



Spire Biomedical, Inc.



Spire Solar, Inc.



SPIRE CORPORATION

2002 Annual Report



To our Stockholders, Customers and Employees:

The year 2002 was an eventful year for Spire Corporation. Spire strengthened its financial position, introduced its new catheter and broadened its technology base. Spire Biomedical, Inc.'s revenues climbed 30%, buoyed by brisk demand for biotechnological surface treatments for medical device implants. Spire Solar, Inc.'s related revenues decreased 13% in 2002 due primarily to excess capacity within the industry resulting in lower than expected investment in solar module manufacturing equipment. Spire Solar Systems revenues increased 10% at Spire Solar Chicago.

A major achievement in 2002 was Spire sold an exclusive patent license for its hemodialysis split-tip catheter to Bard Access Systems, Inc. ("Bard"), in exchange for \$5 million upon execution of the agreement with an additional payment of \$5 million to be paid no later than 18 months after signing, and another \$6 million from Bard upon achievement of certain milestones by Bard. The initial \$5 million payment, booked in the fourth quarter of 2002, augments our working capital and will accelerate its sales and marketing efforts. Future payments will help Spire Biomedical pursue its strategy of developing advanced medical devices embodying innovative surface treatments that enhance therapy. In addition, the Company received a sublicense that permits the Company to continue to

manufacture and market hemodialysis catheters for the treatment of chronic kidney disease.

For the year ended December 31, 2002, total revenues for the year ended December 31, 2002 were \$14,822,000, a 5% increase from \$14,152,000 for 2001. Revenue gains were largely the result of strong demand for Spire Biomedical's ion beam-based processing services, growth in Chicago PV systems business, and an expansion in biomedical contract research activity. Net income for 2002, including the gain on the sale of a patent license, was \$2,237,000 or \$0.33 per share, compared with a loss of \$2,163,000 or \$0.32 per share for 2001. At December 31, 2002, cash and cash equivalents totaled \$7,799,000, compared with \$5,583,000 at December 31, 2001 and the Company had no outstanding debt. The Spire Solar business accounted for \$8.2 million in sales and the Spire Biomedical business was \$6.6 million.

Spire Solar, Inc.

In 2002, Spire Solar Chicago ("SSC"), began module production at its new facility in the Chicago Center for Green Technology, after operating for two years in temporary space. In its third year of engaging in integrated photovoltaic ("PV") systems business, SSC operated profitably while delivering more than 400 kilowatts of electric generating capacity valued at approximately \$4 million. We entered into purchase agreements in 1999 with both the City of Chicago and Commonwealth Edison to



provide solar electric systems. These agreement were extended to December 15, 2003 and December 31, 2004, respectively.

Spire also entered into a business agreement with BP Solar in which BP Solar supplies solar cells and invested in the module capital equipment for the Chicago business.

SSC continues to be our model for replicating vertically integrated PV facilities in other urban centers through partnerships with local utilities and municipalities. Although progress has been slower than expected, SSC is optimistic that its "Solar Brightfield" strategy for placing mega-watt sized solar generating facilities on industrial brownfields will gain increasing support as the economy improves.

The Spire Solar Equipment ("SSE") business had a challenging year in the face of weaker foreign demand. Despite growth in solar electric applications, the buildup of excess module manufacturing capacity worldwide curbed new orders for its assembly, testing and framing equipment. As SSE's domestic PV systems business expands, its core manufacturing expertise will increasingly become an enabling technology for creating local, PV system facilities.

As a result, SSE expects to be less affected by adverse swings in the global PV equipment market. To further strengthen our distributed energy operations, Spire incorporated Spire Solar, Inc. in December 2002. Spire Solar, Inc. has been formed to pursue its own Business objectives, which may include the possibility of seeking outside investment.

Spire Biomedical, Inc.

