



# Venture Capital 101: A Resource Guide for Commercializing Environmental Technology



*August 2010*

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# **Venture Capital 101: A Resource Guide for Commercializing Environmental Technology**

*August 2010*



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# Executive Summary

For the past 65 years, venture capital has been an important source of funding for innovative, entrepreneurial companies in the United States (U.S.). Today those companies have grown to employ approximately 12 million people and generate nearly \$3 trillion in revenue. Such companies, including Intel, Genentech, Facebook, Microsoft, and FedEx, might not exist today without the funding and guidance provided during their early stages by venture capital investors. In good economic times and bad, venture capital investors continue to seek out opportunities to fund ground-breaking ideas that bring new products to market.

The purpose of this Resource Guide is to help those working in the environmental field gain a better understanding of venture capital investment and the important role it can play in commercializing promising, innovative technologies that will address our nation's environmental and economic challenges. The Guide is intended to make this information accessible to a wide audience, including EPA managers and staff; other federal, state, and local government officials; technology investors; entrepreneurs; academics and students, including those in business schools; and others.

The Guide is designed to describe venture capital in sufficient detail so readers can differentiate it from other sources of funding and understand when and how venture capitalists invest. **It is not intended, however, to be a “how to” manual about the specific steps that individuals or organizations might take to collaborate with venture capitalists. Nor is it intended to be comprehensive in the information it provides.** Rather, it should help readers engage the venture capital community as participants and stakeholders in the process of seeking innovative technological solutions to solve some of our most complex environmental problems.

Stimulating private-sector investment in new environmental technologies is among the most important initiatives EPA can undertake, particularly with the Agency's ongoing budget constraints. The global need for solutions to complicated environmental problems exceeds the fiscal capacity of any government, and the venture capital community appears ready to mobilize and complement government efforts to rapidly develop and diffuse technologies. The Agency's interest is in facilitating commercialization of environmental technologies that emerge from all public and private sources across the nation—including researchers, developers, innovators, and entrepreneurs. The interest of inventors and entrepreneurs is to obtain financial assistance to help their technologies cross the “Valley of Death” and enter the marketplace.

This Guide serves as a complement to two recent reports: the EPA National Advisory Council for Environmental Policy and Technology (NACEPT) report entitled, *EPA and the Venture Capital Community: Building Bridges to Commercialize Technology* (April 2008), and the *Report of the EPA-Venture Capital Community Summit: Exploring Programs to Commercialize Environmental Technology* (June 2009).<sup>1</sup> The NACEPT report recommended that EPA forge and sustain communications with the early-stage investment community and investigate how to strengthen financial support for environmental technology commercialization. The Summit brought together EPA senior managers and senior members of the venture capital community to discuss how the Agency and the venture capital community could implement these recommendations.

Venture capitalists have successfully financed many innovations that have advanced technological solutions, significantly impacted our economy, and improved the quality of our lives. Venture

<sup>1</sup> These two reports are available on the Web at <http://www.epa.gov/ncer/venturecapital>.

capitalists—willing to take entrepreneurial risks alongside company founders—have been responsible for much of the critical, high-risk investment in some of our country’s most promising ideas.

In the late 1990s, the concept of clean technologies (cleantech), primarily focused on clean and alternative energy sources and production, was introduced as a new venture capital investment sector. Cleantech became one of the fastest growing investment sectors. Based on the *MoneyTree* Report,<sup>2</sup> which tracks venture capital investments in the United States, cleantech investments grew 10-fold from \$0.4 billion in 2004 to \$4.1 billion in 2008. With the economic downturn, those investments fell by one-half to about \$2.0 billion in 2009. Even so, the cleantech sector continued to enjoy high investor interest, with more than 50 percent of venture capitalists predicting growth in cleantech investments in 2010.

A similar decline was observed in U.S. venture capital investments in environmental technology, which overlaps cleantech and addresses environmental issues. This investment fell from nearly \$400 million in 2008 to about \$200 million in 2009. The majority of environmental technology venture capital investments during this period was focused on chemical and solid waste recycling equipment followed by water treatment equipment and waste disposal systems.

There are several types of venture capital firms. Most are organized as limited partnerships with the venture capital firm serving as the general partner. A venture capital firm is generally an independent company that has no affiliation with any specific financial institution. Some venture capital firms, however, affiliate with a commercial bank, investment bank, or insurance company. Other firms may be subsidiaries of industrial corporations.

Congress must provide federal agencies with statutory authority to create venture capital funds and establish not-for-profit investment companies to manage them. Federally sponsored venture capital funds assist agencies in the development, deployment, commercialization, and procurement of new and emerging technologies and businesses. These funds also help federal agencies pursue leading-edge research and development efforts that may address priority federal problems.

The first federal agency to have a venture capital program was the Small Business Administration (SBA). Its Small Business Investment Company program was created in 1958 to fill the gap between the availability of venture capital and the needs of small businesses in start-up and growth situations. Since the early 1990s, a number of other federal agencies, including the Department of Agriculture, the Central Intelligence Agency, the Department of the Army, and the National Aeronautics and Space Administration, have created federal venture funds. In addition, the Department of Energy has been authorized to provide loan guarantees for commercializing innovative energy technologies.

Likewise, at least 30 states, including New Mexico, Texas, Michigan, Ohio, Oklahoma, and Iowa, have created their own state-supported venture capital funds to help jump-start local entrepreneurs’ access to capital. Some of these funds consist of a portfolio of other investment funds, while others are state-funded but privately managed.

Several state pension funds (such as those in California and New York), green funds (such as Pennsylvania’s Keystone Green Fund), and state government funds (such as the Oregon Investment Fund) started in recent years to make significant cleantech and environmental technology investments through independent venture capital firms.

Among state pension funds, the California Public Employees Retirement System (CalPERS) and the California State Teachers (CalSTRS) Funds have made the largest commitments to date. From

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<sup>2</sup> The *MoneyTree* Report is a quarterly report of venture capital investment activity in the United States prepared by PricewaterhouseCoopers and the National Venture Capital Association.

2004-2007, for example, CalPERS committed \$400 million to cleantech-related stock portfolios in the United State and overseas. It also made investments through its Environmental Technology Program Board.

Although many entrepreneurs and others seek venture capital investment, only a small percentage of them obtain it. For every 100 business plans that come to a venture capital firm for funding, usually only 10 are deemed worthy of a thorough review and only 1 ends up being funded. Venture capitalists look at a wide range of management and technical issues before investing. These issues include: the prospective company's management team, product concept, market potential, fit to the venture capital fund's objectives, value-added potential for the company, intellectual property position, competition, the capital needed to build a successful business, and projected returns and timing of those returns for the fund's investors.

Despite the investors' careful assessments and committed follow-through, however, for every company they fund, according to the National Venture Capital Association (NVCA), only 1 in 7 has gone public through an initial public stock offering and only 1 in 3 has been acquired through a buy-out or merger. Depending on the focus and strategy of a venture capital firm, it normally seeks to exit its investment in a portfolio company within 3 to 7 years.

Venture capitalists may invest in one or more stages of the development and commercialization of a technology. These stages include: seed/start-up stage (a company has a concept or product under development); early stage (a product or service is in testing or pilot production); expansion stage (a product or service is in production and commercially available); and later stage (the product or service is widely available). An early stage venture capital investment might take 5 or more years to mature, while a later stage investment may take fewer years.

Although seed and early stage venture capital investments rose in 2008 and fell in 2009, the shift by venture capitalists away from seed and early stage investments has been underway for more than a decade. This trend toward investment in expansion and later stages of development results in less investment in the more innovative—and riskier—ideas.

In releasing its investment predictions for 2010, the president of NVCA said, "Of all the predictions put forth this year, a collective lack of enthusiasm for seed and early stage investing is the most concerning.... Yet, seed and early stage companies represent a pipeline that must be supported if our country is to continue building new and innovative companies. We need the environment to improve for these early stage investors."

Angel investors have become an important source of funds for investment in seed and early stage companies. Angel investors can play a critical role in helping a company take a good idea and move it to the point where venture capital investment may be more appropriate. A 2006 survey by the Angel Capital Association (ACA) found that 80 percent or more of angel investments were made in seed/start-up and early stage companies.

There are important differences between angel investors and venture capital investors. In general, angels invest in start-up and early stage companies, while venture capitalists invest at those stages and also provide growth capital for companies whose technologies are further along in the development continuum. Angels risk their own personal capital, whereas venture capitalists largely risk other investors' resources. Angel investments typically are smaller than venture capital investments. In addition, the amount that venture capital firms want to invest often exceeds the amount needed by companies in the seed and early stages. The ACA reported that the average angel investment in 2006 was about \$240,000, while the average venture capital investment was about 10 times that amount. At that time, there were approximately 230,000 active angel investors and about 800 venture capital firms in the United States.

Total investments by angels and venture capitalists have been roughly the same—in 2009, total angel investments were \$17.6 billion and total venture capital investments were \$17.7 billion—but the number of companies in which they have invested and the geographical distribution of those companies have been significantly different. In 2009, venture capitalists invested in 2,365 companies, while angels invested in 57,255 entrepreneurial ventures.<sup>3</sup> More than two-thirds of all venture capital investments in 2009 were made in California, Massachusetts, and New York, and one-half of all states had one or no venture capital deals. In contrast, angel investments were made in all 50 states.

Many innovators and entrepreneurs seek initial funding from angel investors who may be more willing to invest in highly speculative opportunities or may have a prior relationship with the individuals involved. Unfortunately, recent economic conditions also have caused angel investors to shift their investments to later stages. For the first half of 2009, angel investments in seed and start-up stages fell nearly 20 percent to the lowest level for several years. This change in angel investment behavior is likely an indication of both a need to increase investments in existing portfolio companies and a change in the risk tolerance of angels.

In a 2006 report, the National Association of Seed and Venture Funds (NASVF) found that university research institutions are increasingly viewed as a source of new innovative technology products and services. As a class, these institutions are being challenged to find commercial uses for their assets, transfer technology to corporate investors, and license inventions to local start-ups in an effort to spur development

Some regions, in an attempt to accelerate these commercialization activities, have formed “pre-seed” venture capital funds in affiliation with universities or entrepreneur development centers. Examples of these funds include Michigan’s Technology Transfer Office Invention Development Fund at Wayne State University and the Technology Business Finance Program of the Oklahoma Center for the Advancement of Science and Technology.

NASVF found that pre-seed funds have helped entrepreneurs move from invention to prototype and demonstrate the functionality or marketability of their products. Further, they found that capitalization for these funds usually comes without a requirement for traditional return on investment, with state general funds and university foundations being the primary investment sources for these technology innovations.

There is no doubt that venture-backed companies have stimulated growth in regional economies throughout the United States. Although mature venture hubs like California’s Silicon Valley and Boston’s Route 128 corridor tend to get most of the attention, smaller hubs in Texas, New York, Colorado, Florida, and Washington are positioning themselves to become consistent drivers of their regional economies.

Although California attracted nearly \$3 billion of cleantech venture investment from 1999 to 2005, and Massachusetts about \$1 billion, those other states together were able to attract an impressive \$1.2 billion in cleantech investment during that same period. In 2009, Georgia edged out Washington for a position in the top seven states attracting cleantech venture capital investments.

With regard to environmental technology, five states—California, Pennsylvania, New York, Illinois, and Florida—accounted for more than \$308 million (78 percent) of venture capital investments in 2008. Florida surpassed California in 2009, taking the lead in U.S. environmental technology venture capital investments. These two states, along with New York, Pennsylvania, and Massachusetts, accounted for nearly \$198 million (99 percent) of the environmental technology investments that year.

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<sup>3</sup> **Note:** The Guide uses various sources that report different numbers for total investments, number of companies invested in, and number of deals; however, these numbers generally are in the same ball park.

Nonprofit public interest organizations, like the Natural Resources Defense Council (NRDC) and the Environmental Defense Fund (EDF), support venture-related activities. In 2000, NRDC assisted in the creation of Environmental Entrepreneurs (E2), a bipartisan business network with nearly 800 members representing almost \$20 billion in private equity capital. In early 2007, EDF helped negotiate the acquisition of Texas Utilities, the largest energy provider in Texas, by Texas Pacific Group and Kohlberg Kravis Roberts (KKR), which at the time was the largest (\$45 billion) private equity buyout in history.

In early 2008, EDF announced another partnership with KKR, the Green Portfolio Partnership, to develop a set of analytic tools by which companies could assess and track improvements on a series of environmental metrics. In late 2008, the analytic tools were pilot tested with three companies, generating savings of \$16.4 million and preventing more than 25,000 metric tons of greenhouse gas emissions. In 2009, five additional KKR portfolio companies joined the Green Portfolio Partnership, and in 2010, the eight companies reported combined savings of more than \$160 million in operating costs and the elimination of more than 345,000 metric tons of CO<sub>2</sub> emissions, 1.2 million tons of waste, and 8,500 tons of paper use. *Green Returns*, an innovative and flexible approach designed for the private equity industry to improve business and environmental performance, was released by EDF in early 2010.

This Guide describes a wide variety of information sources that provide data on venture capital investment and related topics. The national associations mentioned above have Websites that offer online access to information and publications as well as training and educational opportunities. State and local agencies and university-based academic centers and business schools also support training and education opportunities for entrepreneurs, technology developers, investors, and others who want to learn more about the venture capital industry. Twenty academic institutions offering such programs are described in this Guide.

This Guide is presented in seven chapters and seven appendices. The contents of these chapters and appendices are summarized below.

**Chapter I: Introduction** explains the purpose of the Guide, its intended audiences, and EPA's interest in the venture capital community.

**Chapter II: Overview of Venture Capital Funding** provides readers a history of venture capital funding since its creation in the mid-1940s, and identifies some national and regional trends in venture capital investing through 2009.

**Chapter III: Investment by Stage of Development** describes the four key stages of development in which venture capital investments are made. The leading organizations that monitor and track investments in these stages—PricewaterhouseCoopers in collaboration with the NVCA (these two organizations publish the *MoneyTree* Report using data from Thomson Reuters) and the Cleantech Group—use these key stages to report venture investments to their members and the general public. This chapter also describes the development stages in which venture investors direct the majority of their investment resources.

**Chapter IV: Sources of Investment** describes the two principal sources of private sector venture-backed company investments in the United States—angel and venture capital investors. It also includes information on Federal Government venture capital funds, institutional investors (e.g., public pension funds), and state-equity investments. In addition, this chapter covers the investment process and success rates for venture capital investments.

**Chapter V: Venture Capital Investment in Environmental and Clean Technologies** offers definitions of clean technology and environmental technology and explains how the venture capital community defines its industrial sectors and geographic regions. It also provides information on national, regional, and state investments in cleantech and environmental technologies as well as investments

by stage of development and industrial category. In addition, this chapter describes environmental due diligence, which offers the means to measure net environmental benefits derived from the commercialization of an environmentally beneficial technology.

**Chapter VI: Obtaining Information About Venture Capital** describes a wide range of information sources about venture capital investments. It offers some recent (2008-2009) data on venture capital investments by geographic area (region and state) from the *MoneyTree* Report. This chapter also describes the mission, resources, capabilities, and services of six major national venture capital associations, such as the NVCA and ACA, as well as state and local associations. In addition, it provides information on nonprofit environmental organizations associated with the venture capital community, Web-based directories of venture capital firms, and published and online resources such as newsletters, reports, and books on venture capital investing. Chapter VI also includes descriptions of federal sources of venture capital investment information.

**Chapter VII: Training and Education Opportunities** describes training and educational opportunities offered by national professional and trade associations, academic centers and university-based schools of business, and other organizations. The training and educational opportunities of 6 association programs, 20 academic centers and business schools, and 2 private organizations are presented in this chapter.

The most popular form of training and educational opportunities for venture capital investing occurs in the annual or semi-annual conferences and seminars sponsored by the national trade and professional associations, as well as their regional, state, and local affiliates. These conferences and seminars include training sessions as well as extensive networking opportunities, sometimes called investor forums or capital networks, to allow entrepreneurs, inventors, and investors to exchange ideas and perspectives. Several associations also sponsor Webcasts and Webinars on specific regional or topical issues. All of these association conferences and seminars are advertised on their relevant association Websites.

**Appendix A** provides a description of the *MoneyTree* Report, its data sources, industry categories, sectors, geographic classifications, and stages of development. **Appendix B** contains the Cleantech Group's definition of clean technology and its industrial segments. **Appendix C** lists the top 10 states for venture capital investments in 2007 and 2008 and provides membership data for states in the Investor Network on Climate Risk (INCR) and the Clean Energy States Alliance (CESA). **Appendix D** contains a list of venture capital data resources. **Appendix E** describes an environmental due diligence process used to determine the environmental benefits created by the private equity investments in clean energy-related and other technologies. **Appendix F** lists cleantech venture capital investments by state for the period 1999 to 2005, and **Appendix G** provides examples of corporate investments, including bank holding companies and financial services companies, and venture capital investments in clean technologies.

The Guide also contains a list of acronyms and abbreviations, a glossary, and an extensive bibliography. ●





# I. Introduction

This Venture Capital Guide was originally prepared to introduce Environmental Protection Agency (EPA) managers and staff to venture capital and how the venture capital community operates. Outside reviewers commented, however, that a number of other audiences also would benefit from the Guide—venture capitalists and entrepreneurs; federal, state, tribal, and local governments; business schools; and other organizations interested in commercializing environmental technology.

The Agency's interest is based on the need to increase the commercialization of environmental technology over the long term to solve environmental problems. The technologies of concern are not just those developed by EPA, but those emerging nationally from all public and private sources—including researchers, developers, innovators, entrepreneurs, small businesses, and large corporations.

At EPA's request, the National Advisory Council for Environmental Policy and Technology (NACEPT) considered what EPA could do to meet this need. The Council's report, *EPA and the Venture Capital Community: Building Bridges to Commercialize Technology* (April 2008), is available on the Web at [www.epa.gov/ncer/venturecapital](http://www.epa.gov/ncer/venturecapital).

One of that Report's recommendations was for EPA to “forge and sustain communication with the early-stage venture capital community.” In response to this recommendation, EPA held an “EPA-Venture Capital Community Summit: Exploring Programs to Commercialize Environmental Technology” in November 2008. The Summit brought together EPA senior managers and senior members of the venture capital community to discuss how the Agency and the venture capital community could implement these recommendations. The Report of the Summit, which also is available on the Web site indicated above, includes a number of ideas for EPA activities.

Venture capital is important for commercialization because it can help take a technology—whether at the research, development, or demonstration/verification phase—from being a “good idea” into the marketplace. A technology must traverse this “Valley of Death” if it is to be available to address environmental issues. For EPA, facilitating venture capital investment to accomplish this is the ultimate in leveraging its resources.

This Guide provides a “primer” about venture capital. It also identifies resources that people can draw upon to further their knowledge of venture capital and to begin interacting with the venture capital community to promote the commercialization of environmental technology. **The Guide is not, however, a “how to” manual about specific steps that individuals or organizations might take to enter into communication or cooperation with the venture capital community. Nor is it intended to be comprehensive in the information it provides.**

Solving complex environmental problems generally requires partnerships involving industry, academia, non-governmental organizations (NGOs), federal agencies, and other stakeholders. In the past, EPA usually did not include venture capitalists and other investors as stakeholders. This Guide should help EPA managers and staff to engage the venture capital community as participants in this process.

Your comments about the Guide are welcome, as are any questions you may have about EPA's venture capital activities. Please address them to Paul Shapiro at [shapiro.paul@epa.gov](mailto:shapiro.paul@epa.gov). ●





## II. Overview of Venture Capital Funding

### A. History of Venture Capital Funding: 1946–1994

Venture capital is a type of private equity capital typically provided by professional, outside investors to new, growth businesses. Generally made as cash in exchange for shares in the portfolio company, venture capital investments offer companies an opportunity for growth and market penetration that otherwise might not be available. Likewise, venture capitalists offer investors the potential for above-average returns on their investments.

A venture capital fund is a pooled investment vehicle, often a limited partnership (LP), that primarily invests the financial capital of third-party investors (the limited partners) in enterprises that are too risky for the standard capital markets or bank loans (Bartlett, 2007; NVCA, 2007a). The venture capital firm that puts together and manages the fund is usually the general partner.

Venture capital investments typically are associated with new, cash poor, and/or rapidly expanding companies. Based on their knowledge of the company and its products or the market in which companies seek to establish their products, venture capital managers often are actively involved in the management of the portfolio companies in which they invest through board membership. In return for the capital invested, venture capitalists receive equity shares and privileges, such as active participation in the company's decision-making. This is why venture capitalists often have been described as hands-on managers (Randjelovic, et al., 2002).

Venture capital investing began in the United States in the late 1940s, spread to the United Kingdom in the 1980s, and became a fledgling industry in the rest of Europe in the 1990s (Ganzi, 1998). Georges Doriot, United States (U.S.) Army General and Harvard Business School Professor, is considered to be the father of the modern venture capital industry. In 1946 in the Boston area, Doriot formed the American Research and Development Corporation (AR&DC), whose biggest success was the Digital Equipment Corporation. When Digital Equipment went public in 1968, it provided AR&DC with a 101 percent annualized return on investment. AR&DC's \$70,000 initial investment in Digital Equipment in 1957 grew in value to several hundred million dollars. It is commonly believed that the first venture capital backed start-up company was Fairchild Semiconductor, funded in 1959 by Venrock Associates. Venture capital investments in the 1950s and 1960s were primarily the sphere of influence of wealthy individuals and families (Bartlett, 2007; Pernick, 2007).

