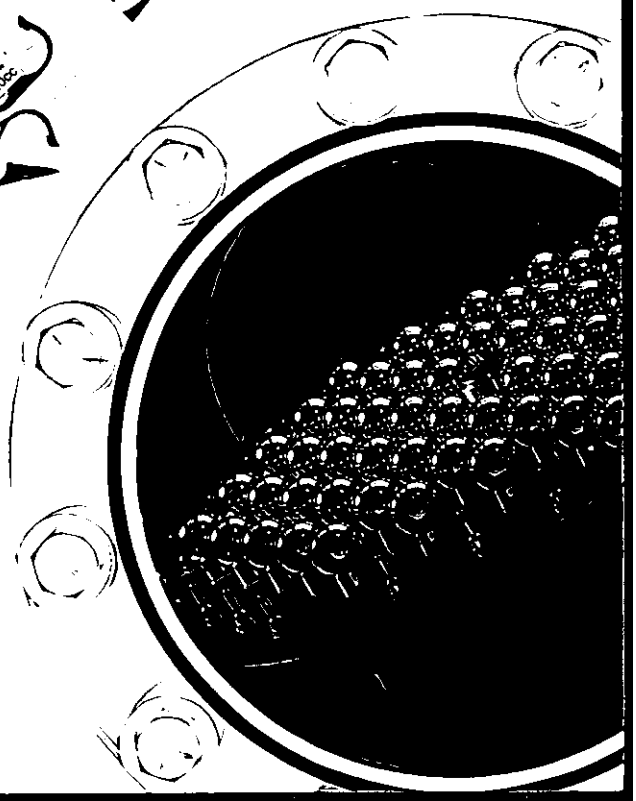
Using its superior surface modification technologies, Spire Biomedical also markets the most advanced line of hemodialysis catheters in the industry: the Gold Series family of heparin coated catheters.

ALTA™ GOLD Fixed-Tip Catheter

FDA approved since 2006, the Decathlon™ Gold is the first End-Point™ Bonded, heparin-coated hemodialysis catheter that has been shown to reduce the complications of clotting and catheter occlusions. These complications contribute significantly to the annual costs of maintaining vascular access in kidney failure patients. Superior to conventional coating techniques, Spire's unique End-Point™ covalent bonding maximizes the exposure of heparin to the blood by firmly anchoring it to the catheter surface, thereby providing long-term anti-clotting performance.



For the past year, Spire Biomedical has achieved significant market penetration with this breakthrough product, and has recently expanded the Gold Series product line to include a variety of tip configurations and insertion styles for additional flexibility. The Gold Series family of heparin coated catheters can significantly improve long-term hemodialysis treatment and benefit both patients and healthcare professionals.



Surface treatment solutions reduce articulating surface wear on orthopedic implant components and proximal femoral (hip) heads, above and right.

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

Board of Directors

Udo Henseler, Ph.D., CPA
President and 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 and Chief Executive Officer
Claros Diagnostics, Inc.
(A point-of-care immunoassay diagnostic technology firm)

Guy L. Mayer
President and Director
RTI Biologics, Inc. (formerly Regeneration Technologies, 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, Ltd.
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 28, 2008, 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 2007 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 2008 Annual Meeting of Stockholders is scheduled to be held at 10:00 a.m. on Thursday, May 22, 2008 at Spire Corporation, One Patriots Park, Bedford, Massachusetts.

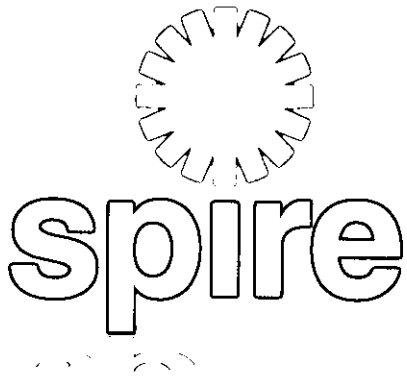
INVESTOR RELATIONS
For further information about the Company or additional copies of this Annual Report, Form 10-K or other information, visit the Company's website at www.spirecorp.com. The Company will provide to any person without charge, upon request, a copy of the Form 10-K. Any person wishing a 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, 2007 filed with the Securities and Exchange Commission, contains an audited consolidated balance sheet of Spire Corporation and subsidiaries as of December 31, 2007 and the related consolidated statements of operations, stockholders' equity and comprehensive earnings/(loss) and cash flows for each of the years in the two-year period ended December 31, 2007.

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 duration 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.

Selected Financial Data

Years Ended December 31	2007	2006	2005	2004	2003
	(in thousands, except per share amounts)				
Consolidated Statements of Operations:					
Net sales and revenues	$38,423	$20,125	$22,422	$17,278	$15,803
Gain on sale of licenses/trademark	2,735	–	6,320	3,000	4,989
Earnings (loss) before income taxes and extraordinary gain	(3,864)	(8,151)	44	(4,120)	42
Income tax benefit (expense)	877	–	–	–	33
Extraordinary gain on investment in joint venture	1,301	–	–	–	–
Net income (loss)	(1,686)	(8,151)	44	(4,120)	9
Income (loss) per share of common stock – basic & diluted	$ (0.20)	$ (1.03)	$ 0.01	$ (0.60)	$ 0.00
Weighted average number of common and common equivalent shares outstanding – basic	8,272	7,898	6,975	6,809	6,764
Weighted average number of common and common equivalent shares outstanding – diluted	8,272	7,898	7,237	6,809	6,870
Consolidated Balance Sheets:					
Working capital	$2,834	$3,938	$5,270	$3,996	$8,182
Cash and cash equivalents	2,372	1,536	3,630	3,337	5,999
Total assets	48,480	27,684	17,952	20,105	22,792
Stockholders' equity	8,702	9,463	9,255	7,892	11,796



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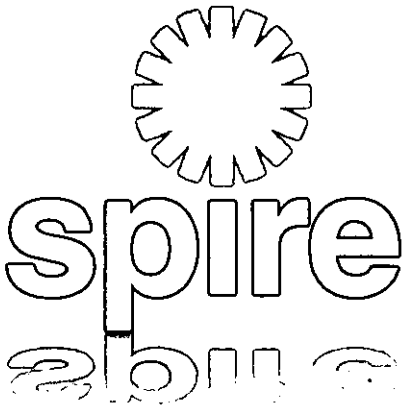

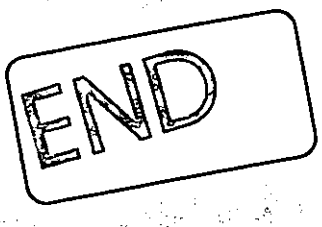

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