Spire Biomedical turned in a banner year in 2002, reflecting steady growth in its primary ion implantation processing services and new product launches. Besides continuing to serve a loyal base of hip and knee joint implant makers, Spire Biomedical introduced two new vascular catheters and a related insertion kit aimed at improving therapy for chronic kidney disease patients. Marketing of the catheters through a national system of independent distributors gained momentum towards the end of 2002 and initial results have been encouraging.

The Pourchez XpressO™ catheter represents a significant milestone in the evolution of our biomaterials business into the medical products arena. For over 15 years, Spire Biomedical has provided surface treatment services to makers of orthopedic joint implants, catheters, guide wires, stents and other medical devices. Although this has been and will continue to be a steady business for Spire

Biomedical, its objective is to leverage its core surface engineering technology to capture the higher margins associated with finished medical components and devices. Spire Biomedical has a successful history of seeking government contract funding to pursue research and development ("R&D") initiatives in support of product development strategy. The R&D programs, federally funded through such entities as the National Institutes of Health and National Science Foundation, took on fresh importance in 2002. Spire formed a life sciences research team to refocus our long-standing optoelectronics expertise on biophotonic applications, an emerging market opportunity. Spire believes that next generation biophotonics instruments, adapted to emerging markets, such as bioterrorism and genomics, possess strong commercial potential. At year end, Spire was performing on 18 contracts and grant programs, up from 15 a year earlier, in such areas as improved surface coatings for implantable medical devices, laser-based surgery and nanocomposites.

In 2002, Spire strengthened its Board of Directors with the addition of Michael J. Magliochetti, Ph.D., an executive with extensive experience in the medical technology industry. Mr. Magliochetti's direct involvement in diagnostic device markets is closely aligned with Spire's entry into the catheter business and with increasing R&D efforts in biophotonics-based diagnostic and monitoring equipment.



Going Forward

Spire is confident that its target markets offer substantial long-term growth opportunities. With fossil fuel prices climbing, the demand for emission-free, reliable and secure alternative energy sources will continue to expand. An aging population, coupled with increasingly active lifestyles, requires implantable medical devices that resist wear and infection. Spire expects that its R&D programs will be an increasingly important contributor to growth and profits. The Company has a solid technological foundation on which to build, a loyal customer base and a dedication to quality and customer service.

Our major objectives for 2003 are to gain acceptance of our new catheter products in the hospital market, broaden the customer base of our solar electric systems business and raise operating margins and develop a sustainable life science business based on our biophotonics technology. The management team recognizes the importance of improving profitability as a means to enhance shareholder value. We will work diligently in the year ahead to earn your support and confidence.

Chairman of the Board, Chief Executive Officer
and President

Spire Solar Equipment

Spire Solar, Inc. ("Spire Solar") is a leading supplier of PV module manufacturing equipment and turnkey production lines worldwide. During almost three decades in the solar electric energy industry, Spire Solar has acquired substantial intellectual property, expertise and experience in advanced PV module manufacturing and process technology. Spire Solar's equipment is in use in more than 140 facilities in 42 countries, helping to lower the costs of making solar modules from cells. In the United States, Spire Solar Chicago uses its own advanced PV assembly equipment as an enabling technology to fabricate its own solar modules and PV systems.

Multiple industry sources indicate that the global PV industry has been growing at a compound annual rate of better than 25% over the past decade and the outlook for the future is bright. Although capital costs for solar electric generation are higher than for conventional power, PV offers inherent advantages including zero-emissions energy, peak demand generation, distributed power generation, and security from supply disruptions. The cost of electricity from solar cells has declined four fold since 1980, and in the United States today, thousands of homes and businesses use PV electricity.

In 2002, Spire Solar sold PV equipment to customers in Cyprus, Portugal, Italy, India, Korea, Japan, China and

Switzerland, as well as to a number of domestic module factories. More than 80% of Spire Solar's equipment sales represent exports. In addition to its PV manufacturing technology, Spire Solar has the training and know-how necessary to establish a successful manufacturing operation. Last year, Spire Solar's Bedford-based equipment operation received ISO 9001:2000 certification, an independent mark of quality assurance. This designation signifies its commitment to product improvement and customer satisfaction.