One of the first government steps toward recognizing the need for and creating a professionally managed U.S. venture capital industry was the passage of the Small Business Investment Act (SBIA) of 1958. The Act mandated that the U.S. Small Business Administration (SBA) license private "Small Business Investment Companies" (SBICs) to help finance and manage small entrepreneurial U.S. businesses. The SBIA was passed to address concerns raised in a Federal Reserve Board Report to Congress, which concluded that a major gap existed in the capital markets for long-term funding for growth-oriented small businesses. Facilitating the flow of capital through the economy to small entrepreneurs to stimulate the U.S. economy was and remains the principal goal of the SBIC program today.

Shortly after passage of the SBIA, the National Association of Small Business Investment Companies (NASBIC) was formed. NASBIC is the professional association for the SBIC industry.<sup>4</sup> NASBIC is the oldest organization of venture capitalists in the world and has played a pivotal role in promoting the growth and vitality of the industry for nearly half a century.

<sup>4</sup> See <http://www.nasbic.com>

From 1958 through 2006, SBICs have invested approximately \$46 billion in small U.S. companies, including approximately \$2.9 billion invested in nearly 2,300 small U.S. companies in 2005 alone. According to the NASBIC, SBIC-financed companies have far outperformed national averages in terms of increases in sales, profits, assets, and new employment. Some of America's most successful and well-known companies received critical early-stage financing from SBICs, including JetBlue Airways, Whole Foods Market, Staples, and Callaway Golf (NASBIC, 2007).

In its early history, the growth of the venture capital industry was limited by a wide range of issues, such as investment restrictions for publicly traded SBICs, changes in capital gains tax rates, securities laws, and Employee Retirement Income Security Act regulations.<sup>5</sup> It was not until the early 1980s, with the success of venture capital partnerships, that the industry finally realized some substantial growth. From 1980 to 1984 venture capital partnership commitments increased nearly fivefold, from \$600 million to \$2.73 billion (see Figure 1).

The increase was attributed to the earlier success of several venture capital partnerships established in the 1970s. These partnerships were, by the late 1970s, reporting annual returns in excess of 20 percent, driven by venture capital investments in Apple Computer, Intel, and Federal Express, among other firms. These high returns attracted the attention of new institutional venture capital investors, many of whom had experienced sluggish public stock returns throughout the 1970s. Commitments to venture capital partnerships also grew as investors in the original partnerships reinvested their gains when these partnerships were liquidated (Fenn, et al., 1995).

**Figure 1. Investments by Venture Capital Partnerships, 1980–1994**

Year	Total Amount Invested (\$ in billions)	Number of Companies Invested In	Average Investment per Company (\$ in millions)
1980	0.61	504	1.21
1981	1.16	797	1.46
1982	1.45	918	1.58
1983	2.58	1,320	1.95
1984	2.73	1,410	1.96
1985	2.67	1,388	1.92
1986	3.22	1,512	2.13
1987	3.97	1,740	2.26
1988	3.85	1,530	2.52
1989	3.38	1,465	2.31
1990	2.30	1,176	1.96
1991	1.36	792	1.72
1992	2.54	1,093	2.33
1993	3.07	969	3.13
1994	2.74	1,011	2.71

Source: Fenn, et al., 1995

Following the 1980-1984 surge, commitments to venture capital partnerships leveled off and fluctuated from \$2 to \$3 billion over the next 5 years. Commitments fell during the 1990-1991 recession, reflecting not only the reduced demand for venture capital but also the financial problems experienced by a number of large institutional investors, notably banks and insurance companies. Commitments rebounded during 1992-1994 and continued to grow in the years thereafter. Venture capital partnerships increased steadily in size (millions of dollars invested) during the 1980s, and by the early 1990s, the average partnership size was nearly twice that of a decade earlier.

Market analysts have believed that, as the size of partnerships increases, expanding the average size of investments is more efficient than increasing the number of investments, and that later-stage

<sup>5</sup> There is limited information about the venture capital market in the nearly three decades between the late 1940s and the mid to late 1970s. During this period, the venture capital market was relatively small compared to other private equity investments and sensitive to numerous economic factors.

investments require less work for the general partners than investments in start-up firms and early-stage new ventures. This buttressed the perception that the increase in the average venture capital fund was accompanied by a shift toward larger and later stage investments (Fenn, et al., 1995). As a result, the availability of very early first seed investment (\$500,000 - \$1.5 million) money for start-ups from the venture community became almost nonexistent; entrepreneurs were forced to seek these early investments from angel investors or community-based economic development funds.

## B. National Trends in Venture Capital Funding: 1995–2009

Venture capital investments changed significantly during the period 1995 to 2009: from 1995 to 2000, there was a significant expansion of investment, followed by major contraction from 2001 to 2003, steady growth from 2004 to 2007, a small drop in 2008, and a substantial decline in investment in 2009<sup>6</sup> (see Figure 2).

In 1995, venture capital investments totaled \$7.35 billion in 1,536 companies; in 2000, about \$100 billion were invested in 6,379 companies. This represented a more than 13-fold increase in investment in 5 years. Venture capital investments peaked in 2000, the year that is considered the apex of the “dot-com” bubble. These investments declined nearly as fast as they rose. By 2003, investments slid to \$19.09 billion with 2,482 companies receiving investments. More than an 80 percent drop in investment dollars and a greater than 60 percent drop in companies invested in occurred. These dramatic changes in venture capital investments illustrated the rapid return within the venture capital industry to more realistic company valuations.

**Figure 2. U.S. Venture Capital Investments, 1995–2009**

Year	Total Venture Capital Investments (\$ in billions)	Number of Companies Receiving Investments
1995	\$7.35	1,536
1996	\$10.58	2,076
1997	\$14.10	2,543
1998	\$19.71	2,986
1999	\$51.42	4,429
2000	\$100.50	6,379
2001	\$38.57	3,822
2002	\$21.01	2,675
2003	\$19.09	2,482
2004	\$21.92	2,652
2005	\$22.87	2,735
2006	\$26.31	3,117
2007	\$30.47	3,336
2008	\$27.95	3,307
2009	\$17.69	2,372

Source: NVCA, 2010a

From 1995 to 2000, the average investment per company more than tripled (from \$4.8 million to \$15.8 million). From 1999 to 2000, the total venture capital investments nearly doubled (from \$51.4 billion to \$100.5 billion) without a proportional increase in the number of companies in which the funds were invested (from 4,429 to 6,379 companies). This dramatic jump in invest-

<sup>6</sup> The majority of publicly available venture capital investment data is provided by the *MoneyTree* Report (<http://www.pwcmon-eytree.com>), which is supported by PricewaterhouseCoopers and the National Venture Capital Association based on data from ThomsonReuters (see Appendix A). Investment data generally are listed by the number of investment “deals” and the sum of equity resources (dollars in millions or billions) provided in these deals. In some cases, investment data are provided by the number of companies in which investments are made; however, there is not a one-for-one relationship between a deal and portfolio company investment. Deals are checks written by venture capital investors. Often an investment round consists of a single check to a portfolio company; so a round equals a deal. Sometimes a round consists of multiple deals, however, because partial payments (known as “tranches”) are made as previously agreed upon milestones are met.

ments represented an unprecedented rise in valuation of the companies and the creation of an over-inflated venture capital bubble. This was called the “dot-com” bubble because a majority of the investments at this time were by San Francisco Bay Area venture capitalists in Silicon Valley California Internet-based companies. It should be noted that the “dot-com” bubble affected investment in the information technology (IT) industry much more than it did the life science industry, which tends to be less volatile.

The stock market plunge and technology slump that started in March 2000, shook many venture capital firms with significant losses from overvalued and non-performing companies. By 2003, many firms were forced to write off companies they had funded just a few years earlier. Many venture capital funds found that the market value of their venture-backed companies was less than their invested value.

From 2004 through 2007, total venture capital investments grew steadily. Although there was only a small growth in new investments in 2004 and 2005, the market picked up in 2006 and 2007. In 2008, despite a slow economy, U.S. venture capitalists invested nearly \$28.0 billion in more than 3,300 companies, the second largest number of company investments since 2000 (NVCA, 2010a). The 2008 \$8.4 million average investment per company represents a continuing movement toward larger, later stage investments.

In 2009, reflecting the downturn in the financial markets, venture capitalists invested \$17.7 billion in 2,393 companies, marking the lowest level of dollar investment since 1997. The 2009 \$7.4 million investment level per company also was the lowest since 1998. Venture investments in 2009 represented a 37 percent decrease in dollars and a 28 percent decrease in the number of companies receiving investments from 2008. It was the second consecutive year of annual company investment and dollar declines.<sup>7</sup>

The 2009 double digit declines in venture capital investments were spread across almost every industry including Clean Technology, Life Sciences, and Software. Investment dollars also fell across every stage of development category, with the exception of a small (i.e., 2%) increase in seed stage investments.

The United States maintains the oldest and most dominant position worldwide in venture capital. The U.S. venture capital industry has played a key role in nourishing the domestic economy. Many of the companies backed by venture capital in the 1970s and 1980s continue to be known for their innovative business models and have grown substantially.

In its 2009 report, *Venture Impact*, the National Venture Capital Association (NVCA), the leading trade association for U.S. venture capital firms, found that the total revenue of venture capital backed companies represented nearly 21 percent of the Gross Domestic Product and employment by venture capital backed companies represented more than 11 percent of total U.S. private sector employment (NVCA and Global Insight, 2009). Beyond electronic hardware and software companies such as Intel, Apple, Microsoft, and Cisco, there are many other well-known consumer product companies that have started as venture capital backed companies, including FedEx, Home Depot, Starbucks, Whole Foods, Staples, and PetSmart (see [Figure 3](#)).

In late 2009, NVCA surveyed its members about the potential for venture capital investment in 2010. According to *Venture View: 2010*, the annual predictions survey conducted by the NVCA, venture capitalists were cautiously optimistic about the improving nature of their business in 2010. More than 70 percent of NVCA members participated in the survey. Most respondents predicted more venture dollars going into more portfolio companies in 2010. Sixty-three percent of all respondents expected venture investments to remain the same or increase from 2009 (i.e., \$17.7 billion), with 44 percent

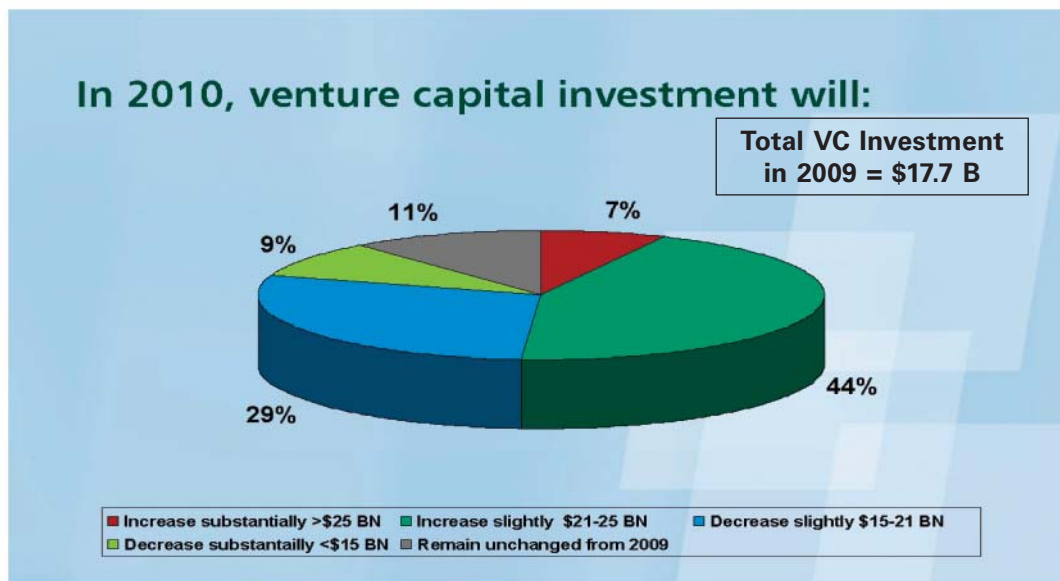
<sup>7</sup> Based on the cyclical nature of venture capital investment history, venture capital funds started in a bad economic environment usually outperform those started in good economic times; this is simply a matter of “buy low and sell high.”

**Figure 3. Examples of Venture Capital-Backed Companies**



forecasting a level between \$21 and \$25 billion. Slightly more than one-half (51%) of the respondents predicted that more companies would receive venture financing in 2010, while nearly one-third (29%) believed the number of portfolio companies would remain the same (see Figure 4).

**Figure 4. Predicted 2010 U.S. Venture Capital Investment**



Source: NVCA, 2009a

### C. Regional Investments in Venture Capital Funding

California and Massachusetts lead the nation in access to venture capital. Computer software, biotechnology, and telecommunications are some of the leading venture capital industries in these states (NVCA, 2009c; NASVF, 2006; Shachmurove, 2007).

In its 2009 Yearbook, the NVCA reported that five states—California, Massachusetts, New York, Texas, and Washington—received 73 percent (\$12.9 billion) of the total U.S. capital investment in 2009 (\$17.7 billion). California and Massachusetts alone received 61 percent (\$10.9 billion) of the

total U.S. capital investment in 2009. More information about venture capital investments by state is presented in Chapter VI.

A recent study (Shachmurove, 2007) found statistically significant correlations between regions and industries for venture capital investments. It further found that the Northern California area (Silicon Valley and the San Francisco Bay area) was the national leader in venture capital investments. The New England region, specifically the Boston area, had the second highest venture capital investments, followed by the Southeast (Georgia, North Carolina, etc.), the Midwest (Missouri, Michigan, etc.), and the Metropolitan New York City region.

The study reported that geographic regions, like California, that had a large share of total venture capital investments in 1995 maintained their share through 2005. Beyond the precedent that “venture capital money has followed venture capital money” across geographic regions, the study also found that specific venture capital industry categories, like Biotechnology and Software, have enjoyed a higher portion of venture capital investments.

Although Biotechnology investing declined in 2009 by 19 percent in both dollars and deals, the NVCA reported that it was the single largest investment sector of the year in term of dollars, with \$3.5 billion going into 406 deals. In 2009, the Software Sector remained the largest single industry category in terms of deal volume (i.e., 619) and the second largest behind Biotechnology in terms of dollars (i.e., \$3.1 billion). Even though Software investing was high in 2009, this sector received a 40 percent decline in dollars and a 35 percent decline in deals from 2008, when \$5.1 billion went into 948 deals.

See Chapter V for information on investment in clean technology and environmental technology ●





### III. Investment by Stage of Development

#### A. Introduction

There is a lack of agreement about the specific number of stages at which venture capital is invested and the terms used for these various stages. Generally, there are four key stages of development at which investments are made: Seed/Start-Up, Early, Expansion, and Later. The leading organizations that monitor and track investments in these stages—PricewaterhouseCoopers in collaboration with NVCA (these two organizations publish the *MoneyTree* Report using data from Thomson Reuters) and the Cleantech Group—use these key stages to report venture investments to their members and the general public (see Chapter V for the definition and a discussion of “cleantech”). The Cleantech Group combines the two later stages—expansion and later—into a single follow-on or expansion stage. The *MoneyTree* Report is a quarterly study of venture capital investment activity in the United States. It claims to be the only industry-endorsed research of its kind and is widely cited. Because of its wide acceptance among the venture capital community and other investors, the four *MoneyTree* stages are used in this Guide. See Chapter VI, Section A, for a discussion of some *MoneyTree* data.

More detailed information about the differences between how the *MoneyTree* Report and the Cleantech Group report their venture capital investment data is provided in Chapter V of this Guide. Also, **Appendix A** contains information on *MoneyTree* Report terminology and **Appendix B** provides information on the Cleantech Group’s definition of clean technology and its industrial segments.

Data regarding venture capital investments by stage of development are publicly available on the *MoneyTree* Website (<http://www.pwcmoneytree.com>); definitions of *MoneyTree* Report terms also are available on the Website. The *MoneyTree* Report contains quarterly investment data from 1995 to the present. Current quarterly investment data generally are posted within 1 to 2 months after the end of the most recent quarter.

**Figure 5** presents venture capital investments by stage of development for 2008 and 2009 as reported by *MoneyTree*. The high percentage of venture capital investments in the combined expansion and later stages of development (75% for 2008 and 64% for 2009) is consistent with the trends for venture capital investments across these stages for the past 15 years. During this period, venture capitalists tended to be more interested in investing in later rather than seed or early stages of a portfolio company’s technology development to reduce the exit time for their investments.

**Figure 5. U.S. Venture Capital Investments by Stage of Development, 2008–2009**

Stage	2008		2009	
	Investment (\$ in Millions)	Number of Deals	Investment (\$ in Millions)	Number of Deals
Start-Up/Seed	\$1,625.2	494	\$1,596.3	309
Early Stage	\$5,326.6	1,069	\$4,671.8	889
Expansion	\$10,370.2	1,224	\$5,510.5	804
Later Stage	\$10,624.8	1,197	\$5,912.1	800
Total	\$27,946.8	3,984	\$17,690.7	2,802

Source: NVCA, 2010c

Sometimes, later stage investments are called “mezzanine” or “bridge” financing because the companies are expected to “go public” (i.e., issue an Initial Public Offering [IPO] of Common Stock) within 6 to 12 months. Often, bridge financing is structured so that it can be repaid from the proceeds of the IPO. Bridge financing also can involve restructuring of major stockholder positions within the portfolio. Acquisition and buyout financing is another form of investment. Mergers and acquisitions represent the most common type of successful exit for venture investments. In the case of a merger or acquisition, the venture firm will receive stock or cash from the acquiring company and the venture investor will distribute the proceeds from the sale to its limited partners (NVCA, 2007a).

## B. Stage Descriptions

The stages of development used in the *MoneyTree* Report are:

- ✧ **Seed/Start-Up Stage**—The initial investment stage. The company has a concept or product under development, but probably is not fully operational. The company usually has been in existence less than 18 months.
- ✧ **Early Stage**—The company has a product or service in testing or pilot production. In some cases, the product may be commercially available. The company may or may not be generating revenues and usually has been in business less than 3 years.
- ✧ **Expansion Stage**—The company’s product or service is in production and commercially available. The company demonstrates significant revenue growth but may or may not be showing a profit. The company usually has been in business more than 3 years.
- ✧ **Later Stage**—The company’s product or service is widely available. The company is generating on-going revenue and probably has a positive cash flow. The company is likely to be, but not necessarily, profitable. Investments may include spin-offs of operating divisions of existing private companies or established private companies.

## C. The Stages at Which Venture Capitalists Invest

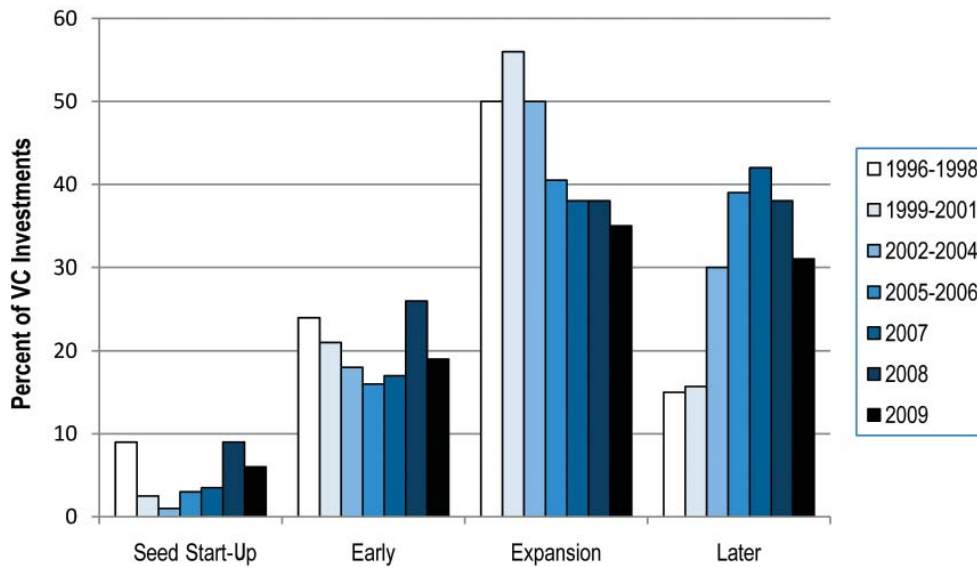
Venture capitalists may invest in portfolio companies throughout the lifecycle of a company’s product or technology. Venture capitalists started out by investing in the early stages of a product’s/technology’s development, but in recent years found the size and number of investments too cumbersome given the expected return on investment. As a result, the recent trend for venture capital investments has been for a greater proportion of available investment funds to be used in the later and expansion stages. This has resulted in less investment in the more innovative—and riskier—ideas.