Sales of PV manufacturing equipment during 2002 did not meet expectations, largely due to a high level of competition and industry-wide consolidation. While equipment orders have historically been subject to cyclical swings, Spire Solar continues to foresee positive trend line growth in demand for its products. To sharpen its competitive edge, Spire Solar has recently reengineered its products around a reference design concept so that it can address specific customer needs in a more cost effective manner. In addition, under a Department of Energy contract, the Company is developing the next generation machinery for making large-scale modules that the Company believes will bring greater economies of scale to the PV industry.

Spire Solar expects geopolitical concerns relating to energy self-sufficiency, coupled with growing public pressure for a



cleaner environment, to continue to drive solar energy usage in the United States and other developed nations. In developing nations, the lack of a wired infrastructure makes the modular, reliable and low maintenance nature of photovoltaics an attractive technology for remote power needs.

Spire Solar is committed to supplying the world PV market with highly reliable, state-of-the-art, competitively priced module manufacturing equipment. With products based on cost-efficient engineering and manufacturing practices, the Company expects to gain market share and enhance the future profitability of its solar equipment business.



Spire Solar, Systems

The Spire Solar Systems business unit is focused on providing distributed power generation through photovoltaic technology. The business unit's principal operating entity is Spire Solar Chicago, a full-service solar electric energy entity providing grid-connected PV systems in the Chicago region. SSC was established in 1999 with assistance from the City of Chicago, the local utility ComEd and the State of Illinois. SSC's mission is to provide the Chicago area with a reliable source of clean, renewable energy and skilled jobs, as well as to increase public awareness of the benefits of so-called green power. The City of Chicago's program to promote the use of solar energy, backed by state financial incentives, is one of the most ambitious programs of the type in the United States.

In 2002, SSC evolved beyond the start-up phase by initiating production of solar modules at a new factory located at the Chicago Center for Green Technology, a showcase for environmentally friendly technologies. SSC assembles and manufactures solar modules and integrates them into PV systems. As a single stop, turnkey supplier, SSC assists customers with system design and post-sales service and support, including acquisition of grants and grid connections. With an annual production capacity of three megawatts, the factory is large enough to operate profitably, yet small enough to undertake custom designs of PV modules for a variety of applications.

To date, SSC has delivered solar electric systems on more

than 30 sites in Chicago, including seven of the City's major museums and eight public schools. Each of these systems has a peak generating capacity of more than 700 kWDC and is valued at approximately \$8 million. Multi-year purchase agreements with ComEd and the City of Chicago were extended in 2002. ComEd was extended to December 31, 2004 and the City of Chicago was extended to December 15, 2003, allowing for the continued purchase of locally produced solar energy systems subsidized up to 60% (maximum of \$300,000 per purchaser). Subsidies from the Illinois Department of Commerce and Community Affairs and the Clean Energy Community Foundation's renewable energy grants facilitate the purchase of SSC's solar electric systems. SSC has been increasingly able to spread customer project costs over multiple client sources and this practice appears to be gaining market acceptance.

While most of SSC's customers to date have been municipal and non-profit organizations, SSC has begun to expand more aggressively into commercial and industrial markets. In late 2002, the Company signed contracts to deliver PV systems at two Chicago area multi-family housing projects, Lakefront SRO Holland Apartments and the Children's Place at Vision House Apartments, and at a development of twelve new single-family homes in the Chicago area. One of SSC's most promising new markets involves the construction of integrated photovoltaics systems, which reflect aesthetic as well as utilitarian values. As a module producer, SSC offers architects and builders customized



Designs in a range of colors, cell configurations and backsheets.

Using Chicago as a model, the Spire Solar Systems business unit plans to use its core PV manufacturing and systems integration experience to develop turnkey PV systems facilities in other cities and to provide solutions to distributed energy generation requirements. Spire Solar Systems business unit intends to partner with municipalities and local utilities to supply emissions-free electricity close to the point of use. The business unit believes that its green energy projects will help utilities meet peak generation demand, relieve strains on the grid infrastructure and comply with "renewable portfolio standards" enacted by a growing number of states, which may include Illinois. Helping to convert brownfields into solar Brightfields through the use of large-scale solar arrays is a critical part of our strategy to assure longer-term profitability.

Although current United States economic conditions have temporarily hindered its progress, the Spire Solar Systems business unit believes that rising public concern about dependence on oil imports, volatility of natural gas prices, as well as environmental drawbacks of other conventional power sources will accelerate public policy actions in support of solar generation which will in turn lead to an increase in demand for solar generation.

Spire Biomedical, Inc.

Spire Biomedical, Inc. specializes in surface engineering to improve the performance of implantable medical devices such as orthopedic implants, stents, catheters and vascular grafts. Spire Biomedical's proprietary ion beam-based processes reduce friction and wear, impart anti-microbial properties, and enhance tissue and blood compatibility. Spire Biomedical's treatments can be applied to metals, polymers and ceramics, modifying their surface properties while leaving the core materials unchanged. Its patented IonGuard® ion implantation process for hip and knee implants continued to make up the largest part of its processing activity in 2002. Spire Biomedical's family of surface treatment processes includes coatings suited for promoting bone/implant bonding (IonTite™ Hydroxyapatite) and coatings designed to improve radiopacity of temporary and permanent implants (IonSight™).

Spire Biomedical's core surface treatment business is expanding due to favorable demographics, principally the aging of the baby boomer generation, as well as elders' increasingly active lifestyles. Increased longevity coupled with an increasing number of bone and joint replacements will continue to drive demand for more durable orthopedic implants. As the leader in surface engineering, Spire Biomedical is well positioned to benefit from growth in these medical markets in 2003 and beyond.

In 1999, Spire Biomedical embarked on a new strategic direction aimed at developing advanced medical devices that would embody the Company's unique surface treatments. This strategy was successfully initiated in 2002 when Spire Biomedical obtained Food and Drug Administration (FDA) clearance to market the Pourchez Xpresso™ line of split-tip hemodialysis catheters. It is a product based on a patent license that the Company obtained from a prominent French surgeon. This line of catheters represents the first major step towards fulfillment of Spire Biomedical's strategic plan to become a provider of treated medical devices that reduce device-related complications such as clotting and infection. In October 2002, the Company sold to Bard Access Systems its rights to the split-tip catheter patent in exchange for \$5 million upon the execution of the agreement, with another \$5 million due no later than 18 months after signing, and another \$6 million upon achievement of certain milestones by Bard Access Systems. The sale, which included a sublicense to permit the Company to market split-tip hemodialysis catheter products, provides additional capital to reinvest in expanding Spire Biomedical's sales and marketing efforts.

The Pourchez catheter is a premium product designed to enhance therapy for dialysis patients. It is targeted at a United States catheter dialysis market that the Company believes to be growing at more than 10% annually, but has seen little product innovation in recent years.



The split-tip catheter has a kink-resistant design and provides higher blood flows at lower pressures than are available from conventional catheters. To meet the needs of the catheter market, the Company also launched the Pourchez RetrO™ catheter in 2002, which utilizes a novel process known as retrograde tunneling. Also introduced in 2002 was the SafeTrac™ dual wire insertion kit, offering an alternative and potentially safer method of insertion. A national network of medical product distributors has begun marketing the Company's catheters.

Spire Biomedical is pleased with physicians' acceptance of its catheters. Although the Company's initial focus is the United States market, international markets offer promising opportunities for its catheters. To prepare for market entry in Europe in 2003, the Company obtained the European Union's CE mark certification. Crossing this regulatory hurdle required the demonstration of high quality systems and standards. Going forward, Spire Biomedical expects to add other vascular access products with clinically desirable features and to use its experience in surface engineering to further enhance the performance of such products.