As shown in **Figure 5**, \$5.9 billion was invested in 800 later stage deals in 2009. These amounts were declines of 44 percent and 33 percent, respectively, compared with 2008. Later stage companies attracted 33 percent of dollars and 29 percent of deals in 2009, compared to 38 percent of dollars and 30 percent of deals in 2008.

Although seed and early stage investments rose in 2008 and fell in 2009, the shift by venture capitalists away from seed and early stage investments has been evident for more than a decade (see **Figure 6**).

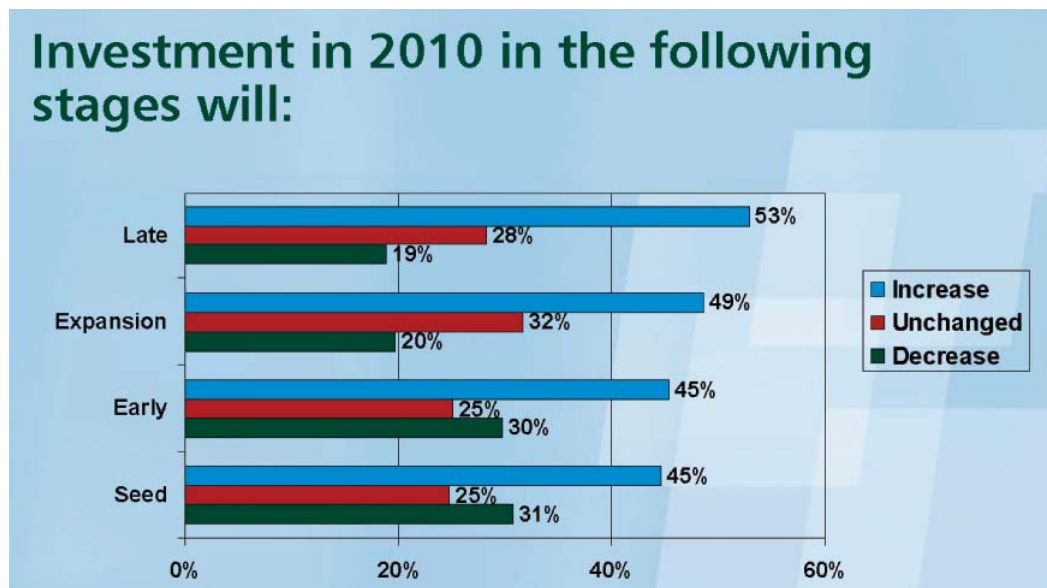
In NVCA’s *Venture View: 2010* predictions survey, venture capitalists were asked to predict their stage of development investments. According to the survey, 53 percent of those who responded expected investments in late stage development to increase in 2010, 49 percent predicted growth in expansion stage investments, and 45 percent envisioned growth in early and seed stage investments. The *Venture View: 2010* survey results for stage of development investments are presented in **Figure 7**.

**Figure 6. U.S. Venture Capital Investments by Stage of Development, 1996–2009**



Source: NVCA, 2010a

**Figure 7. Predicted 2010 Venture Capital Investment by Stage of Development**

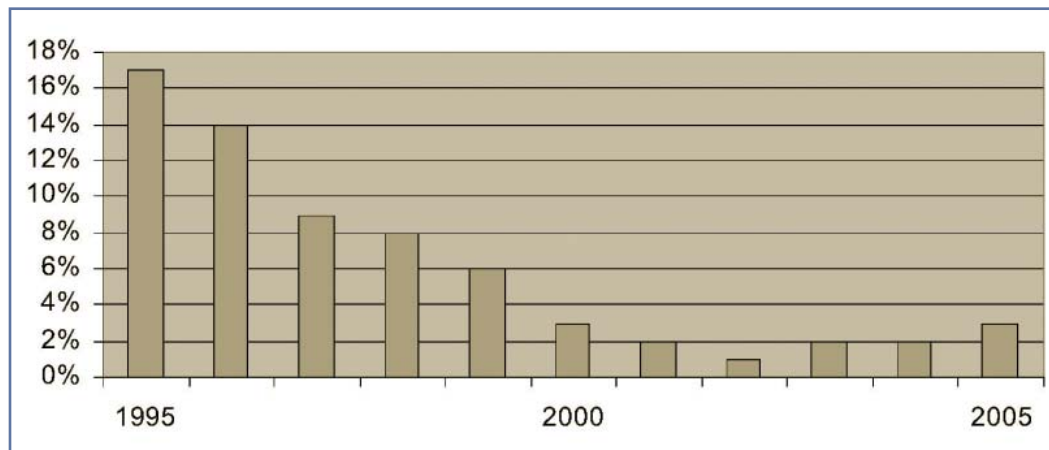


Source: NVCA, 2009d

In releasing the survey results, NVCA President Mark Heesen said, “Of all the predictions put forth this year, a collective lack of enthusiasm for seed and early stage investing is the most concerning. The weak exit market combined with proposed tax policy which would discourage long term investment puts tremendous pressure on VCs to move towards later stage investing. Yet, seed and early stage companies represent a pipeline that must be supported if our country is to continue building new and innovative companies. We need the environment to improve for these early stage investors” (NVCA, 2009b).

The NASVF, a nonprofit organization that represents private and public small investors committed to building their local economies, conducted a study of the shift among venture capitalists away from seed and early stage investments. In its 2006 report, *Seed and Venture Capital: State Experiences and Options*, NASVF traced the amount of seed and start-up money as a percentage of venture capital from 1995 to 2005 (see Figure 8).

**Figure 8. Seed and Start-Up Funding as a Percentage of All Institutional Venture Capital Investments by Year**



Source: NASVF, 2006

NASVF found that in 1995 venture capitalists were investing 17 percent of their funds in the seed/start-up stages of development, but these investments fell in 2002 to less than 2 percent and rebounded to slightly more than 3 percent by 2005.

NASVF concluded that seed investing was high in the latter half of the 1990s because of the development of the Internet. Although the design of a Web-based business costs relatively little, the marketing and implementation of a Web-based strategy cost millions. This funding requirement resulted in huge infusions of capital in brand new Internet companies. Some venture capitalists had the value of their investments multiply in a short period of time, sometimes in a matter of months, giving impetus to the rise of substantial seed/start-up capital for a time. This trend was dramatically reversed when many Internet companies failed to become profitable and the “dot-com” bust occurred.

The 2006 NASVF report found that venture capital played a relatively small role in funding pilot-scale innovation for start-up companies. NASVF found that only 3.4 percent of the \$21 billion venture capitalists invested in 2005 went to start-up companies. Based on its analysis, the NASVF found that the majority of venture capital investments went to follow-on funding for companies originally financed by angel investors (see Chapter IV, part A), corporate investors, or public sector programs (primarily state-related programs rather than federal Small Business Innovation Research [SBIR] and Small Business Technology Transfer [STTR] programs).<sup>8</sup> As indicated by the NVCA and PricewaterhouseCoopers *MoneyTree* data, this trend continued through 2008 and is expected to continue into the future (PricewaterhouseCoopers and NVCA, 2009).

The NASVF report also found that venture capitalists invested in business sectors that were not only growing rapidly but had not yet reached the competitive shakeout stage. In other words, NASVF concluded that venture capitalists filled a gap between the early start-up stage and the

<sup>8</sup> The Small Business Administration (SBA) Office of Technology administers the Small Business Innovation Research (SBIR) Program and the Small Business Technology Transfer (STTR) Program. Through these two competitive programs, SBA ensures that the nation’s small, high-technology, innovative businesses are a significant part of the Federal Government’s research and development efforts. Eleven federal departments and agencies participate in the SBIR Program; five departments participate in the STTR Program. Each state also has an SBIR/STTR contact to describe these programs to interested parties and encourage their use.

The 11 federal departments and agencies that participate in the SBIR Program include: Department of Commerce, Department of Defense, Department of Education, Department of Energy, Department of Health and Human Services, Department of Homeland Security, Department of Transportation, Environmental Protection Agency, National Aeronautics and Space Administration, National Science Foundation, and SBA. The five federal departments and agencies that participate in the STTR Program include: Department of Defense, Department of Energy, Department of Health and Human Services, National Aeronautics and Space Administration, and National Science Foundation.

expansion and later stages of development. Interestingly, some companies in which venture capitalists had high returns in early business growth cycles are no longer in existence. The disk drive industry, for example, had more than 40 venture-backed companies in 1983, but by 1984 the industry market value had dropped threefold, and by 1998, only three major companies remained. Given the dramatic fluctuations in some high technology products, NASVF found that venture capitalists sought to quickly exit a portfolio company investment and the industry overall before it “topped out” among customers and consumers (NASVF, 2006). ●





## IV. Sources of Investment

### A. Angel Investors

Angel investors are an important source of financing for small businesses and entrepreneurs. Because of the venture capitalists' criteria for potential investments, many companies seek initial funding from angel investors who may be more willing to invest in highly speculative opportunities, or may have a prior relationship with the company or entrepreneur. Angel investors normally invest their own funds, unlike venture capitalists, who manage the pooled money of others in a professionally managed fund. Although typically thought of as individuals, the actual entity that provides the angel funding may be a trust, business, or investment fund. The term "angel" originally comes from England, where it was used to describe wealthy individuals who provided money for theatrical productions. A pioneering 1978 report on how entrepreneurs raised seed capital in the United States was the first publication to use the term "angel" to describe investors who supported entrepreneurs (Wetzel, 1983).

Angel capital fills the gap in early company financing between "friends and family" who provide initial funding and venture capital. It is difficult for companies to raise more than a few hundred thousand dollars from friends and family, and most traditional venture capital funds typically are not interested in considering investments less than several million dollars. Thus, angel investments have evolved into the most common, non-owner, initial round of financing for high-growth potential companies.

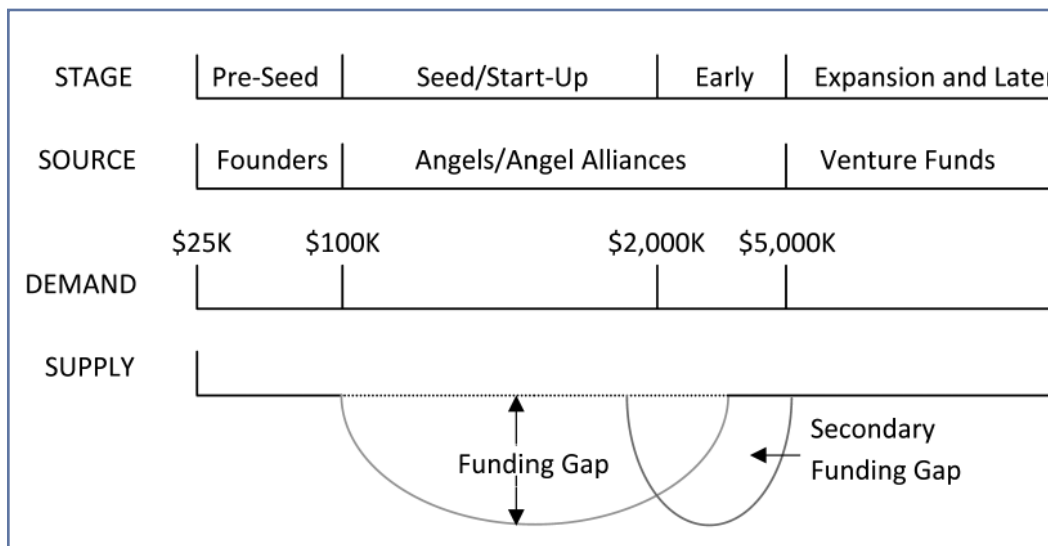
A study by the Center for Venture Research (CVR) at the University of New Hampshire found that angel investors had replaced venture capitalists in seed and early stage investments. It reported that angel investor financing in seed/start-up and early stage investments had ranged from \$100,000 to \$2 million and that these investments normally were raised from six to eight angel investors. The study also showed that as venture capitalists continued to make only larger (greater than \$5 million per deal) investments in portfolio companies at expansion and later stages of development, angel alliances—combinations of multiple angel groups—evolved to provide additional funding (\$2-5 million range) in the early stages of development (Sohl, 2003).

**Figure 9** illustrates the CVR study's results on the source and size of equity capital needed at each stage of company development. The study found that there was a realistic ("make it or break it") need for growth capital in the initial stages of a company's product and services development. There was a critical "funding gap" in the seed/start-up stages between \$100,000 and \$2 million and a "secondary funding gap" between \$2 million and \$5 million. Angel, not venture capital, investors filled these funding gaps. The study estimated that between 300,000 and 350,000 angel firms invested more than \$25 billion every year across nearly 50,000 companies (Sohl, 2003).

Anecdotal evidence from numerous angel groups around the country indicated that the amount invested and the number of companies receiving investments decreased substantially in 2009. Just as venture capital firms have conserved remaining fund cash for a reduced portfolio of companies, angels have had to do the same thing with their depreciated assets to maintain investment in existing portfolio companies or they have cut back dramatically.

Cumulatively, angel investments are not small. In 2009, total angel investments matched total venture capital investments—\$17.6 billion in angel funding versus \$17.7 billion in venture capital

**Figure 9. Stage of Investment Funding**



Source: Sohl, 2003

funding; however, these angel investments were made in more than 24 times the number of companies—57,225 companies vs. 2,365 companies receiving venture capital investments (Sohl, 2010; NVCA, 2010c).

There were approximately 50 formal business angel groups in the United States in 1997. By 2002, angel groups grew to more than 170 formal and informal organizations and the number continued to rise (Ewing Marion Kauffman Foundation, 2002; Sohl, 2003). Angel investments likewise expanded. In 2006, the total angel investment of \$25.6 billion was a nearly 11 percent increase over 2005, with a commensurate 3 percent increase over 2005 in the number of companies in which angel funds were invested (Sohl, 2007). Angel investments increased 1.8 percent in 2007, rising to \$26.0 billion. In 2008, total angel investments fell to \$19.2 billion, a 26.2 percent decrease from 2007. Angel investing continued to decline in 2009, falling to \$17.6 billion (Sohl, 2008; Sohl, 2009; Sohl, 2010).

There are strategic investment differences between angel investors and venture capitalists. Venture capitalists are professional investors who dedicate 100 percent of their time to investing and building innovative companies on behalf of third-party investors or their limited partners. The angel investment community is a more informal network of investors who invest in companies for their own interests. Most angel groups investigate opportunities in their local areas and pull investment membership from a city-centered, or “one-hour drive from home” region (Ewing Marion Kauffman Foundation, 2003). Beginning in the late 1980s, angels started to coalesce into informal groups with the goal of sharing deal flows and due diligence work, and pooling their funds to make larger investments. Angel groups generally are local organizations made up of 10 to 150 accredited investors in early-stage investing (Sohl, 2003).

Angel investors and venture capitalists have one essential and primary goal in common: they both are in the business of making money. Angels invest with anticipation of a healthy return on their investment. They tend to have among the most lucrative returns, which is commensurate with the high level of risk they take for providing the earliest investment dollars in a company. Angels also have many attributes that set them apart from other types of investors. Angels typically:

- ❖ Have a sense of social responsibility and enjoy community involvement.
- ❖ Take a role in the entrepreneurial process.
- ❖ Act as mentors and advisers to the entrepreneur.
- ❖ Provide early-stage investment dollars.



- ✧ Invest regionally.
- ✧ Invest smaller amounts at a time.
- ✧ Invest their own money.
- ✧ Are able to tolerate the loss of their entire investment.
- ✧ Have a diversified portfolio.
- ✧ Take a long-term view of their investments—often referred to as “patient money” (Preston, 2007).

Angel investors tend to invest in the early development stages of a company and limit their investments to several hundred thousand dollars each. Based on a 2006 survey by the Angel Capital Association (ACA), a professional association of angel investors, 80 percent or more of the angel investments made were for seed/start-up and early stage companies.<sup>9</sup> The average reported investment was about \$241,000 per deal. In 2006, there were 234,000 active angel investors in the United States (ACA, 2007). In comparison, there were approximately 800 venture capital firms in the United States in 2006, and these firms managed approximately \$236 billion (NVCA and Global Insight, 2007). Recent anecdotal evidence shows that, because of economic conditions, major angel groups are investing later and requiring revenues as proof of concept.

In 2009, the angel investment market exhibited a modest decrease in investment dollars, but there was little change in the number of investments. Total angel investments in 2009 were \$17.6 billion, a decrease of 8.3 percent from 2008. A total of 57,225 entrepreneurial ventures received angel funding in 2009, a modest 3.1 percent increase from 2008, and the number of angel investors in 2009 was 259,480 individuals, which was virtually unchanged from 2008 (Sohl, 2010).

The small decline in total dollars invested by angels, coupled with the increase in number of investments, resulted in a smaller deal size for 2009—a drop in deal size of 11.1 percent from 2008. These data indicated that although angels had not significantly decreased their investment activity, they were committing fewer dollars because of lower valuations and a cautious approach to investing (Sohl, 2010).

Based on investments for 2009, CVR found that the Software Sector accounted for the largest share of angel investments (19%) among the top five sector investments (see **Figure 10**). The Industrial/Energy Sector, which includes many clean technology investments, accounted for 17 percent of angel investments in 2009, which is more than double the 8 percent invested in this sector in 2008 (Sohl, 2009; Sohl, 2010). The CVR also reported that angel investments continued to be a significant contributor to job growth in 2009. These investments created 250,000 new jobs in the United States, or 4.4 jobs per angel investment in 2009, which was approximately 5 percent of all new jobs in the United States in that year (Sohl, 2010).

**Figure 10. Top Five Industrial Sector Investments by Angel Investors for 2009**

Sector	Software	Industrial/Energy	Healthcare/ Medical Devices	Retail	Biotechnology
Percentage of Deals	19%	17%	17%	9%	8%

Source: Sohl, 2010

According to CVR, there was a decline in angel investments in the seed and start-up stages in 2009, with 35 percent of total angel investments in these stages—a 10 percent decrease from 2008. Angels also exhibited an increased interest in post-seed/start-up investing, with 62 percent of investments in the early and expansion stages (up from 40% in 2008). This decrease in seed/start-up stage investing was attributed to the unfortunate reality of a weak economy (Sohl, 2009; Sohl, 2010).

<sup>9</sup> See <http://www.aca.com>

## B. Venture Capital Funds

### B.1 The Investment Process and Success Rates

Venture capital investing is risky, but venture capitalists are somewhat risk averse because they are investing other people's money. Historically, venture capital investments were made in the early stage of development of the portfolio companies and only a small percentage of companies succeeded in the market (Bovarid, 1990). As venture capital firms became more knowledgeable, success rates improved for venture capital backed companies but the high risk of early investments continues. As a result, the rates of return that venture capital partnerships require have varied by investment type, with expected returns of 50 percent on early stage investments and 25 percent on later stage investments (Fenn, et al., 1995; Bartlett, 2007). Given the need for these high rates of return, venture capitalists are highly selective in the companies in which they invest.

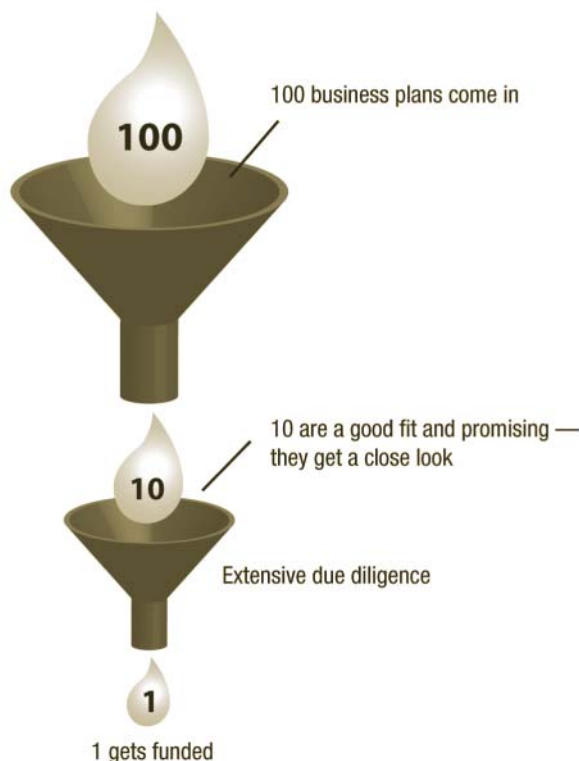
The majority of the following discussion about the selection, review, and success/failure rates for companies in which venture capitalists invest is drawn from the paper, "The Venture Capital Industry—An Overview" (NVCA, 2007a). For every 100 business plans that come to a venture capital firm for funding, usually only 10 get a serious review, and only one ends up being funded. **Figure 11** is a graphic depiction of the business plan funnel used by venture capitalists.

Venture capitalists look at numerous features before investing. For example, the venture capital firm looks at: the prospective company's management team, the product concept, the marketplace, the fit to the venture capital fund's objectives, the value-added potential for the company, the company's intellectual property position and competition, the capital needed to build a successful business, and possible returns and the timing of those returns for its investment. Although the legal and economic structures to create a venture capital fund are similar to those used by other investment asset classes, venture capital is unique.