Product Enhancing Research & Development

For more than three decades, the Company has developed a strong intellectual property estate in biotechnology surface engineering, optoelectronics and photovoltaics. Because the Company is a technology-driven company, its R&D programs have been critical to the development of state-of-the-art solar electric module manufacturing equipment, as well as proprietary surface treatments for medical implants. Assuring its continued leadership in both these businesses requires a sustained R&D effort. The Company believes that a strong commitment to R&D is vital to enhancing our existing products, creating new revenue sources for the future and maintaining our technological edge.

The National Renewable Energy Laboratories awarded the Company with a \$4.7 million cost shared contract to build automated high-volume production equipment that can assemble solar modules more than five times the size of today's standard size modules. The equipment and technology that the Company plans to develop under this program will enable the building of super-sized modules, each generating as much as one kilowatt. The Company believes these new modules can

be used to cover contaminated land sites with large utility-connected arrays to generate clean energy. Its objective is to show that transforming industrial brownfields into Solar Brightfields™ can be economically feasible. The Company sees a big potential market for "Solar Breeder" factories, a term used for PV module assembly factories that will continuously produce these specialized modules for deployment in Solar Brightfields.



In the Spire Biomedical area, the Company's scientists and engineers are developing innovative materials and coatings that leverage the Company's core competence in surface engineering. Despite numerous improvements in implant design over the past decade, wear continues to be the major factor that limits the lifetime of the components, reducing their utility for younger and more active patients. The Company is currently developing new hard coatings to reduce wear and improve longevity of these implants, as well as developing bone-friendly coatings for their fixation. The Company also received a grant from the National Institutes of Health to develop advanced solid lubricant coatings for bearing components used in the x-ray tubes of CT scanners. Bearing failure is currently a key problem with CT scanners, and as x-ray energies increase to provide more accurate imaging, even higher performance bearings will be required. Better vacuum-compatible lubricant coatings for the bearing components of these systems are critical to achieving desired improvements. In the medical products area, the Company is developing surface treatments to further differentiate its dialysis catheters from the catheters of competitors. These treatments will help reduce access-related problems such as clotting and infection.

Research & Development

Optoelectronics, like photovoltaics, involves the conversion of light into electricity, or electricity into light, using semiconductor materials. When the Company sold its compound semiconductor processing business at the end of 1999, it retained the rights to apply its optoelectronics capabilities to the Company's biomedical business. As part of its strategy to develop new types of medical instruments and components, the Company has redirected its optoelectronics expertise toward Biophotonics: the science of using lasers, light and radiant energy for surgery or non-invasive detection and diagnosis of diseases as well as patient health monitoring. Applications of biophotonics range from using light for selectively treating tumors and sequencing DNA to removing birthmarks.

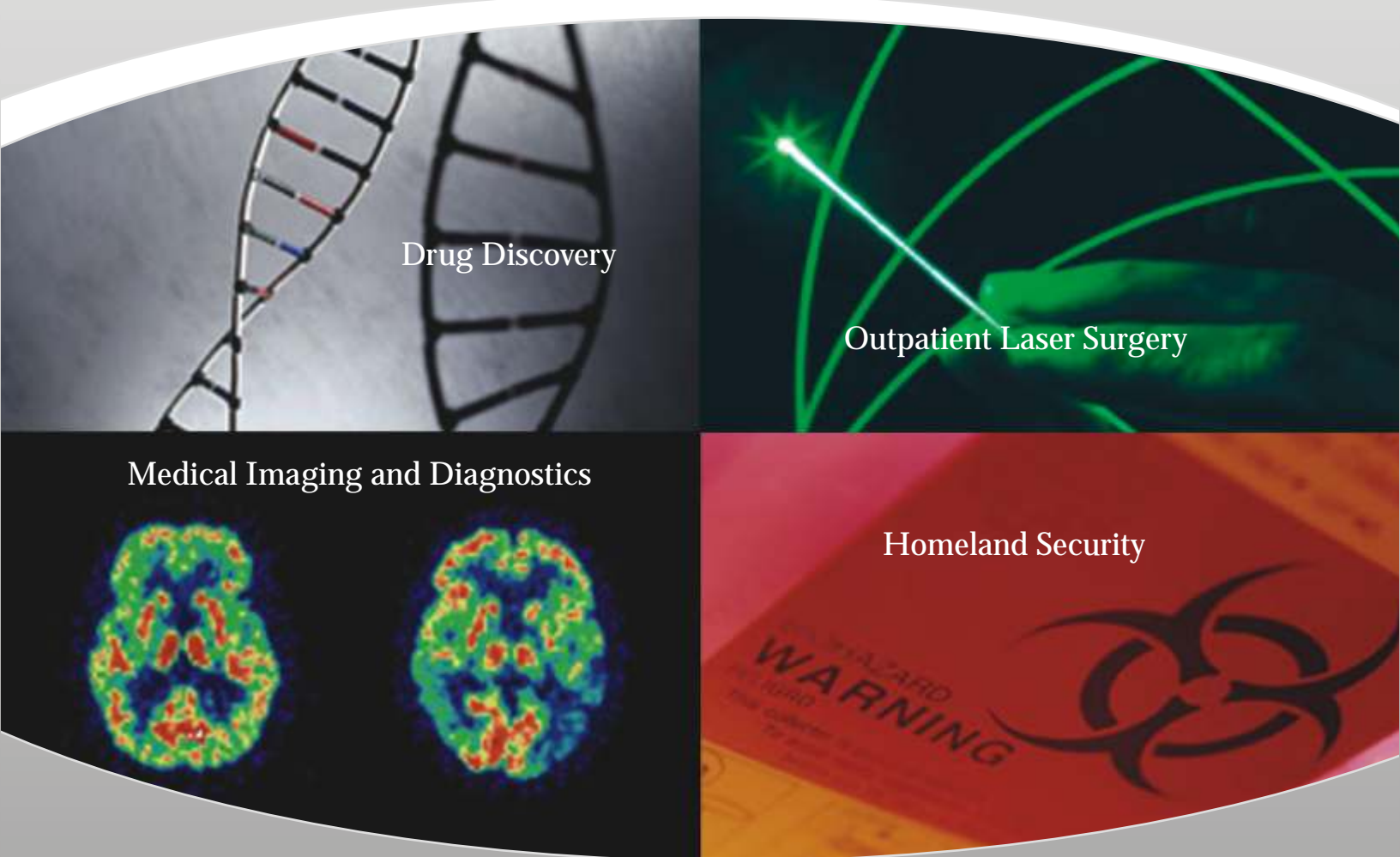
Semiconductor-based lasers have become virtually indispensable in a number of surgical specialties from angioplasty to oncology. The development of new medical laser technologies offers exciting opportunities for further improving the practice of medicine.

One of the Company's chief areas of focus is the development of next-generation, laser-based surgical instruments and optical health monitoring devices. In 2002, the Company concluded the first phase of a National Institutes of Health project to develop an improved

cerebral imaging tool for neo-natal care. The Company also received a National Institutes of Health research grant for the design, fabrication and demonstration of a small fiber laser for use in middle ear surgery for children. Other R&D initiatives relate to developing instruments that characterize DNA and detect biological agents. With the rapid expansion of government research funding to fight bioterrorism, the Company expects to participate in programs to detect biological agents.

The efficacy of the Company's R&D programs is strengthened by strategic alliances and working partnerships with large medical instrument companies and university research laboratories whose capabilities complement our own.

Apart from its catheter development program, substantially all of the Company's R&D outlays have been funded by government grants and contract awards. In 2002, revenues from R&D contracts totaled approximately \$2.4 million and were funded by such agencies as the National Institutes of Health, the National Science Foundation, the Department of Energy and the Department of Defense. The Company plans to continue to aggressively pursue these grants in its chosen fields of expertise.