To attract venture capital investment in today's economy, a business must demonstrate that it has reduced some of the risk for the investor, which means having a prototype and a group of customers.

Each venture capital fund or portfolio is a separate partnership. A new fund is established when the venture capital firm obtains necessary commitments from its investors of about \$100 million. In 2006, the average venture fund size was \$175.6 million (NVCA, 2007b). Venture capital money is taken from investors through multiple calls during the life of the fund as the investments are made. Funds tend to have a 10-12 year lifetime. Although the partners may start a new fund during the lifetime of an existing fund, new funds typically are started after an existing fund has completed the initial round of investment in its final portfolio. This typically will occur in the first 18 months to 3 years of a fund's life. An initial funding of a portfolio company will cause the venture fund to reserve three or four times the first investment for follow-on financing.

**Figure 11. The Business Plan Funnel**



Source: NVCA and Global Insight, 2007

Over the next 3 to 5 years, the venture firm works with the founding entrepreneur to provide successive “rounds” of funding, if needed, to support the company’s growth.<sup>10</sup> The venture capital payoff and return to investors come after the portfolio company is acquired or goes public in a stock offering. Although investors have high hopes, for every company getting funded, according to the NVCA, only 1 in 7 (14%) ever goes public through an initial public offering (IPO) and only 1 in 3 (33%) is acquired through a merger or acquisition. As contrasted to the entrance funnel, wherein only 1 in 100 (1%) of candidate business plans is successfully supported by venture capitalists, these figures indicate that in the exit funnel venture capitalists have a nearly 50 percent chance (i.e., 14% + 33%) of recouping their original investments.

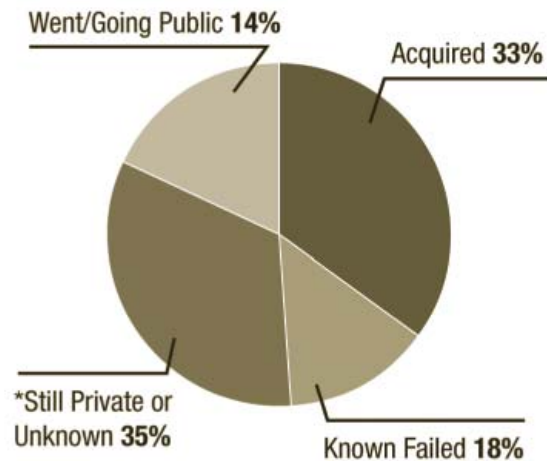
**Figure 12** presents the exit results for nearly 12,000 companies first funded by venture capital from 1991 to 2000. Depending on the investment focus and strategy of the venture capital firm, it normally will seek to exit the investment in the portfolio company within 3 to 7 years of the initial investment. Although the IPO may be the most glamorous and heralded type of exit for the venture capitalist and owners of the company, most successful exits of venture investments occur through a merger or acquisition. Again, the expertise of the venture firm in successfully exiting its investment will affect the success of the exit for both the venture firm and the owner of the company (NVCA, 2007a).

At public offering, the venture firm is considered an insider. Its stock ownership in the company is regulated, and restrictions are placed on how that stock can be sold or liquidated for several years. Once the stock is freely tradable, usually after about 2 years, the venture fund will distribute the stock or cash to its limited partner investors who then may manage the public stock as a regular stock holding or may liquidate it upon receipt. From 1980 through 2006, almost 3,000 companies financed by venture funds went public (NVCA, 2007b). In the case of a merger or acquisition, similar to an IPO, the venture firm will receive stock or cash from the acquiring company and the venture firm will distribute the proceeds from the sale to its limited partners.

## B.2 Types of Venture Capital Funds

According to the NVCA, there are several types of venture capital firms, but most firms invest their capital through funds organized as a limited partnership (LP) in which the venture capital firm serves as the general partner. The most common type of venture capital firm is an independent company that has no affiliations with any other financial institution. These are called private independent firms. Venture firms also may be affiliates or subsidiaries of a commercial bank, investment bank, or insurance company and make investments on behalf of outside investors or the parent firm’s clients. Still other firms may be subsidiaries of non-financial, industrial corporations making investments on behalf of the parent. These latter firms typically are called direct investors

**Figure 12. The Exit—Outcomes of the 11,686 Companies First Funded 1991 to 2000**



\* Of these, most have quietly failed

Source: NVCA and Global Insight, 2007

<sup>10</sup> There is no particular or consistent pattern for the conduct of successive rounds of funding. The *MoneyTree* Report does not track rounds of investment. Rounds are usually designated alphabetically, e.g., Series A, Series B, and so on. The *MoneyTree* Report lists data on investments by 17 financing sequence levels and tracks financing sequences with a number designation, e.g., 1, 2, 3, through 17. These sequences represent the cash for equity investment received by a portfolio company from a venture capital firm. The *MoneyTree* Report does not define what these sequences are or how they are distinguished from investments by state of development.

or corporate venture investors. Some venture capital firms work with federal, state, or local government-affiliated investment programs that help start-up companies. One common vehicle is the Small Business Investment Company (SBIC) Program administered by the Small Business Administration (SBA) (see Section B.3.1), in which a venture capital firm may augment its own funds with federal funds and leverage its investment in qualified portfolio companies (NVCA, 2007b).

Venture capital firms normally will organize their partnerships as pooled funds, which are funds made up by the general partner and the investors or limited partners. These funds typically are organized as fixed-life partnerships, usually having a life no longer than 10 years, with the possibility of extending it 2 to 3 years. Each fund is capitalized by commitments of capital from the limited partners. Once the partnership has reached its target size, the partnership is closed to further investment from new investors or even existing investors, so the fund has a fixed capital pool from which to make its investments (NVCA, 2007a).

In a typical venture capital fund, the general partners receive an annual management fee that ranges from 1 to 3 percent per year; the majority of venture funds charge 2 to 2.5 percent of the committed capital to the fund and 20 percent of the net profits (also known as carried interest) of the fund (Sahlman, 1990; Gompers and Lerner, 1994). General partners typically are required to invest a nominal amount of their own money in the fund (1-2%). The carried interest is considered the general partners' fee for carrying the management responsibility plus all the liability, and for providing the needed expertise to successfully manage the investment over its life cycle. Funds are structured so that as liquidity occurs, the limited partners receive their investment back first with a nominal interest. Beyond that, funds are then distributed on an 80/20 basis.

Larger venture capital firms usually have several overlapping funds at the same time because a fund typically has an investment window of 4 years; this allows these firms to continue investing and to keep specialists in all stages of the development of its invested companies. Being a general partner in a fund can be quite lucrative if the fund returns to its investors at a 25 percent or higher internal rate of return (IRR). Carried interests for large funds can be quite large. Smaller firms tend to thrive or fail with their industry contacts and investments and in many cases have not established the multiple fund structure in time for downturns in the marketplace. Failure rates for small venture firms are very high during periods of economic downturn.

The investment cycle for most venture capital funds in a portfolio company is 3 to 7 years, after which the focus is on managing and making follow-on investments in the fund within the fund's portfolio of companies. According to the NVCA, this model was pioneered by successful funds in Silicon Valley through the 1980s and 1990s. It involved investing in technological trends broadly but only during their period of ascendance, and reducing exposure to management and marketing risks of any individual firm or its product. An early stage investment might take 5 or more years to mature, while later stage investments may take only a few years. The venture capital fund's investment cycle must be congruent with the limited partnership's concern for risk and liquidity. In other words, venture funds tend to invest in deals with longer gestation periods at the beginning of the fund's life and deals with potentially quicker liquidity toward the end of their investment cycle.

As noted in Chapter IV, Section B.1, a venture firm may raise a second fund either during the lifetime of or after closing the first fund to continue to invest in companies and to provide more opportunities for existing and new investors. It is not uncommon to see a successful firm raise six or seven funds consecutively over the span of 10 to 15 years. Each fund is managed separately and has its own investors or limited partners and its own general partner. The investment strategy for these funds may be similar to that for other funds in the firm; however, the firm may have one fund with a specific focus, another with a different focus, and yet another with a broadly diversified portfolio. This depends on the strategy and focus of the venture firm itself (NVCA, 2007a).

Like a mutual fund, each venture fund has a net asset value, which is the value of an investor's holdings in that fund at any given time. Unlike a mutual fund, however, this value is determined

not through a public market transaction, but through a valuation of the underlying portfolio. Venture capital investments generally are illiquid and, at any point, the partnership may have both private companies and the stock of public companies in its portfolio. These public stocks usually are subject to restrictions for a holding period and thus are subject to a liquidity discount in the portfolio valuation.

Each portfolio company (i.e., a company in which venture capital is invested) is valued at a value that is agreed upon by the venture firm(s) when investments are made by the venture fund or funds. In subsequent quarters, the venture investor usually will keep this valuation intact until something occurs to change the value. Venture investors try to conservatively value their investments in accordance with the terms outlined in the prospectus of the fund. Although the venture investor usually is conservative in the valuation of companies, it is common to find that early stage funds may have an even more conservative valuation of their companies because of the long lives of their investments when compared to other, later stage funds with shorter investment cycles (NVCA, 2007a).

### **B.3 Federal Government Venture Capital Funds**

Congress must provide federal agencies with statutory authority to create venture capital funds and establish not-for-profit investment companies to manage them. Federally sponsored venture capital funds assist agencies in the development, deployment, commercialization, and procurement of new and emerging technologies and businesses. These funds also help federal agencies pursue leading-edge research and development efforts that may address priority federal problems.

A variety of licensing and direct assistance programs has been created to establish federal venture funds. Federal licensing is conducted through the SBA to establish privately owned and managed for-profit investment companies to provide equity capital and long-term loan funds to small businesses. Direct assistance programs enable federal agencies to create not-for-profit investment companies to provide support for businesses engaged in technology development and commercialization efforts unique to the interests of those agencies.

Starting in the early 1990s, a number of federal agencies created venture funds. These agencies included the Department of Agriculture, the Central Intelligence Agency, the Department of the Army, and the National Aeronautics and Space Administration.

#### **B.3.1 U.S. Small Business Administration**

##### **Small Business Investment Company (SBIC) Program**

The SBIC Program, administered by SBA, was created in 1958 to fill the gap between the availability of venture capital and the needs of small businesses in start-up and growth situations. SBA itself does not make direct investments or target specific industries. Essentially, the SBIC Program is a “fund of funds”—meaning that portfolio management and investment decisions are left to qualified private fund managers. As a result, SBA has minimal direct involvement in an SBIC’s portfolio management operations.

SBICs are privately managed, for-profit investment funds formed to provide equity and/or debt capital to U.S. small businesses. SBICs are licensed by the SBA. SBIC managers must meet rigorous requirements to be licensed. Some of these requirements include: having private capital of not less than \$3 million (for those choosing not to receive leverage funding from SBA) or \$5 million (for those receiving leverage funding from SBA); having qualified management and giving evidence of sound operation; and establishing the need for SBIC financing in the geographic area in which the investment company proposes to operate.

SBICs have their own private capital and may borrow additional funds from an SBA-sponsored trust at favorable rates. SBICs tend to be more risk tolerant than banks or regular venture funds, special-

ize in a particular industry, and target young companies that are not ready for a traditional venture deal. There are limitations on the types of investments made by an SBIC fund. These funds can invest only in small businesses, which are defined as companies having a net worth of less than \$18 million and average after tax income for the prior 2 years of less than \$6 million. SBICs cannot invest more than 20 percent of their private capital in a single company without SBA approval. Project financing for real estate investments is prohibited. SBICs may control small businesses for up to 7 years, which may be extended with SBA approval.

At the end of fiscal year (FY) 2008, SBA had more than \$6.9 billion invested in 349 SBIC funds, plus another \$2.5 billion in outstanding commitments. Combined with private capital, which is estimated to be \$9 billion, the SBIC Program totals more than \$18 billion in capital resources dedicated to funding small businesses.

### **B.3.2 U.S. Department of Agriculture**

#### **Alternative Agricultural Research and Commercialization Corporation**

In 1993, the U.S. Department of Agriculture (USDA) created the Alternative Agricultural Research and Commercialization Corporation (AARCC) with an initial funding level of \$7.5 million. AARCC was a federally sponsored nonprofit organization that created a venture capital fund focused on investing in new and alternative non-food, non-feed products derived from agricultural materials, forestry materials, and animal by-products. AARCC investments were expected to support new agricultural-related commercialization products in the range from \$40,000 to \$1 million, although most were closer to \$100,000. Although AARCC was authorized for \$25 million per year, it was never funded at that level; its peak funding was \$9 million in 1998.

AARCC invested in portfolio companies very early in the technology and product development process and, as a result, it continued to invest in some companies for two to three investment rounds. For some portfolio companies, AARCC investments reached \$3 million each. Companies seeking financial assistance from AARCC were required to have matching funds from the private sector on at least a one-to-one ratio. Over the history of its investments, AARCC claimed that the ratio overall was four-to-one private to public investment.

Funding for the AARCC Corporation was zeroed out by Congress for FY 2000. AARCC ended operations in February 2000.

#### **Rural Business Investment Company → Meritus Ventures**

In 2002, USDA and SBA signed a collaborative agreement to provide rural businesses with greater access to venture capital investment funds through a new initiative called the Rural Business Investment Program, which in turn could create licensed (through the SBA) for-profit Rural Business Investment Companies (RBICs). These RBICs are modeled after the SBA-sponsored SBICs that have been in existence since the late 1950s. Unlike the SBICs, the RBICs were required to be established in rural regions of the country that are not traditionally targeted by venture capital funds.

To be considered as an RBIC, a venture investment company was required to have a minimum of \$10 million in private equity capital. If selected, beyond its required capitalization, each RBIC would have available \$20 million of government-guaranteed debentures. Each licensed RBIC also would have available up to \$1 million of operational assistance grant funding to provide technical assistance to candidate portfolio companies. There was no requirement for matching funds to receive the grant.

In September 2006, the USDA selected and the SBA licensed Meritus Ventures as the first and only RBIC. No other RBICs have been established. Meritus is a \$36.4 million venture capital fund formed to make equity investments in private, expansion-stage companies in predominantly rural areas in central and southern Appalachia. The fund makes investments in small companies in Tennessee, Kentucky, Arkansas, and the Appalachian counties of Ohio, West Virginia, Virginia, North Carolina, South Carolina, Georgia, Alabama, and Mississippi.

Currently, Meritus has invested in four portfolio companies, all of which were formed in 2006-2007. These companies include:

- ✧ Aldis, Inc.—a clean technology company that concentrates on the transportation logistics and advanced infrastructure management markets.
- ✧ Zipit Wireless—a developer of devices used for Internet content and services.
- ✧ SinglePipe Communications—a facilities-based Voice over Internet Protocol provider that delivers residential and business services to the wholesale and channel markets, including cable operators, Internet service, and wireless providers.
- ✧ Wazoo Sports, Inc.—an online broadcast company that specializes in high school and small college sports events.

### **B.3.3 U.S. Central Intelligence Agency**

#### **In-Q-Tel**

In 1999, the U.S. Central Intelligence Agency (CIA) created In-Q-Tel as a 501(c)(3) nonprofit venture capital firm whose founding objective was to help the intelligence community, most notably the CIA, tap into and influence the fast-changing information technology (IT) market. In-Q-Tel currently focuses on new and emerging technologies in five areas: (1) application software and analytics; (2) bio-, nano-, and chemical technologies; (3) communications and infrastructure; (4) digital identity and security; and (5) embedded systems and power.

In-Q-Tel's investment philosophy is driven by an approach called the "Q Process." The Q Process begins with the CIA defining its problems, continues as In-Q-Tel searches for a solution to the Agency's needs, and ends when In-Q-Tel returns solutions to the Agency for implementation.

Initial funding from the CIA for In-Q-Tel was estimated to be \$37 million annually. As of August 2006, In-Q-Tel had reviewed more than 5,800 business plans, invested about \$150 million in more than 90 companies (including Google Earth's mapping technology for its intelligence applications), and delivered more than 130 technology solutions to the intelligence community.

### **B.3.4 U.S. Department of the Army**

#### **Army Venture Capital Corporation → OnPoint Technologies**

In 2002, the U.S. Department of the Army was authorized a one-time \$25 million allocation to create and fund the Army Venture Capital Corporation (AVCC), a nonprofit 501(c)(3) organization. It was expected that AVCC would provide the Army better access to innovative technology companies and would accelerate the transition to, adoption of, and use of new or significantly improved technologies by the Army. In parallel, Congress also passed a law in 2002 that authorized an allocation of \$20 million annually (FY 2003 through FY 2005) to the Army for venture capital investments. This \$60 million endowment was established to provide the cushion to finance multi-year investments by AVCC.

In 2003, AVCC established a for-profit investment company and fund, OnPoint Technologies, to support new and innovative technologies in the area of portable power and energy to lighten soldiers' loads as they operate worldwide. The AVCC Board of Directors oversees and provides management advice to OnPoint Technologies. In addition to addressing battery and power systems, another requirement for the OnPoint fund is co-investment with other, private funds. As of 2006, for every \$1 invested by OnPoint, private venture capital investors co-invested more than \$6.

OnPoint has made investments worth \$500,000 to \$2 million, focusing on mobile power and energy technologies such as generation (fuel cells and microturbines), storage (batteries and capacitors), controls (control circuits and voltage sensors), and usage (low-power logic and components). As of 2006, the Army had contributed nearly \$48 million in capital into OnPoint. More than 300 oppor-

tunities have been reviewed, and OnPoint has made investments in 10 companies, each committed to delivering leading-edge technology products to the Army.

### **B.3.5 National Aeronautics and Space Administration**

#### **Red Planet Capital → Astrolabe Ventures**

In 2006, the National Aeronautics and Space Administration (NASA) created Red Planet, Inc., a nonprofit 501(c)(3) investment company. In turn, Red Planet set up Red Planet Capital (RPC), a for-profit investment fund to support aerospace research and related technologies. NASA and Red Planet selected the RPC Board of Trustees and charged them with tracking the deal-flows within the fund.

Although NASA has extensive aerospace experience, it lacks ability in related technology areas, such as biomedical science, that do not directly relate to its core mission. In this spirit, NASA established RPC as an early-stage investment fund looking for strategies and products related to keeping astronauts safe and healthy in space for extensive periods of time. The RPC focus is captured in the fund's name because NASA was interested in potentially sending astronauts to Mars—the Red Planet—by 2020 or later.

RPC was started in November 2006 with \$11 million in funding. It was expected that the fund would invest \$200,000 to \$1 million in early-stage companies and co-invest in later rounds with other funds. The fund was expected to reach an investment level of \$75 million over 5 years.

RPC had extensive consultations with NASA's managers and technology specialists to identify their needs and requirements. Once these technology areas of interest were identified, RPC planned to develop at least 75 Technology Notes per year detailing how technologies available outside of NASA could fulfill the identified needs. In less than 1 year of operation, RPC produced 90 Technology Notes for NASA. Thirty of the 90 opportunities ultimately were funded by RPC and other private sector investors. NASA itself decided to invest in one of these opportunities.

In 2007, based on the lack of an annual appropriation from Congress, RPC closed and transformed itself into an international fund network called Astrolabe Ventures. Astrolabe currently focuses on nine business sectors including: information technology, advanced communications, biomedical, environmental systems, human-machine interaction, smart manufacturing, energy, advanced materials, and vehicles. Astrolabe invests up to \$3 million to \$5 million per company over multiple rounds of financing, with initial start-up funding as low as \$250,000.

## **C. Institutional Investors**

### **C.1 Types of Investors in Venture Capital Funds**

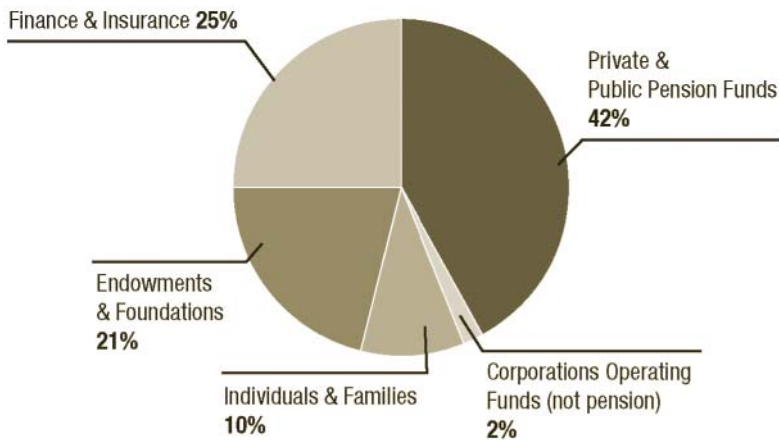
Venture capital fund investing is generally out of reach for the average investor. According to the NVCA, the risk, length of investment, illiquid nature of investments, and high minimum commitment requirements for funds restrict venture capital fund investing to institutional investors. Even with institutional investors, the average venture capital fund varies from a few to almost 100 limited partners depending on the target size of the fund.

In its 2007 report, *Venture Impact*, NVCA identified the five principal investors in venture capital funds: (1) private and public pensions, (2) finance and insurance organizations, (3) endowments and foundations, (4) individuals and families, and (5) corporations operating funds (not pension). As depicted in **Figure 13**, two of these investor types—private and public pensions and finance and insurance organizations—provide approximately two-thirds of the total money invested in venture capital funds.