Drug Discovery

Outpatient Laser Surgery

Medical Imaging and Diagnostics

Homeland Security

Corporate Data

Board of Directors:

Udo Henseler, Ph.D., CPA	Principal owner and manager MSI Management Services International Davie, FL
David R. Lipinski	Independent consultant in corporate finance and strategic business development Lake Forest, IL
Roger G. Little	Chairman of the Board, CEO & President Spire Corporation, Bedford, MA
Michael J. Magliochetti, Ph.D.	President, CEO & Director Hema Metrics, Lowell, MA
Guy L. Mayer	Chairman & CEO VisEn Medical Inc., Woburn, MA
Roger W. Redmond, CPA	Senior Vice President Windsor Financial Group, LLC Minneapolis, MN
John A. Tarello	Senior Vice President, Treasurer and & CFO (Retired) and Director Analogic Corporation, Peabody, MA
Anthony G. Viscogliosi	Chairman of the Board, President & CEO Spine Solutions, Inc., New York, NY

Investor Relations:

For further information about the Company or additional copies of this report, Form 10-KSB or other information, visit the investor relations section of the Company's web site at www.spirecorp.com or contact: Spire Corporation, One Patriots Park, Bedford, Massachusetts 01730-2396.

Executive Officers:

Stephen J. Hogan	Executive Vice President & General Manager Spire Solar, Inc.
Rodger W. LaFavre	Chief Operating Officer Spire Solar, Inc.
Mark C. Little	Chief Executive Officer Spire Biomedical, Inc.
Roger G. Little	Chairman of the Board, CEO & President
Gregory G. Towle	Financial Controller, Treasurer and Principal Financial and Accounting Officer

Independent Accountants:

KPMG LLP, Boston, MA

Legal Counsel:

Greenberg Traurig, LLP, Boston, MA

Transfer Agent and Registrar:

American Stock Transfer and Trust Company, New York, NY

Common Stock Market Data:

The Company's common stock is traded on The Nasdaq Stock Market under the symbol SPIR. On February 28, 2003, the common stock was held by approximately 220 persons or entities of record, including significant amounts of stock held in "street name". The Company did not pay any cash dividends during 2002.

Annual Meeting Information:

The Annual Meeting of Stockholders is scheduled to be held on Thursday, May 22, 2003, 10:00 a.m. at Spire Corporation, One Patriots Park, Bedford, Massachusetts.

Selected Financial Data

Year ended December 31	2002	2001	2000	1999	1998
	(in thousands except per share amounts)				
Consolidated Statements of Operations:					
Net sales and revenues	\$ 14,822	\$ 14,152	\$ 12,885	\$ 11,901	\$ 14,143
Gain on sale of a license	4,465	—	—	—	—
Earnings (loss) before income taxes	2,569	(2,176)	(1,398)	6,437	(3,453)
Income tax expense (benefit)	332	(13)	(598)	1,070	359
Net earnings (loss)	2,237	(2,163)	(800)	5,367	(3,811)
Earnings (loss) per share of common stock - basic	\$ 0.33	\$ (0.32)	\$ (0.12)	\$ 0.83	\$ (0.59)
Earnings (loss) per share of common stock - diluted	0.33	(0.32)	(0.12)	0.82	(0.59)
Weighted average number of common and common equivalent shares outstanding - basic	6,756	6,691	6,629	6,492	6,471
Weighted average number of common and common equivalent shares outstanding - diluted	6,848	6,691	6,629	6,549	6,471
Consolidated Balance Sheets:					
Working capital	\$ 10,524	\$ 6,759	\$ 9,024	\$ 9,718	\$ 1,501
Cash and cash equivalents	7,799	5,583	7,463	10,709	122
Total assets	17,772	14,815	16,442	17,363	10,774
Stockholders' equity	11,775	9,269	11,331	11,853	6,420

The Company's Form 10-KSB for the year ended December 31, 2002, filed with the Securities and Exchange Commission, contains audited consolidated balance sheets of Spire Corporation and subsidiaries as of December 31, 2002 and 2001 and the related consolidated statements of operations, stockholders' equity and cash flows for each of the years in the three-year period ended December 31, 2002.



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Certain matters described in this Annual Report may be forward-looking statements 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-KSB filed with the Securities and Exchange Commission.