A study for the Federal Reserve System found that for the period 1986-1992, public and private pension funds represented about 45 percent of venture capital investors, with bank holding companies, investment banks, and insurance companies representing about 22 percent; and endowments and foundations about 12 percent of total venture capital investments (Fenn, et al., 1995). By 2007, only a small change had occurred in the investment patterns in venture capital funds by public and private pension funds and financial and insurance companies; the most dramatic change in investment patterns was by endowments and foundations<sup>11</sup> (NVCA, 2007b).

**Figure 13. Investors in Venture Capital Funds**



Source: NVCA and Global Insight, 2007

For the period 1980-1994, cumulative commitments to private equity funds totaled \$127 billion; of this total, \$33 billion was committed to venture capital financing and \$94 billion was committed to non-venture investments (Fenn, et al., 1995). The majority of the non-venture investment was composed mainly of the informal private equity market in which unregistered securities were sold to institutional investors and accredited individuals, and angel capital investments—investments in small, closely held companies by wealthy individuals, many of whom have experience operating similar companies. Public pension funds made up the fastest growing group of private equity investors overtaking private pension funds by the early 1990s in terms of the total amount of private equity held.

By 2009, public, private, and union pension funds accounted for approximately 39 percent of the total private equity committed (Skelly, 2010). **Figure 14** provides a listing of the largest institutional investors in private equity funds in 1991-1992. The nine public pension funds listed in this figure allocated private equity of between \$800 million and \$2 billion; the eight largest corporate pension funds allocated between \$500 million and more than \$2 billion; the investments of the three university endowments totaled more than \$1 billion; and the five largest bank holding companies accounted for nearly 70 percent of the top 20 bank holding companies with the largest private equity investments. No specific

**Figure 14. Largest Investors in Private Equity**

<i>Corporate Pension Funds</i>	<i>Public Pension Funds</i>
AT&T	New York State Common Retirement Fund
General Motors	Washington State Retirement System
General Electric	CalPERS
IBM	CalSTRS
GTE	Wisconsin Investment Board
Ameritech	Oregon Public Employee Retirement Fund
Bell Atlantic	Michigan Retirement System
NYNEX	Minnesota Investment Board
	Virginia Retirement System
<i>Endowments</i>	<i>Bank Holding Companies</i>
Harvard University	Chemical Venture Partners
Yale University	First Chicago Venture Capital
Princeton University	BankAmerica Venture Capital Group
	J.P. Morgan Capital Corporation
	Norwest Venture Capital

NOTE. Investors are listed in descending order of volume of private equity investments, based on 1991 data, except for corporate pension funds, for which 1992 data were used.

Source: Fenn, et al., 1995

<sup>11</sup> No data were found on why endowments and foundations doubled their investments in venture capital funds from 1992 to 2007. It is speculated that they were attracted to these investments because of their higher returns, but during this time period the “dot-com” boom occurred and some investors may have reduced rather than enhanced their investments.

data on the total amount of private equity investments by bank holding companies were reported (Fenn, et al., 1995).

The investment strategies for the various institutional investors in private equity funds varied, but all institutional investors had one underlying reason for investing—high financial returns. Corporate pension funds began investing heavily in private equity limited partnerships in the early 1980s. They were attracted by the market's high returns and diversification benefits, but they were prohibited by the 1974 Employee Retirement Income Security Act (ERISA) from making strategic investments that would benefit their parent companies. Although most corporate pension funds, like other investor groups at that time, invested mainly through partnerships, some of the largest funds started to become active in direct and co-investments.

These corporate funds considered themselves sophisticated investors and tended to use their own staffs of experienced investment professionals to evaluate investment strategies and manage their investments (Fenn, et al., 1995). Even today, general partners in limited private equity partnerships consider corporate pension funds valuable investors because their commitment to a partnership often conveys to other potential limited partners a positive message about the quality of that partnership (NVCA and PricewaterhouseCoopers, 2007a). Public pension funds have become large institutional investors and supporters of venture capital investments. The next section provides more detailed descriptions of these funds and their investment trends in recent years.

Endowment or foundation private equity investments are small relative to those of public and private pension funds. These investors simply have less money to invest than their pension fund counterparts. Most endowments and foundations invest through partnerships, but some of the largest university endowments also have active direct investment programs that were started in association with research programs at their own universities.

In a May 2006 report, NASVF found that university research institutions are increasingly viewed as a source of new, innovative products and services. As a class, these institutions are being challenged to find commercial uses for their assets, to transfer technology to corporate investors, and to license inventions to local start-ups in an effort to spur development. Some regions, in an attempt to accelerate these commercialization activities, have formed “pre-seed” venture capital funds in affiliation with universities or entrepreneur development centers. Examples of these funds include Michigan's Technology Transfer Office Invention Development Fund at Wayne State<sup>12</sup> and the Technology Business Finance Program of the Oklahoma Center for the Advancement of Science and Technology.<sup>13</sup>

NASVF found that pre-seed funds have helped entrepreneurs move from invention to prototype and demonstrate the functionality or marketability of their products. Further, NASVF found that capitalization for these funds usually comes without a requirement for return on investment in the traditional sense. State general funds and university foundations are the primary sources (NASVF, 2007).

Bank holding companies have been private equity investors longer than most other institutional investors. As a group, bank holding companies have been investing in private equity since the 1960s. Many bank holding companies got involved in the market to take advantage of economies of scale between private equity investing and other commercial bank products, especially loans. As lenders to small and middle-market companies, bank holding companies have contact with a large number of firms in which they might make private equity investments; conversely, by investing in a private equity partnership, they may be able to generate lending to portfolio companies in which the partnership invests.

Because their equity ownership of commercial enterprises is restricted, bank holding companies have invested in private equity through separately capitalized bank holding company subsidiaries.

<sup>12</sup> See [http://www.techtransfer.wayne.edu/funding\\_resources.asp](http://www.techtransfer.wayne.edu/funding_resources.asp)

<sup>13</sup> See <http://www.ocast.state.ok.us/>

Direct investments can be made through licensed SBICs, and investments in limited partnerships can be made through separate subsidiaries (Fenn, et al., 1995). Bank holding companies consist of a wide range of organizations and groups. According to a 2006 *Economist* survey, Citigroup, JPMorgan Chase, and Bank of America were the top three banking groups in the world by shareholder equity, and Citigroup, American Express, and Merrill Lynch were among the top 20 largest financial services companies in the world.<sup>14</sup>

## C.2 Public Pension Funds

In the early 1980s, public pension funds were relative newcomers to private equity investing. Over the course of the 1980s, public pension fund commitments to private equity partnerships increased sharply, nearly tripling in a decade. Like corporate pension funds, their motive for investing was mainly financial; some, however, like the California Public Employees Retirement System (CalPERS), the California State Teachers Fund (CalSTRS), and the Pennsylvania School Employee Retirement Program, started investing in companies within their states to couple increased fund returns with local economic development (Fenn, et al., 1995).

Public pension funds that invest in private equity are, on average, larger than corporate pension funds that do so. As of 1991, the average assets of the 10 largest public funds with private equity investments were \$32.3 billion, while the average size of the 10 largest corporate funds was \$21.3 billion (The Private Equity Analyst, 1992a).<sup>15</sup> Although they are larger, public pension funds traditionally have operated under tighter budgets than their private counterparts and employ fewer investment professionals. This combination of characteristics—limited staffs and large sums of capital to invest—had the effect of raising the minimum investment size, in many cases to between \$10 million and \$25 million in the early 1990s. Public pension funds also have tended to invest in larger private equity partnerships because they have the additional constraint that they not account for more than 10 percent of the capital of a single partnership (Fenn, et al., 1995).

Public pension funds and their investment decisions are likely to be held up to public scrutiny. The funds may be especially concerned about the public's reaction to losses on investments with which the public is unfamiliar, such as private equity. They also may require evidence of satisfactory investment performance on a more regular basis than is possible with private equity investments. As a result, public pension funds have tended to be more risk averse and have shorter time horizons than corporate pension funds.

Although aversion to risk and illiquidity have not stopped public funds from becoming a major investor group in the private equity market, they have influenced the types of partnerships in which public funds have invested. Public pension funds strongly prefer later-stage venture and non-venture partnerships over early-stage venture partnerships because the former may be somewhat less risky and tend to generate returns more quickly (Fenn, et al., 1995).

U.S. public pension funds are some of the largest in the world. According to the 2007 “Pensions and Investments Global 300 Survey,” prepared by Watson and Wyatt, a business actuarial firm, four U.S. public pension funds were among the top 10 largest (by total asset value) public and private pension funds in the world. These U.S. pension funds were: CalPERS (#3), the Federal Thrift Savings Plan (#5), the New York State Common Retirement Fund (#7), and CalSTRS (#9). The largest pension fund in the world was the Japanese Government Pension Fund. The other funds in the top 10 were Taiwanese and Dutch government funds. In 2007, among the top private pension funds in the world were General Motors, IBM, and General Electric company funds.

<sup>14</sup> No data were found about specific venture and non-venture capital investments by bank holding companies and financial services companies for the period of 1970 through the 1990s.

<sup>15</sup> No comprehensive data were found about the investment strategies of public versus private pension funds since the early 1990s. Based on the more recent NVCA data on these institutional investors, it is assumed that public pension funds have continued to invest more heavily in venture capital than private pension funds.

Several state pension funds, such as those of California and New York; state green funds, such as Pennsylvania's Keystone Green Fund; and state funds, such as the Oregon Investment Fund, have started in recent years to allocate investments to the Environmental and Clean Technology Sectors.

### **C.2.1 California State Pension Funds**

Established more than 75 years ago, CalPERS is the largest U.S. pension fund, with assets totaling more than \$230 billion in 2007. CalPERS administers retirement and health benefits for about 1.5 million current and retired public employees and their families. It has made substantial investments in venture and non-venture private equity. Since 1990, CalPERS has invested in private companies primarily through limited partnerships or funds, typically with managers or general partners acting as third parties that invest the pension fund's capital. In November 2006, CalPERS announced that it committed \$500 million to Sacramento Private Equity Partners, an investment focusing on venture capital and small middle market private equity funds (CalPERS, 2006).

Established 95 years ago, CalSTRS is the third largest public pension fund in the United States, with assets totaling just over \$126 billion in 2007. CalSTRS administers retirement, disability, and survivor benefits for California's 813,000 public school educators and their families from the state's 1,400 school districts, county offices of education, and community college districts.

In February 2004, the California State Treasurer launched the *Green Wave* environmental investment initiative, calling on CalPERS and CalSTRS to implement a four-pronged investment strategy to bolster their financial returns, create jobs, clean up the environment, and combat global warming. The *Green Wave* initiative urged the pension funds to invest \$1.5 billion in cutting-edge technologies and environmentally responsible companies, to prod companies to address the financial risks posed by environmental liabilities and global warming, and to reduce energy consumption by their massive real estate holdings (California State Treasurer's Office, 2004).

Among state pension funds, California funds made the largest commitment to clean technology investments through 2008, including:

- ✧ CalPERS committed \$400 million to clean technology related stock portfolios in the United States and overseas.
- ✧ CalPERS' Environmental Technology Program Board targeted investments in environmental technology solutions that are more efficient and less polluting than existing technologies such as recycling; minimize the use of natural resources; and reduce emissions, refuse, and contamination to air, water, and land. The primary objective of the program is to achieve attractive investment returns over the long-term and help catalyze the adoption of environmental and clean technologies to the broader marketplace.
- ✧ CalSTRS invested \$188 million in clean technology, including \$150 million in renewable energy projects in the United States and Europe (CalPERS, 2006 and 2007; CalSTRS, 2007).

Beyond direct investments in environmental and clean technologies, both CalPERS and CalSTRS sponsored shareholder resolutions calling for climate change risk reporting, such as a gas pipeline company reporting on its greenhouse gas emissions (CalSTRS, 2008).

### **C.2.2 New York Pension and Investment Funds**

The New York State Common Retirement Fund (CRF) holds assets in trust for more than one million state employees and retirees, most local governments, and some public authorities. The State Comptroller is the sole trustee and manager of CRF. The CRF is the second largest pension fund in the United States, with assets exceeding \$154 billion.

Between 2005 and 2007, CRF committed more than \$40 million to private equity funds that invest exclusively in clean technologies and more than \$400 million to other funds that included clean technology companies as part of their strategy. These investments included more than \$16 million invested in New York-based clean technology companies through the Fund's Instate Co-Investment Program, which targets investment of New York State funds into the state economy (CRF, 2006). In April 2008, the Comptroller announced the creation of the CRF Green Strategic Investment Program (GSIP). Under the GSIP, the CRF would actively seek opportunities to invest in renewable energy and clean technologies, committing up to \$500 million over 3 years to environmentally focused investment strategies (New York State Comptroller, 2008).

The CRF created the GSIP because it believed companies that audit their greenhouse gas emissions and integrate green technologies into their business practices are better suited to respond to new marketplace challenges associated with global climate change. At the same time, global demand for energy from alternative sources had increased, and international efforts aimed at curbing greenhouse gas emissions had proliferated. These developments made adopting green investment strategies an area where institutional investors could support important policy goals while generating strong investment returns (New York State Comptroller, 2008).

In January 2007, the New York City Investment Fund (NYCIF), the investment and economic development arm of the Partnership for New York City, released a report entitled, *Cleantech: A New Engine of Economic Growth for New York State*. The NYCIF report identified resources in both the Upstate New York and the New York City Metropolitan areas that could contribute to building the clean technology industry within New York State. The report recommended a series of initiatives by City and State Government to spur investment and job creation in this sector, including:

- ✧ Creating a targeted effort to market the state's clean technology related assets to investors, entrepreneurs, and corporations focused on this industry.
- ✧ Committing \$150 million of New York State pension fund monies to investment managers who will invest in clean technology companies and projects located within New York.
- ✧ Establishing other producer-related incentives, such as procurement from in-state companies, beta testing programs, and reorientation of the New York State Energy Research and Development Authority (NYSERDA) to focus on local production.
- ✧ Leveraging the opportunities presented by the Regional Greenhouse Gas Initiative to create jobs in the financial services sector and related offset projects, such as landfill gas capture, reversing deforestation, or increasing the efficiency of energy systems.
- ✧ Identifying legislative and regulatory actions that could support the growth of the clean technology industry within the state, such as targeted procurement (NYCIF, 2007).

## D. State Equity Investments

Many states are interested in using various forms of equity investments to improve their regional economies. As noted earlier, the majority of venture capital investments from 1999 to 2005 were concentrated in fewer than 10 states, and most of those investments were not in the seed/start-up stage of a product's development. As a result, many universities in those states had been disappointed in the lack of investment from these funds in opportunities developed by their faculty or students. This is the reason that many states began exploring the need to jump-start their local entrepreneurs' access to capital via state programs.

The NASVF reported that institutional venture capitalists invested a total of \$21.7 billion in 2005, with an average deal size of \$7.4 million. Nearly 60 percent of these investments were made in just two states—California and Massachusetts. Texas, New York, New Jersey, Washington, Colorado, and North Carolina rounded out the top eight states, and together these six additional states

received 22 percent of the venture capital in 2005. The other 42 states collectively had less than 20 percent of all venture capital investments.

**Appendix C** has a complete listing of the top 10 states for venture capital investments, including information from the 2006 NASVF Report and more recent data on state venture investments from NVCA and NASVF, and membership data for states in the Investor Network on Climate Risk (INCR) and the Clean Energy States Alliance (CESA). The top three states—California, Massachusetts, and Texas, respectively—for venture capital investment did not change in the period 1995 to 2007. Texas also was the second leading state for having state-supported but privately managed venture capital funds; New Mexico and other states with state-supported funds are generally those that historically have not attracted many private venture investments.

States that are INCR and CESA members also are among the leaders for venture investments. INCR is a network of institutional investors and financial institutions that provides tools for investors to manage the risks and capture the opportunities posed by climate change. Through grants, rebates, loans, and investments in thousands of clean energy technology projects and companies, INCR members have leveraged billions of dollars for clean energy deployment. CESA is composed of members from 16 clean energy funds and two state agencies (the New York State Energy Research and Development Authority and the Maryland Energy Authority).

## **D.1 Privately Managed Funds**

State investment in privately managed, geographically restricted funds is one of the most popular state program models. Two of the largest state funds in this category are the New York In-State Private Equity Program and the Oregon Investment Fund.

In 1999, the New York State Legislature passed legislation calling on CRF (see Chapter IV, Section C.2.2) to invest \$250 million in New York companies. By 2003, CRF had committed \$104 million to the In-State Private Equity Investment Program. Between 2003 and 2006, CRF added \$321 million and, as of 2007, had a total of \$425 million committed to 15 funds. Because CRF requires its investment partners to put up their own money and raise other funds, the total pool of capital available for New York companies was much larger than the In-State Program alone.

The 2006 Status Report of the New York In-State Investment Program stated that the Program had invested more than \$145 million in 64 New York companies; this represented a ninefold increase in both companies receiving capital and the amount invested over the prior 3 years. Nearly \$425 million in new funds also had been made available to 15 different In-State Program private equity managers for investments in New York State. This represented a \$321 million increase from the \$104 million made available in January 2003, and a tripling of the number of private fund managers. In October 2007, the Program surpassed its original goal set by the state legislature in 1999 (New York Comptroller, 2007). Beyond New York companies, the New York In-State Investment Program also has invested in out-of-state companies agreeing to locate in New York to access the funding.

In July 2003, the Oregon State Legislature created the Oregon Investment Council (OIC) to design and implement a \$100 million program that encourages the growth of small businesses within the State of Oregon. The OIC invests in all State of Oregon funds, including the Oregon Public Employees Retirement Fund and the State Accident Insurance Fund. The OIC's statutory mandate is to achieve the highest return possible on its investments. To accomplish this mandate the OIC chose to develop a fund of funds, the Oregon Investment Fund (OIF).

The OIF, which is capitalized by funds from the OIC, has committed capital to private equity and venture capital funds that in turn invest in companies located primarily in the State of Oregon, as well as the Pacific Northwest region. In addition, a percentage of the assets of the OIF may be invested directly into operating companies alongside the OIF's private equity and venture capital

managers. The OIF seeks to build successful, innovative enterprises for the benefit of its investors. In addition, OIF facilitates partnerships among the private equity community in Oregon and between entrepreneurs in the state.

From the inception of the OIF to December 31, 2008, the net impact to Oregon was approximately \$334 million of capital invested by OIF's funds and co-investors in Oregon and Pacific Northwest companies.<sup>16</sup> The OIF committed and invested its funds on behalf of the Oregon Public Employees Retirement Fund (OPERF) and created value in the portfolio for the benefit of OPERF and its constituents. By the end of 2008, the OIF had accomplished a number of very meaningful milestones:

- ✧ Committed \$114 million to 12 funds and invested \$5.5 million directly into 3 companies in Oregon.
- ✧ Invested \$139 million in Oregon and Pacific Northwest companies, representing an increase of more than \$81 million since 2007.
- ✧ Influenced approximately 3,088 jobs in Oregon and Pacific Northwest companies, an increase of 1,385 positions.
- ✧ Increased the number of investments in Oregon and the Pacific Northwest companies to 24, of which 19 were either headquartered in Oregon or had significant operations in the state.
- ✧ Attracted \$195 million in capital from additional investors, an increase from 2007 of \$150 million.<sup>15</sup>

Most experienced privately managed venture funds will not agree to investments that geographically limit their investments to a particular state boundary or region. They normally will agree to “best effort,” but nothing more specific than that. Less restrictive, more regional funds are more common, but not frequent. This is particularly true in regions perceived by the venture capital community to be devoid of good deals.

## D.2 State-Sponsored Funds

State-sponsored investment funds are created by a range of state programs, such as public pension funds, in a number of private venture capital partnerships. The strategy is to select partnerships that are expected to produce market returns, while contributing to the growth of a healthy local venture capital industry. This helps focus a rich variety of experienced investors on the legitimate capital needs of local businesses. Public pension funds often use this model, and the California and New York pension funds described earlier in Sections C.2.1 and C.2.2, are examples of this model.

Some other states, such as New Mexico, also have created venture capital funds through state resources. The New Mexico Private Equity Investment Program helped generate an increase in local venture capital commitments. Venture investments in New Mexico more than doubled to \$1.3 billion between the end of 2005 and 2007, according to a report by Sun Mountain Capital, which advises the State Investment Council on its private equity program. During that period, the program helped create nearly 3,000 New Mexico jobs and generated almost \$280 million in direct annual economic impact. The New Mexico Program started in 1994 with about \$60 million in state funds, but between 2003 and 2007, New Mexico increased available funding more than eightfold, to nearly \$500 million. Through the program, the State Investment Council invests that money in venture capital funds that operate in New Mexico. It also makes direct investments through a \$90 million Co-Investment Fund (New Mexico Business Weekly, 2008).

As of March 2008, New Mexico committed nearly \$360 million to 26 different venture funds, a 66 percent increase from the \$215 million that was committed at the end of 2005. Of the capital committed during that period, \$242 million was invested in New Mexico companies—up from

<sup>16</sup> See <http://www.oregoninvestmentfund.com/>

just \$105 million invested in late 2005. Perhaps most important, New Mexico State investments in local companies—either through direct investments from the Co-Investment Fund or through program commitments to venture capital funds—generated \$7 from private investment in New Mexico-based companies for every \$1 invested by the state (New Mexico Business Weekly, 2008).

According to an NVCA survey on the fastest growing regions for venture capital investment across the country, New Mexico had the highest growth rate between 2006 and 2007, although the base amount was small. In 2007, more than \$128 million was invested in 21 New Mexico companies, compared to \$32 million invested in 8 companies in 2006 (NVCA, 2008a). One of the reasons for this increase was that the New Mexico Private Equity Program requires that any funds it provides to investors or invests directly in a portfolio company must be matched by other private investors. Therefore, if New Mexico puts \$10 million into one venture capital firm, the firm must invest \$5 million from its own fund in New Mexico companies and must arrange for other venture investors to put another \$5 million into New Mexico companies as well (New Mexico Business Weekly, 2008).

The 2008-2009 financial downturn sharply reduced the amount of funding available through the New Mexico Private Equity Investment Program. The fund lost about \$1.6 billion from its 2007 high point because of the crash in stocks and bonds, and that, in turn, wiped out about \$145 million in previously available venture funding. Given all the volatility, new venture investments became frozen. Even with fourth-quarter 2008 losses factored in, however, the New Mexico Private Equity Program outperformed most other state investments that year. The Standard & Poor's 500 Index went down 37 percent in 2008, but the Private Equity Program only dropped three percentage points. The New Mexico Equity Investment Program's venture performance ranked among the best in the country. Of 54 companies that had received funds under the Program, only nine, or 17 percent, failed. That was about one-half the failure rate for such investments nationwide as estimated by the NVCA. In addition, the Program generated more than \$6 from private investment for every \$1 of state capital committed (New Mexico Business Weekly, 2009).

### **D.3 Direct-Investment Funds**

State direct-investment funds receive annual allocations from state legislatures. They make direct investments in technology companies. Although this type of fund was once the typical model for many state science and technology agencies, the approach is not used widely today. Public managers have found it difficult to keep trained staff, tough to maintain appropriate investment standards, and impossible to retain the support of their state legislatures. Nonetheless, some states maintain this approach (NASVF, 2006).

One of the largest direct investment funds is the Maryland Venture Fund (MVF). The MVF was started in 1994, and was considered a leader among state-run funds. About 35 other states have venture funds of some kind, but none is as large as the Maryland Fund. Most state direct-investment funds are associated with university-based research centers, such as those in California and Massachusetts, and offer much smaller equity investments, focusing on technology transfer from their research institutions.

As of 2005, the MVF invested about \$50 million in more than 100 Maryland companies and returned nearly \$60 million from more than a dozen exits. It had an active portfolio of about 50 venture investments in the biotechnology and information technology sectors.

In late 2005, the MVF was reorganized into three separate funds; two of the three funds required one-to-one or three-to-one investor matches. For example, the Challenge Investment Fund required a one-to-one match and offered investments up to \$50,000 each as seed money in technology-driven Maryland companies. The Enterprise Investment Fund required a three-to-one investor match and enables the state to make direct equity investments (buy stock in the investment range



from \$150,000 to \$500,000) in early stage Maryland companies.<sup>17</sup> The MVF attracted more than \$1 billion in private equity and created more than 1,500 jobs. The fund yielded an estimated annual rate of return of 20 percent.<sup>16</sup>

The MVF has been a self-sustaining program, using windfalls created when its companies are bought or go public to make new investments in businesses needing cash for growth. The recession, however, eliminated most opportunities for those companies to be sold, and thus, the fund could not make money to invest. Without new investment returns or state support, the fund was projected to be virtually empty in 18 months (*Baltimore Business Journal*, 2009). ●

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<sup>17</sup> See <http://www.choosemaryland.org/aboutdbed/documents/programreports/2006/04-fy2006mdventurefundannualreport.pdf>





## V. Venture Capital Investment in Environmental and Clean Technologies

This Chapter provides an overview of venture capital investment in environmental and clean technologies. The definition of an environmental technology has evolved over the past 15 years. A history of this evolution and the definitions of environmental technology and clean technology are presented. There is overlap between the two definitions, although from a venture capital investment perspective, environmental technologies sometimes are considered part of the more general definition of clean technologies. An explanation is presented about how the investment community monitors and tracks clean technology investments. This Chapter also provides some past, current, and predicted trends for clean technology investments. The final sections address investment measurement metrics.

### A. Evolving Definitions of Environmental Technology and Clean Technology

The definitions of environmental technology and clean technology have changed over the past 15 years. Traditionally, environmental technologies were viewed as a diverse range of equipment, services, and resources. In 1995, the White House National Science and Technology Council (NSTC), in its report *Bridge to a Sustainable Future: National Environmental Technology Strategy*, defined environmental technology as:

A technology that reduces human and ecological risks, enhances cost effectiveness, improves process efficiency, and creates products and processes that are environmentally beneficial or benign. The word 'technology' is intended to include hardware, software, systems, and services. Categories of environmental technologies include those that avoid environmental harm, control existing problems, remediate or restore past damage, and monitor and assess the state of the environment (NSTC, 1995).

In 2007, the Department of Commerce's International Trade Administration (ITA) defined environmental technologies as "goods and services that advance sustainable development by reducing risk, enhancing cost effectiveness, improving process efficiency, and creating products and processes that are environmentally beneficial or benign." For ITA, the Environment Technology Sector included: air, water, and soil pollution control; solid and toxic waste management; site remediation; and environmental monitoring and recycling. ITA found that environmental technology comprises four major categories:

- ❖ Monitoring and Assessment—Technologies used to establish and monitor the condition of the environment.
- ❖ Pollution Avoidance—Equipment and processes used to prevent or minimize the generation of pollutants.
- ❖ Pollution Control—Technologies that render hazardous substances harmless before they enter the environment.
- ❖ Remediation and Restoration—Technologies used to render hazardous substances harmless.

Water equipment and chemicals and air pollution control represented the largest percentage of the U.S. environmental technology equipment market, wastewater treatment and solid waste management represented the largest percentage of the U.S. environmental technology services market, and water utilities and resource recovery represented the largest percentage of the U.S. environmental technology resources market (ITA, 2007a).

Clean technology advocates view the metamorphosis of the Environmental Technology Sector into the Clean Technology Sector much as many environmentalists view sustainability as the new form of environmental protection. This new view of environmental technology has been adopted and promoted by Environmental Entrepreneurs (E2), an affiliate of the Natural Resources Defense Council (NRDC) (see Chapter VI, Section D.1).

Given the expansive shift in the definition of environmental technology, some generic questions by technology advocates have been raised. What is clean technology or the Clean Technology Sector and how does it relate to environmental technologies? Is clean technology an industry, sector, investment theme, or application? Most investors believe clean technology is neither a sector nor an industry but rather an investment theme or category.

One of the most cited definitions of clean technology is offered by the Cleantech Group:

Cleantech is any knowledge-based product or service that improves operational performance, productivity, or efficiency; while reducing cost, inputs, energy consumption, waste, or pollution.<sup>18</sup>

The Cleantech Group<sup>19</sup> categorizes clean technology investments into 11 segments:

- ✧ Agriculture
- ✧ Air & Environment
- ✧ Energy Efficiency
- ✧ Energy Generation
- ✧ Energy Infrastructure
- ✧ Energy Storage
- ✧ Manufacturing & Industrial
- ✧ Materials
- ✧ Recycling & Waste
- ✧ Transportation
- ✧ Water & Wastewater

**Appendix B** contains more detailed definitions of these clean technology segments with example technologies. It is worth noting that beyond traditional environmental technologies such as air and environment, recycling and waste treatment, and water and wastewater, several clean technology segments also include environmentally related technologies such as agriculture (e.g., farm efficiency technologies, natural pesticides), materials (e.g., green chemistry, nanomaterials, and environmentally friendly solvents), and transportation (e.g., hybrid vehicle technology, efficient engines).<sup>20</sup>

In its May 2007 report, *Cleantech Venture Capital: How Public Policy Has Stimulated Private Investment*, E2 and the Cleantech Group defined clean technology as follows:

Cleantech categories encompass a broad range of products and services, from alternative energy generation to wastewater treatment to more resource-efficient industrial processes. Although several of these categories are different, all share a common thread: they use new, innovative technology to create products and services that compete favorably on price and performance while reducing humankind's impact on the environment. To be considered "cleantech," products and services must:

- ✧ Optimize use of natural resources, offering a cleaner or less wasteful alternative to traditional products and services;

<sup>18</sup> See <http://www.Cleantech.com>.

<sup>19</sup> The Cleantech Group is composed of five companies: the Cleantech Network, LLC, a network of 8,000 Cleantech investors and 9,500 companies and professional services worldwide; Cleantech Advisors; Cleantech Indices; Cleantech Search; and Cleantech China. A full description of each of these Cleantech Group companies is available at <http://www.Cleantech.com>.

<sup>20</sup> The Cleantech Group collects and defines its venture capital data slightly differently than NVCA and PricewaterhouseCoopers in the *MoneyTree* Report. The Cleantech Group divides the United States into seven regions (i.e., Midwest, Northeast, Northwest, Southwest, Southeast, Rockies/Plains, and West Coast) and uses three investment rounds or stages of funding (i.e., seed stage, first round, and expansion stage investments).

- ✧ Have their genesis in an innovative or novel technology or application; and
- ✧ Add economic value compared to traditional alternatives (Stack, et al., 2007).

The Cleantech Group pointed out that there is a difference between how entrepreneurs and investors view clean technology. The Cleantech Group explained that clean technology is not environmental technology and offers the distinctions identified in **Figure 15**.

**Figure 15. Environmental Technology Versus Clean Technology<sup>21</sup>**

<b>Environmental Technology 1980s – 1990s</b>	<b>Clean Technology 1990s – 2000s</b>
Regulatory driven market	Economic market drivers
Compliance-based purchasing	Productivity-based purchasing
“End-of-pipe” technologies, e.g., scrubbers on smoke stacks	“Front-of-pipe” technologies, e.g., zero emission plants
Chemical science	Biological and material science
Traditional engineering	Systems design and engineering
Slow growth markets, e.g., waste management	Rapid growth markets, e.g., solar energy
“Save the world” mentality	“Entrepreneurial” mentality
Low information technology use	High use of information technology

Source: Parker, 2006

In August 2007, the Department of Commerce’s U.S. Commercial Service, a federal agency dedicated to helping small-to-medium sized companies with their exporting strategies, announced its 2007 Clean Technology Initiative to promote the export of U.S. clean technology, products, and services. In its announcement, the U.S. Commercial Service defined clean technology as:

Technology that optimizes the use of resources while reducing ecological impacts and increasing economic performance. Clean technology covers a broad scope of industries, including those related to energy, water, materials, transportation, and design/planning.

According to the U.S. Commercial Service, there was a series of converging factors creating export opportunities for clean technology companies in overseas markets. In the United States, a number of economic and policy factors were driving explosive growth in the Clean Technology Sector, including long-term energy price projections and supply security, recent advances in critical technologies (such as energy technology and nanotechnology), developing regulatory regimes, growing consumer demand for more innovative products, opportunities for profit through greater efficiencies, and growing scarcity of raw materials in some industries. Industry sources saw international markets as being critical to the growth of the Clean Technology Sector in the United States. In particular, the break-neck economic growth of both India and China was creating imperatives that were, in turn, generating growing demand for clean technology.

The U.S. Commercial Service found that the San Francisco Bay Area, with San Francisco at its epicenter, was well poised as a gateway for linking growing U.S. capacity in the Clean Technology Sector to developing markets overseas. With its national laboratories, university research centers, extensive venture capital and financial industry assets, highly entrepreneurial business culture, and supportive municipal and regional policies, the region generated and/or attracted a wide and deep range of clean technology firms (ITA, 2007b).

<sup>21</sup> Venture capital data for the Cleantech Group are collected from a variety of sources, including Dow Jones VentureOne, Thomson Financial VentureXpert, investor member announcements, news wires, press releases, and company and government Websites. Venture capital activities in the United States and Canada have been tracked from 1999 to the present. See Parker, et al., 2006: *A Year of Expansion*, for more information.

## B. Tracking Clean Technology Venture Capital Investments

Since the early 2000s, venture capital investments in environmental and energy technologies have been collectively tracked as investments in clean technologies. Background information on how the definition of environmental technology has evolved and currently is being used is described below. Currently, the most up-to-date and routine tracking of venture capital investments in clean technologies is provided by two national associations—the Cleantech Group and the NVCA and PricewaterhouseCoopers through the *MoneyTree* Report.

There are differences between how these two associations track clean technology venture capital investments. Reasons for the differences have not been definitively established but may include: the source of data—the Cleantech Group receives data from the Dow Jones Group, and the *MoneyTree* Report is based on data from Thomson Reuters; industry affiliation—the Cleantech Group’s focus is exclusively on clean technology investors and the *MoneyTree* Report covers a wide range of investors from biotechnology to Internet-related technologies; and geographic conditions—the Cleantech Group covers clean technology investments internationally and the *MoneyTree* Report covers investments in the United States only.

The Cleantech Group offers membership-only database access, while the *MoneyTree* Report offers free quarterly information on venture capital investments. The Cleantech Group only has been tracking clean technology data since 2002; although *MoneyTree* only has begun publicly reporting on Clean Technology Sector investments in the past year, it has collected clean technology investment data since 1995. **Figure 16** highlights some of the differences between how *MoneyTree* and Cleantech Group classify and report data on clean technology investments.

**Figure 16. Venture Capital Investment Classifications—*MoneyTree* Versus Cleantech Group**

Subject	<i>MoneyTree</i>	Cleantech Group
Industry Classifications	17 classifications <sup>22</sup> (clean technology is defined as a sector, not an industry classification)	Clean Technology Sector only
Sectors	- Clean Technology - Internet Specific - Life Sciences	Clean Technology Sector only
Industry Segments	No industry segments identified	11 industry segments <sup>23</sup>
Geographic Regions	18 United States regions <sup>24</sup>	12 international regions (United States – 7 regions; Canada – 2 regions; Europe, Middle East, and China) <sup>25</sup>
Stages of Development	- Seed/Start-Up - Early - Expansion - Later	- Seed - First Round - Follow-up or Expansion
Investment Focus	United States only	United States, Canada, Europe, Asia, and the Middle East

<sup>22</sup> Biotechnology, Business Products and Services, Computer and Peripherals, Consumer Products and Services, Electronic/Instrumentation, Financial Services, Healthcare Services, Industrial/Energy, IT Services, Media and Entertainment, Medical Devices and Equipment, Networking and Equipment, Retailing/Distribution, Semiconductors, Software, Telecommunications, and Other.

<sup>23</sup> The Clean Technology Sector is defined as a combination of 11 industry segments composed of 7 environmental technologies (transportation, water & wastewater, air & environment, materials, manufacturing/industrial, agriculture, and recycling & waste) and four energy technologies (energy generation, energy storage, energy infrastructure, and energy efficiency).

<sup>24</sup> Alaska/Hawaii/Puerto Rico, Colorado, DC/Metroplex, LA/Orange County, Midwest, New England, New York Metro, North Central, Northwest, Philadelphia Metro, Sacramento/Northern California, San Diego, Silicon Valley, South Central, Southeast, Southwest, Texas, and Upstate New York.

<sup>25</sup> West Coast, Northeast, Southwest, Midwest, Southeast, Northwest, Rockies/Plains, Western Canada, Eastern Canada, Europe, Middle East, and China.

NVCA publicly reports venture capital investments in the *MoneyTree* Report, whereas the Cleantech Group data are available on a membership and subscription basis only. NVCA has adopted the Cleantech Group definition of what business segments comprise the Clean Technology Sector, but the *MoneyTree* Report does not identify clean technology investments quarterly because this definition crosses several *MoneyTree* industry classifications such as the Industrial/Energy, Biotechnology, Electronics/Instrumentation, and Other classifications. Given the recent number of investments made in clean technology, *MoneyTree* does report separately these investments annually, along with investments in the Life Sciences Sector (i.e., Biotechnology and Medical Device Classifications) and the Internet-related Sector (a collection of several industry classifications).

Based on *MoneyTree* data, NVCA reported significant declines in venture capital investments across most industry classifications (including Clean Technology, Life Sciences, and Software) during 2009. The *Moneytree* Report for 2009 reported double-digit declines in investment dollars for the year in all industry categories except Networking and Equipment and Other. Despite 2009 investment declines of 19 percent in both dollars and deals, Biotechnology was the single largest investment sector for that year, with \$3.5 billion going into 406 deals. The Medical Devices and Equipment Sector finished the year as the third largest sector, with \$2.5 billion going into 309 deals—a 27 percent drop in dollars and a 19 percent decline in deals. Overall, the Life Sciences Sector (Biotechnology and Medical Devices and Equipment combined) accounted for 34 percent of total venture capital dollars invested in 2009 compared to only 28 percent in 2008.

For 2009, the Software Sector remained the largest single industry category in terms of deal volume and second largest behind Biotechnology in terms of dollars. Venture capitalists invested \$3.1 billion into 619 Software deals, a 40 percent decline in dollars and a 35 percent drop in deals from 2008, when \$5.1 billion went into 948 deals.

The 2009 *Moneytree* Report also indicated that the Clean Technology Sector experienced a significant decline in 2009, with \$2.2 billion invested in 209 deals. This investment level represents a 47 percent decrease in dollars and a 28 percent decline in deal volume from 2008, when \$4.1 billion was invested in 290 deals. Clean technology investing accounted for 12 percent of all venture capital dollars in 2009, compared to 15 percent in 2008. In the fourth quarter of 2009, venture capitalists invested \$198 million into 33 clean technology deals, which is a 38 percent drop in dollars and a 50 percent decline in deals from the third quarter of 2009, when \$322 million went into 66 deals. Clean technology crosses traditional *MoneyTree* industrial categories and basically includes alternative energy, pollution control and recycling, and power supplies and conservation (NVCA, 2010a).

**Figure 17** provides an overview of clean technology investments from 1995 to 2009. Although clean technology investments rose dramatically from 2007 to 2008, the decline in 2009 put them below their 2007 level. This trend also was evident in overall venture capital investments.

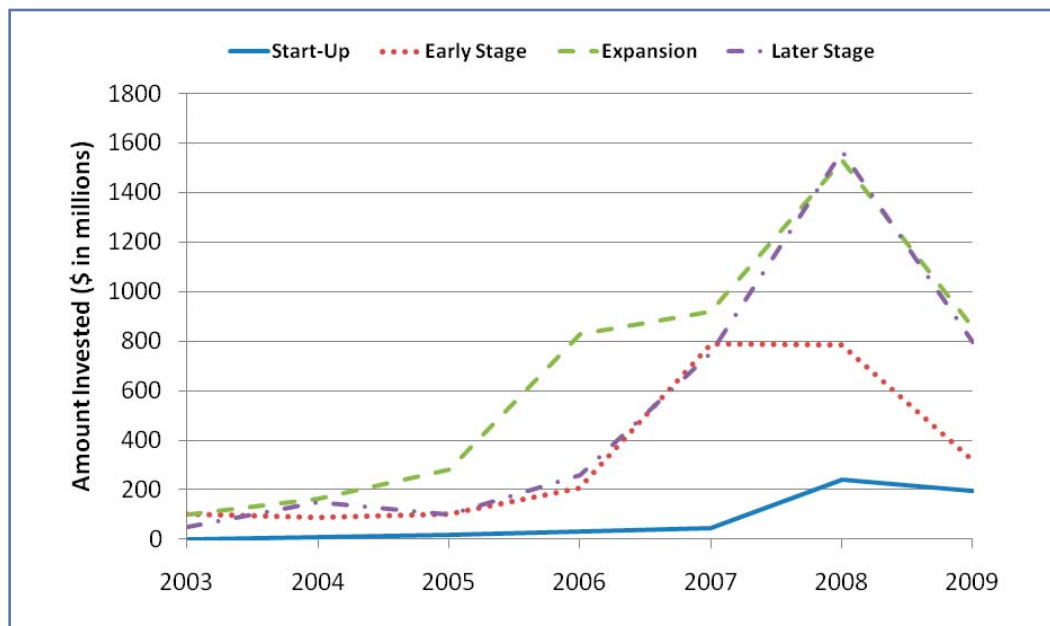
In their September 2008 report, *The Exit Slowdown and the New Venture Capital Landscape*, PricewaterhouseCoopers and NVCA concluded that clean technology investments in the expansion and later stages of development were growing (PricewaterhouseCoopers and NVCA, 2008). They found that investments in expansion stage companies rose dramatically from 2003 to 2007 (see **Figure 18**). The average deal size nearly tripled in the expansion and later stage investments during this period. Although there were declines in clean technology investments at all stages of development from 2008 to 2009, the expansion and later stage investments still dominated in 2009.

**Figure 17. Clean Technology Investments, 1995–2009**

Year	Clean Technology Investments (\$ in Millions)	No. of Clean Technology Deals	Average Investment Per Deal (\$ in Millions)
1995	76.7	36	2.1
1996	146.7	46	3.2
1997	147.4	47	3.1
1998	123.3	37	3.3
1999	216.9	39	5.6
2000	606.6	48	12.6
2001	346.0	56	5.9
2002	375.1	68	5.5
2003	261.5	63	4.2
2004	434.1	86	5.0
2005	502.4	92	5.5
2006	1,597.4	147	10.9
2007	2,701.2	247	10.9
2008	4,116.0	290	14.2
2009	2,170.4	209	10.4

Source: NVCA, 2010c

**Figure 18. U.S. Venture Capital-Backed Clean Technology Investments by Stage of Development, 2003–2009**



Source: PricewaterhouseCoopers and NVCA, 2008; NVCA, 2010a



## C. National Investment in Environmental and Clean Technologies

In 1995, the National Science and Technology Council, a White House group created to enhance technology collaboration and reduce barriers, found that financial uncertainty and a high level of risk limited the availability of investment capital for environmental technologies. Although the environmental technology industry at that time was larger than many other sectors of the U.S. economy, the NSTC found it attracted very little private capital.

Based on data collected on venture capital investments in environmental technologies in the early 1990s, the NSTC found that only about \$31 million in venture capital was invested in conventional control and remediation technologies in 1993, and these investments supported just 12 firms. By 1994, venture capital environmental technology investments dropped to \$25 million, invested in fewer than 10 companies, and this level of investment was expected to continue to decline. The NSTC concluded that a number of reasons accounted for the environmental technology industry's tendency to repel capital. They found that government environmental policies and regulations were important drivers of the market, but the timing and size of current and future markets often were a function of the specifics of regulation, including the timetable for new regulations, the stringency of current standards, and their enforcement (NSTC, 1995).

Although there are much more optimistic data about environmental technology investments today, these investment levels are small compared to those for clean technology energy-related technologies. The clean technology category currently offers a good approximation for venture capital support for environmental technology. Although the clean technology category is dominated by four energy segments (i.e., energy generation, energy infrastructure, energy storage, and energy efficiency), and energy-related investments have led other segments for the past 2 years, there has been some encouraging growth in certain environmental technology segments.

In 2007, the Cleantech Group reported that U.S. and Canadian investments in clean technologies surged. Based on data compiled for 2005 and 2006, the Cleantech Group found that energy-related technology investments jumped to a total of \$2.14 billion, almost three times the amount invested in 2005, and 33 percent greater than the investment total for the entire clean technology industry in 2005. In addition, the Cleantech Group found that environmental technology investments in areas such as recycling and waste and transportation (e.g., hybrid vehicles), also rose from 2005 to 2006 (Stack, et al., 2007).

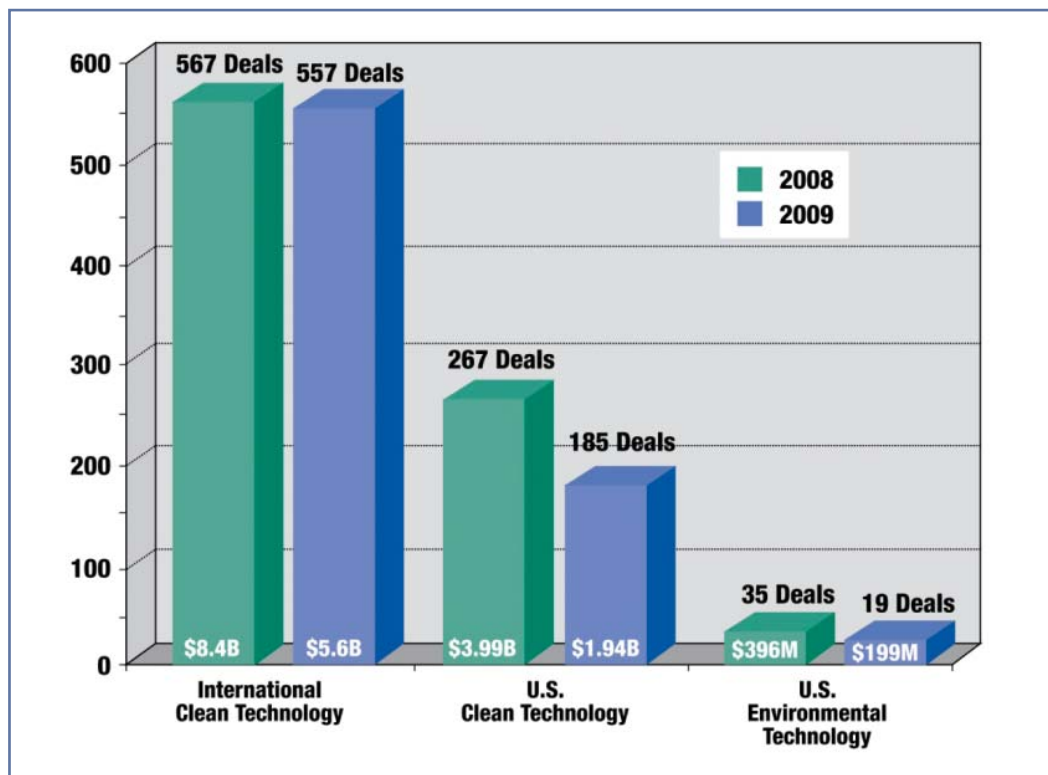
Although U.S. clean technology investments were down in 2009 compared to 2008, international clean technology investments as reported by the Cleantech Group were not as severely affected. **Figure 19** depicts clean technology and environmental technology investments for 2008 and 2009. The U.S. environmental technology investments comprise venture capital investments in pollution and recycling related equipment such as air filters and air purification equipment, chemical and solid material recycling, and water treatment equipment and waste disposal systems.<sup>26</sup>

**Figure 20** provides more information on the industry subcategories in which the 2008 and 2009 environmental technology investments were made. Although 2009 overall environmental technology investments fell dramatically, there continued to be strong interest in water treatment and waste disposal systems, with the number of deals in this category actually rising from 2008 to 2009 (i.e., 8 to 12 deals) with a small decrease (about 6%) in investments.<sup>27</sup>

<sup>26</sup> Industry analysis is based on Venture Equity Investment Codes (VEICs) described in the NVCA 2009 Yearbook, Appendix D. The Clean Technology Sector is based on *Moneytree* Report classifications in Energy Related (6000 series) and Industrial Products (8000 series), while the Environmental Technology sector is based on investments in the 8500 series.

<sup>27</sup> The 8500 series is subdivided into four industry subcategories: 8510 – Air Filter & Air Purification & Monitoring Equipment; 8520 – Chemical and Solid Material Recycling; 8530 – Water Treatment Equipment & Waste Disposal Systems; and 8599 – Other Pollution & Recycling Related.

**Figure 19. Clean Technology and Environmental Technology Investments, 2008–2009**



Source: NVCA, 2010a (U.S. data) and Cleantech Group, 2009 (International data)

**Figure 20. Environmental Technology Investments by Industry Subcategory, 2008–2009**

Industry Subcategory	2008 Deals	2009 Deals	2008 Investments (\$ in millions)	2009 Investments (\$ in millions)
Air Filters and Air Purification & Monitoring Equipment	5	2	\$21.4	\$4.65
Water Treatment Equipment & Waste Disposal Systems	8	12	\$51.6	\$48.5
Chemical and Solid Waste Recycling	19	4	\$282.2	\$117.1
Other Environmental Related	3	1	\$40.5	\$28.3
<b>Total</b>	<b>35</b>	<b>19</b>	<b>\$395.7</b>	<b>\$198.6</b>

Source: NVCA, 2010a

Figure 21 depicts how the 2008 and 2009 environmental technology investments were distributed among states. Although the total number of states in which investments were made fell sharply from 2008 to 2009 (i.e., 13 to 8 states), California continued to lead all states in the total number of deals during this period (i.e., 16 over 2 years) and closely followed Florida in total environmental technology investments (i.e., \$121 million versus \$134 million over 2 years).

In December 2009, the NVCA released the results of its *Venture View: 2010*, NVCA's annual predictions survey. According to survey respondents, the venture industry would begin to see gradual increases in investment levels and exit transactions in 2010, but the asset class would continue to shrink in size over the next 5 years. Specific areas of optimism included clean technology investing, growth equity and later stage companies, and ongoing opportunities overseas. In releasing the survey results, Mark Heesen, NVCA President, said, "It is readily understood by the venture capital community that our industry is going to contract in size going forward. That will mean fewer firms, for sure, but not necessarily fewer companies funded. There is a great deal of innovation taking place and

**Figure 21. Environmental Technology Investments by State, 2008–2009**

State	2008 Deals	2009 Deals	2008 Investments (\$ in millions)	2009 Investments (\$ in millions)
California	7	9	\$78.35	\$42.76
Pennsylvania	4	3	\$76.04	\$13.66
New York	5	3	\$60.50	\$28.55
Illinois	2	–	\$59.50	–
Florida	1	1	\$34.00	\$100.0
Michigan	2	–	\$25.50	–
Washington	5	–	\$20.68	–
New Mexico	1	–	\$19.00	–
Massachusetts	3	2	\$15.35	\$12.48
Kansas	1	–	\$3.75	–
Colorado	1	–	\$2.00	–
Ohio	2	1	\$0.99	\$1.14
Maryland	1	–	\$0.08	–
<b>Total</b>	35	19	\$395.7	\$198.6

Source: NVCA, 2010a

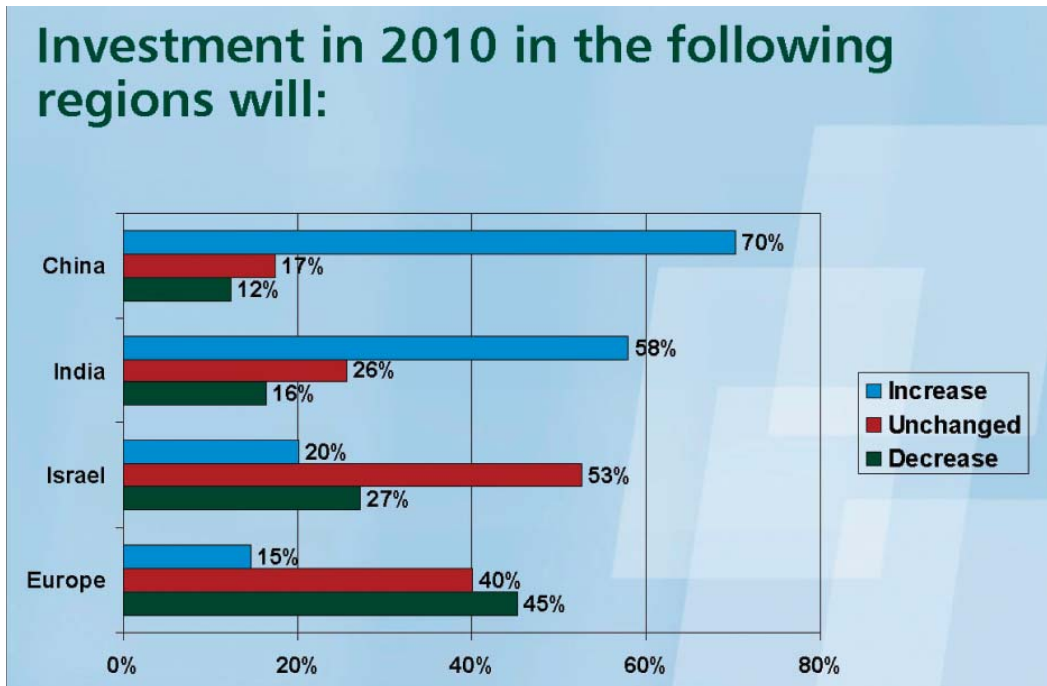
venture capitalists who have the track record to raise funds will be well positioned to build companies. Most venture capitalists will agree that a smaller industry is a better one” (NVCA, 2009b).

Figures 22 and 23 present some of the prediction results from the survey. As illustrated in the figures, most survey respondents (70%) believed that venture capital investments in China would rise, whereas only 12 percent believed they would fall in 2010. Likewise, 54 percent of the respondents predicted that clean technology investments would rise in 2010, whereas 26 percent believed they would fall.

In 2007, similar conclusions about the growth potential of the Clean Technology Sector were made in the report, *Cleantech Venture Capital: How Public Policy Has Stimulated Private Investment* by E2 and the Cleantech Group (Stack, et al., 2007). Focusing on the connection between clean technology and public policies at both the national and state levels, the report found that the current U.S. advantage in clean technology is a huge asset and one that must be protected and cultivated carefully. The report’s major findings were:

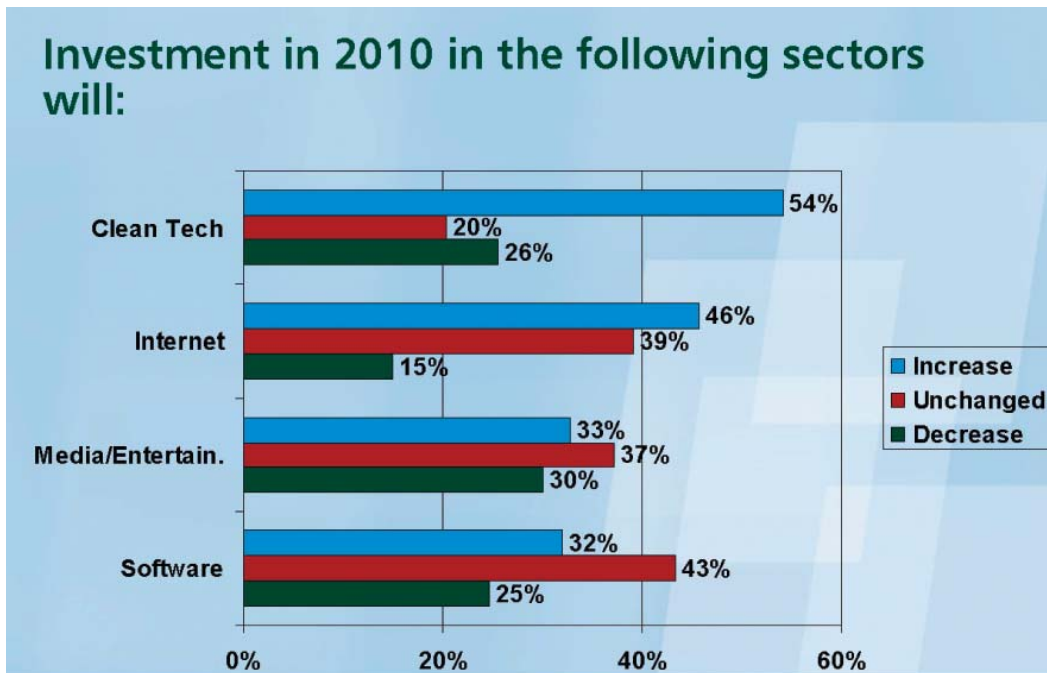
- ✧ Growth in the Clean Technology Sector accelerated in 2006, with significant activity in the public market (e.g., the creation of the Cleantech Capital Indices in the stock market).
- ✧ Energy prices, entrepreneurial talent, and advances in technology are industry factors accelerating growth (e.g., high oil prices, expertise from the Biotechnology and Information Technology Sectors, and nanomaterials advances) in the Clean Technology Sector.
- ✧ Public policies at the national and state levels have accelerated clean technology growth (e.g., U.S. federal and state efforts to promote ethanol, state renewable portfolio standards promoting renewable electricity generation).
- ✧ Climate change is beginning to influence growth in clean technology (e.g., governors of 10 states established the Regional Greenhouse Gas Initiative [RGGI], the country’s first mandatory cap and trade program for participating states).
- ✧ Clean technology can create thousands of new jobs (e.g., the Renewable Energy Sector generates more jobs per megawatt of power installed, per unit of energy produced, and per dollar of investment than the Fossil Fuel-Based Energy Sector) (Stack, et al., 2007).

**Figure 22. Predicted 2010 International Venture Capital Investments**



Source: NVCA, 2009a

**Figure 23. Predicted 2010 Highest Potential Growth for Sectors**



Source: NVCA, 2009a

Investments in the Clean Technology Sector started to accelerate in 2006. In that year, total U.S. and Canadian clean technology venture investments surpassed those of several leading *MoneyTree* industry categories such as the Medical Devices and Equipment, Telecommunications, and Semiconductor Sectors. The Clean Technology Sector trailed all of these categories in 2005.

In 2006, the Clean Technology Sector became the third largest U.S. and Canadian venture capital investment category (11% of all venture investments), behind Software and Biotechnology.<sup>28</sup> Total U.S. and Canadian venture capital invested in clean technology companies reached \$2.9 billion in 2006, a 78 percent increase over the \$1.6 billion invested in 2005.<sup>29</sup> In another study, the Cleantech Group found that the U.S. economy offered the largest potential for clean technology investments, followed by Europe and Canada.

Following the economic downturn of 2000-2001, the Clean Technology Sector was one of the few U.S. investment categories that experienced real growth. Although U.S. venture capital investments as a whole were down by 33 percent in 2006 compared to 2001, investments in U.S. clean technology companies were up 243 percent in that time—more than two and one-half times the growth rate of the next strongest industry—Electronics/Instrumentation. One study found that clean technology venture capital investments have followed the same trend as other industrial sectors for development stage funding. In 2006, the majority of clean technology investments were in the expansion stage (Stack, et al., 2007).

Although it is common for early stage financing to exceed seed/start-up financing (during early stage financing, companies tend to have a greater need for capital and pose a lower risk for investors), the tremendous magnitude of expansion financing seen in 2006 was viewed by some venture capital firms as an indication that clean technology initial public stock offerings would be forthcoming in the next few years, as companies graduate from later stage financing to public financing. The comparative lack of seed/start-up financing suggested that some early stage clean technology companies still were struggling to reach the point where significant venture investments become possible. Some venture capitalists claimed that more proactive public policies could play an important role in helping new clean technology companies caught in this funding dilemma to survive (Stack, et al., 2007).

## D. Regional and State Investments in Clean Technologies

As seen in **Figure 24**, the majority of venture capital investment in all sectors from 2007 to 2009 was made in two U.S. geographic regions—the West Coast (Silicon Valley [i.e., Northern California], Los Angeles/Orange County, and San Diego) and the Northeast (Boston area and other New England states). The combination of these regions accounted for more than 60 percent of all the venture capital investments for 2007 to 2009; California alone accounted for nearly 50 of the total investments for each of these years.

According to the Cleantech Group, in 2006, the West Coast led the way in clean technology venture investments, bringing in a total of \$1.13 billion (including \$510 million in the third quarter alone), a 127 percent increase from its 2005 total. Although the West Coast greatly outperformed the Northeast region in 2006, the 2005 investment data showed that the Northeast region was catching up to the West Coast, trailing it by less than 20 percent in total clean technology investments (Stack, et al., 2007).

<sup>28</sup> The United States represents the majority of the North American Cleantech investment, about 87.5 percent. Elsewhere in their report, Stack, et al., acknowledge that in 2006, Canada invested \$320 million and the United States invested \$2,540 million of the approximately \$2.9 billion total North American Cleantech investment.

<sup>29</sup> This finding is generally consistent with the NVCA and PricewaterhouseCoopers announcement, based on *MoneyTree* data, for the second quarter of 2007, when the Cleantech Sector had the third largest amount of venture capital investments behind Software and Life Sciences (Biotechnology and Medical Devices).

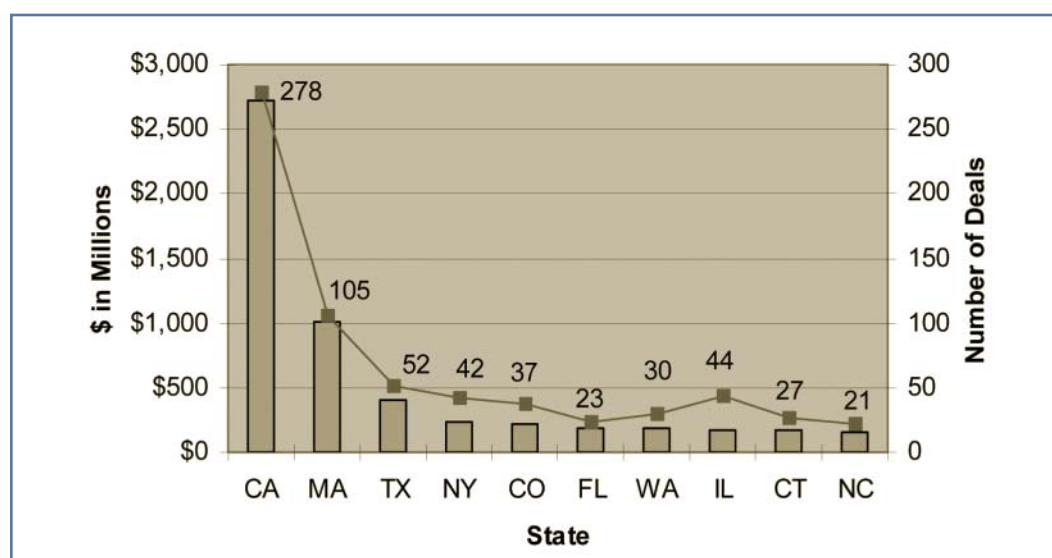
**Figure 24. U.S. Regional Total Venture Capital Investment Trends, 2007–2009**

Region	2007 (\$ in Millions)	2008 (\$ in Millions)	2009 (\$ in Millions)
Silicon Valley	\$11,024	\$10,728	\$6,984
New England	\$3,893	\$3,307	\$2,113
NY Metro	\$1,695	\$1,975	\$1,416
Southeast	\$2,038	\$1,219	\$986
LA/Orange County	\$1,620	\$2,010	\$954
San Diego	\$1,992	\$1,192	\$903
Midwest	\$1,216	\$1,278	\$721
Northwest	\$1,715	\$1,076	\$705
Texas	\$1,468	\$1,288	\$645
DC/Metroplex	\$1,271	\$985	\$540
Colorado	\$610	\$837	\$529
Philadelphia Metro	\$844	\$754	\$424
North Central	\$589	\$618	\$369
Southwest	\$549	\$466	\$314
South Central	\$106	\$79	\$24
Upstate NY	\$137	\$90	\$18
Sacramento/N. Cal	\$100	\$69	\$17
AK/HI/PR	\$21	\$21	\$7
<b>Total</b>	<b>\$30,888</b>	<b>\$27,992</b>	<b>\$17,669</b>

Source: NVCA, 2010a

From 1999 to 2005, California alone attracted nearly \$3 billion of clean technology venture capital and Massachusetts about \$1 billion. **Figure 25** illustrates the significant lead these two states had over the other states in the top 10 for clean technology investments. California also hosted the most venture-backed clean technology companies of any state or region. The U.S. Commercial Service concluded that California appeared to be a natural host for a clean technology regional cluster,

**Figure 25. Top 10 States for Clean Technology Venture Capital Investment, 1999–2005**



Source: NASVF, 2006

possessing many of the necessary ingredients, including: a thriving technology base, abundant entrepreneurial and management talent, access to capital, and a proactive environmental public policy. In a 2004 E2/NRDC survey, venture capitalists were asked to name the one place worldwide that is the most attractive for clean technology/clean energy investment. California received nearly twice as many mentions as any other state, region, or country (Burtis, et al., 2006a).

As **Figure 26** indicates, California's clean technology activity during the period 1999-2005 was focused around four sectors: Energy-tech, Materials & Nanotechnology, Manufacturing/Industrial, and Enabling Technologies. The second largest region for clean technology investments was the Northeast region, comprising 11 states and Washington, DC (see **Figure 27**).

As with other venture capital investments, the Boston area leads the other northeast states and Washington, DC, in clean technology investments. Like California, Massachusetts (Boston area) includes several world-class universities—Harvard University, the Massachusetts Institute of Technology, Boston University, Northeastern University, and the University of Massachusetts. Many of these schools maintain leading programs in fields relevant to clean technology, such as engineering, energy, biology, and computer science. Because Boston has an extensive financial services industry, local capital is abundant, and Massachusetts, like California, has proactive environmental public policies. Massachusetts has a Renewable Portfolio Standard, which mandates that 4 percent of state-wide electricity generation must be derived from renewable sources by 2009, with the percentage increasing by 1 percentage point each year. Massachusetts also has several innovative financing mechanisms to foster clean technology start-ups (e.g., Massachusetts Renewable Energy Trust,<sup>30</sup> Massachusetts Green Energy Fund,<sup>31</sup> and the Sustainable Energy Economic Development Initiative<sup>32</sup>).

Outside of the Boston area, the second sub-region within the Northeast that has supported clean technology investments encompasses New York, Connecticut, New Jersey, and Pennsylvania. Of the 119 Northeastern clean technology companies that received venture funding from 2001 to 2005, 43 were in Massachusetts and 52 were in New York, Connecticut, New Jersey, and Pennsylvania combined (Burtis, et al., 2006b).

According to the Cleantech Group, clean technology investments in the Northeast region were growing and could be expected to receive much larger capital flows as the region's clean technology companies mature. As in California, the Northeast's clean technology cluster was centered on energy. Energy technology companies received 41 percent of clean technology venture capital funding in 2005. Materials (including nanotechnology) were second at 24 percent, with Manufacturing/Industrial receiving 10 percent (Stack, et al., 2007).

From 2001 to 2005, a higher percentage of investors putting money into clean technology companies were headquartered in the Northeast rather than in California (29% vs. 21%). In 2005, the Northeast received \$410 million in clean technology venture capital funds. Massachusetts received \$247 million in 28 financings, and the combined four-state region around New York received \$64 million in 21 financings. The smaller average deal size for the New York-area cluster reflected a higher prevalence of early stage company start-ups, especially in New York State (Burtis, et al., 2006b).

The third largest U.S. region for clean technology investments, according to the Cleantech Group, was the Midwest Region (e.g., Michigan, Illinois, and Indiana). In 2005, this region contained 75 clean technology venture-backed companies in 11 states and received \$190 million in 30 clean technology venture capital financings, which was up 129 percent from reported 2004 activity of \$83 million in 11 financings. Of the Midwestern states, Illinois led the pack with \$50 million received, followed by Indiana at \$41 million and Michigan at \$28 million.

<sup>30</sup> See <http://www.masstech.org/renewableenergy/index.html> for details on the Massachusetts Renewable Energy Trust.

<sup>31</sup> See <http://www.massgreenenergy.com/> for details on the Massachusetts Green Energy Fund.

<sup>32</sup> See <http://www.mtpc.org/seed/index.asp> for details on the Sustainable Energy Economic Development Initiative.

**Figure 26. California Clean Technology Cluster Composition**

	Unique VC-funded Companies <u>2001-2005</u>	2005 VC \$ Raised (\$MM)	2005 VC Financings
Energy-tech	45	\$181	21
Materials & Nanotechnology	22	\$100	9
Manufacturing/ Industrial	14	\$29	3
Enabling Technologies	12	\$52	4
Materials Recovery and Recycling	7	\$18	2
Water Purification & Management	7	\$31	5
Agriculture & Nutrition	5	\$16	3
Air Quality	4	\$37	6
Environmental IT	4	\$18	3
Transportation & Logistics	4	\$2	1
	<b>124</b>	<b>\$484 MM</b>	<b>57</b>

Clean technology companies in California have included:

SEGMENT	COMPANY & DESCRIPTION
<b>Energy-tech</b>	<b>eLite Optoelectronics</b> (Sunnyvale) <i>Energy Efficiency</i> Developer of high power indium gallium nitride light emitting diodes used in various solid state lighting applications.
	<b>Nanosolar, Inc.</b> (Palo Alto) <i>Energy Generation</i> Developer of cost-efficient solar panels with novel high-volume production technology.
	<b>PowerGenix Systems</b> (San Diego) <i>Energy Storage</i> Developer of high discharge rate rechargeable nickel-zinc (NiZn) batteries.
<b>Materials &amp; Nanotechnology</b>	<b>Sub-One Technology</b> (Livermore) Developer of high performance carbon film coatings for interior surfaces, improving existing in-service life expectancy of high-wear critical components.
	<b>Yulex Corporation</b> (Carlsbad) Manufacturer and marketer of a safe, natural rubber latex for medical products.
<b>Enabling Technologies</b>	<b>Crossbow Technology Inc.</b> (San Jose) Provider of wireless sensor networks for applications such as environmental monitoring.
	<b>NeoPhotonics Corporation</b> (San Jose) Developer & manufacturer of optical components for industries including electronic and photonic materials, energy storage, and the manufacture of catalysts, ceramics, and semiconductors.
<b>Manufacturing/ Industrial</b>	<b>SpectraSensors, Inc.</b> (San Dimas) Manufacturer of laser and LED-based gas sensors for industrial, energy, and environmental applications.

Source: Burtis, et al., 2006b



**Figure 27. Northeast Clean Technology Cluster Composition**

	<b>VC-funded Companies 2001-2005</b>	<b>2005 VC \$ Raised (\$MM)</b>	<b>2005 VC Financings</b>
<b>Energy-tech</b>	41	\$168	27
<b>Materials &amp; Nanotechnology</b>	19	\$99	11
<b>Manufacturing/ Industrial</b>	14	\$43	4
<b>Agriculture &amp; Nutrition</b>	10	\$23	4
<b>Water Purification &amp; Management</b>	8	\$4	3
<b>Materials Recovery and Recycling</b>	7	\$25	2
<b>Air Quality</b>	6	\$13	4
<b>Enabling Technologies</b>	6	\$0	0
<b>Transportation &amp; Logistics</b>	5	\$36	3
<b>Environmental IT</b>	3	\$0	0
	<b>119</b>	<b>\$410 MM</b>	<b>58</b>

Clean technology companies in the Northeast have included:

<b>SEGMENT</b>	<b>COMPANY &amp; DESCRIPTION</b>
<b>Energy-tech</b>	<b>Evergreen Solar</b> (Marlboro, MA) <i>Energy Generation</i> Developer of thin-film technology for solar photovoltaic cells. Evergreen Solar went public in 2000 and now has a market capitalization of nearly \$1 billion (as of April 23, 2006).
	<b>Franklin Fuel Cells, Inc.</b> (Malvern, PA) <i>Energy Generation</i> Developer of solid oxide fuel cell (SOFC) technology.
	<b>GridPoint, Inc</b> (Washington, DC) <i>Energy Efficiency</i> Provider of intelligent energy management appliances.
	<b>Lilliputian Systems, Inc</b> (Woburn, MA) <i>Energy Generation</i> Developer of a micro-fuel-cell based power supply for handheld electronics.
	<b>Comverge, Inc.</b> (East Hanover, NJ) <i>Energy Infrastructure</i> Provider of energy monitoring and communications software to utilities and energy service companies.
	<b>Materials &amp; Nanotechnology</b>
	<b>Aerogel Composite, LLC</b> (Storrs, CT) Developer of proprietary technologies involving meso-porous carbon aerogel composites.
	<b>ApNano Materials, Inc.</b> (New York, NY) Provider of nanotechnology-based products including the first commercial solid lubricant based on spherical inorganic nanoparticles.
<b>Manufacturing/ Industrial</b>	<b>Sensors for Medicine and Science, Inc.</b> (Germantown, MD) Developer of sensing technology for detection and measurement of molecules.
	<b>Tiger Optics, LLC.</b> (Warrington, PA) Developer of laser-based spectroscopy instruments for detection of trace contaminants in gases.

Source: Burtis, et al., 2006b

Illinois also hosted the most venture-backed clean technology companies, at 22. Like the other regions, the Midwest's largest Clean Technology Sector was Energy-tech, with Manufacturing/Industrial and Materials & Nanotechnology rounding out the top three (Burtis, et al., 2006b). **Figure 28** provides a description of the funded sectors in the Midwest.

**Figure 28. Midwest Clean Technology Cluster Composition**

	<b>VC-funded Companies 2001-2005</b>	<b>2005 VC \$ Raised (\$MM)</b>	<b>2005 VC Financings</b>
<b>Energy-tech</b>	26	\$93	15
<b>Manufacturing/ Industrial</b>	13	\$10	2
<b>Materials &amp; Nanotechnology</b>	12	\$54	4
<b>Materials Recovery and Recycling</b>	7	\$11	3
<b>Agriculture &amp; Nutrition</b>	5	\$6	1
<b>Transportation &amp; Logistics</b>	5	\$0	1
<b>Water Purification &amp; Management</b>	3	\$16	2
<b>Environmental IT</b>	2	\$1	1
<b>Enabling Technologies</b>	1	\$1	1
<b>Air Quality</b>	1	\$-	0
	<b>75</b>	<b>\$190</b>	<b>30</b>

Clean technology companies in the Midwest have included:

<b>SEGMENT</b>	<b>COMPANY &amp; DESCRIPTION</b>
<b>Energy-tech</b>	<b>Hydrogen, LLC</b> (Cleveland, OH) <i>Energy Generation</i> Manufacturer of multi-megawatt fuel cell systems utilizing proprietary, air-cooled phosphoric acid fuel cell technology.
	<b>Iroquois Bio-Energy Company LLC</b> (Rensselaer, IN) <i>Energy Generation</i> Producer of ethanol from corn.
	<b>Tekion, Inc.</b> (Champaign, IL) <i>Energy Storage</i> Developer of an advanced battery technology with a unique micro fuel cell technology.
	<b>Akermin, Inc</b> (St Louis, MO) <i>Energy Generation</i> Developer of portable fuel cells.
<b>Manufacturing/ Industrial</b>	<b>Informance International</b> (Northbrook, IL) Developer of equipment efficiency and utilization analysis software for the manufacturing industry.
	<b>Cool Clean Technologies</b> (Eagan, MN) Provider of carbon dioxide cleaning technology.
<b>Materials &amp; Nanotechnology</b>	<b>Northwest Coatings LLC</b> (Oak Creek, WI) Developer and manufacturer of customized specialty energy-curable and water-based coatings and adhesives that are environmentally friendly and solvent free.
	<b>Nanosphere</b> (Northbrook, IL) Developer of a system for detecting bio-molecules such as nucleic acids and proteins.

Source: Burtis, et al., 2006b

**Appendix F** contains a listing of the total clean technology venture investments by state for the period 1999 to 2005. During this time, the percentage of investments made in clean technology by the top 10 states relative to their total venture capital investments was small, ranging from 2 to 3 percent (see **Figure 29**).

The clean technology investments for the top 10 states for 2008-2009 are listed in **Figure 30**. These 10 states account for more than 90 percent of the investments for each year and about 75 percent of the total number of annual deals. Although there was a decline in clean technology investments during this period, the top five states—California, Massachusetts, Colorado, Washington, and Georgia—continued to lead all of the other states in these investments.

**Figure 29. Top 10 State Investments: Clean Technology Versus Total Venture Capital Investments, 1999–2005**

State	Clean Technology Investment (\$ in millions)	Total Investment (millions)	Percentage
California	\$2,720	\$120,995	2.24%
Massachusetts	\$1,005	\$30,365	3.41%
Texas	\$397	\$16,593	2.39%
New York	\$235	\$15,623	1.50%
Colorado	\$216	\$9,817	2.20%
Florida	\$193	\$6,614	2.92%
Washington	\$180	\$8,377	2.15%
Illinois	\$171	\$5,835	2.93%
Connecticut	\$164	\$3,973	4.13%
North Carolina	\$163	\$5,154	3.16%

Source: NASVF, 2006

**Figure 30. Top 10 States for Clean Technology Investments, 2008–2009**

State	2008 Deals	2009 Deals	2008 Investments (\$ in millions)	2009 Investments (\$ in millions)
California	103	74	\$2,316	\$1,234
Colorado	20	9	\$420	\$42
Massachusetts	32	19	\$288	\$117
Washington	13	5	\$140	\$36
Georgia	7	5	\$116	\$82
Illinois	5	–	\$84	–
Pennsylvania	10	5	\$81	–
New York	9	–	\$74	\$49
New Hampshire	4	–	\$54	–
Maryland	5	–	\$54	–
Florida	–	2	–	\$100
Texas	–	10	–	\$50
Michigan	–	5	–	\$35
Oregon	–	3	–	\$30
<b>Total</b>	<b>208</b>	<b>137</b>	<b>\$3,627</b>	<b>\$1,775</b>

Source: NVCA, 2010a

In **Appendix G** of this Guide, additional information is provided about corporate investments, including those made by bank holding companies and financial services companies, and venture capital investments in clean technologies.

## E. Investment Measurement Metrics

The decision thresholds venture capitalists use to determine how they make their technology investments are varied and complex. Some large institutional investors, such as CalPERS, use a combination of financial and environmental due diligence for their investments. Although its financial due diligence criteria are not publicly disclosed, CalPERS employs a private company, the Environmental Capital Group (ECG), to conduct its environmental due diligence for potential clean technology investments.<sup>33</sup>

Another approach to investment measurement metrics is under development by Kohlberg, Kravis, Roberts and Company (KKR), a large private investment company, and the Environmental Defense Fund (EDF), an environmental advocacy group. As described in more detail in Section E.2 and Chapter VI, in May 2008, KKR and EDF announced the creation of a Green Portfolio Partnership to develop metrics initially for KKR portfolio companies; later, these metrics will be made available to all interested parties. Using these metrics, eight reporting companies have saved more than \$160 million in operating costs and eliminated more than 345,000 metric tons of CO<sub>2</sub> emissions, 1.2 million tons of waste, and 8,500 tons of paper use.<sup>34</sup>

A third more general approach to “drivers” of environmental technology investments was identified in the April 2008 EPA National Advisory Council for Environmental Policy and Technology (NACEPT) report, *EPA and the Venture Capital Community: Building Bridges to Commercialize Technology*.<sup>35</sup> These drivers spanned a range of categories from metrics to policy considerations and market factors. A more detailed description of these drivers is provided below and in the NACEPT report.

### E.1 Environmental Due Diligence

The Environmental Capital Group (ECG) is not an investor or venture capital company. Rather, it is a private advisory firm that works with venture capitalists and other financial managers to provide environmental due diligence, performance monitoring, and reporting services that account for the environmental impacts created by the portfolio companies of interested investors, particularly for investments in clean energy and technology.

A brief description of ECG’s environmental due diligence process is presented below, and a more complete description of the process is contained in **Appendix E**.

The general purpose of the environmental due diligence process is to answer two key questions:

- ❖ If the technologies of the portfolio companies are successfully commercialized, will the fund result in significant net environmental benefits?
- ❖ Does the fund management have the capability and willingness to implement its environmental strategy and measure the resultant environmental benefits?

ECG developed analytical methods to measure and report significant net environmental benefits created by portfolio companies. To analyze net environmental benefits, ECG considers how the “new” process or product compares to the “existing” process or product. This requires an understanding not only of the environmental impacts of the company’s technology, but also of the technology

<sup>33</sup> <http://www.environmentalcapitalgroup.com/>

<sup>34</sup> <http://blogs.edf.org/innovation/2010/06/25/the-green-portfolio-project-achieves-160-million-in-savings-after-two-years/>

<sup>35</sup> [http://www.epa.gov/ocem/nacept/reports/pdf/2008\\_04\\_28\\_venture\\_capital\\_report.pdf](http://www.epa.gov/ocem/nacept/reports/pdf/2008_04_28_venture_capital_report.pdf)

that it seeks to replace. It also requires establishing the boundaries of the analysis and considering significant positive and negative environmental impacts within those boundaries.

To measure benefits, ECG developed an Environmental Performance Reporting System (EPRS) whose objectives are to: (1) measure the net environmental benefits of each fund and portfolio company investment, and (2) establish an environmental performance basis for proactively choosing future clean energy and technology investments. The calculation of net environmental benefits is similar to an engineering or technical report that links a business result, such as the number of product units sold or amount of material processed, to the associated environmental result, such as tons of emissions avoided or gallons of water saved. ECG works with the venture capital firm to conduct this analysis, including assessing which environmental impacts should be included, identifying respected literature sources, and checking the analysis for consistency with similar technologies based on ECG's broad understanding of the market.

## **E.2 Green Portfolio Partnership**

In May 2008, as mentioned above, KKR and EDF announced the establishment of the Green Portfolio Partnership. This is the first such partnership between an environmental organization and a private equity firm. Through this partnership, KKR and EDF plan to develop a set of analytic tools by which investors can assess and track improvements on their investments using a series of environmental metrics. These tools will enable investors to cost-effectively monitor efficiency, reduce waste, and address environmental impacts, such as greenhouse gas emissions, the use of toxic substances, waste generation, or water consumption.

In February 2009, it was announced that three KKR companies—US Foodservice, PRIMEDIA, and Sealy, participated in the pilot phase of the project. Using a set of analytic tools and metrics to evaluate environmental impacts, the companies identified areas for environmental and business improvement, established baselines and developed environmental goals, and prepared action plans for future improvement. The process helped managers to cost-effectively improve efficiency and reduce waste while addressing the environmental impacts of their business. US Foodservice, for example, had a goal to improve the efficiency of its delivery fleet while reducing greenhouse gas emissions. In 2008, the company successfully saved more than \$8 million in fuel costs, avoided more than 22,000 metric tons of carbon dioxide emissions, and improved the efficiency of its fleet by more than 4 percent compared to a 2007 baseline. For the three companies combined, the analytic tools generated savings of \$16.4 million and prevented more than 25,000 metric tons of greenhouse gas emissions.<sup>36</sup> In 2009, five additional KKR portfolio companies joined the Green Portfolio Partnership. In 2010, these eight companies combined have saved more than \$160 million in operating costs and eliminated more than 345,000 metric tons of CO<sub>2</sub> emissions, 1.2 million tons of waste, and 8,500 tons of paper use.<sup>37</sup>

KKR is committed to sharing the results, best practices, and success stories generated through the Green Portfolio process across the portfolio companies and with the public. KKR and EDF identified other KKR portfolio companies, such as Sungard, Accellent, HCA, Biomet, and Dollar General, for the next series of pilot projects. Most companies in KKR's U.S. portfolio were expected to participate in this program by the end of 2009. To drive broader change across the private equity and other industries, the tools and best practices developed through the partnership were to be available through the EDF Innovation Exchange in the fall of 2009. In early 2010, EDF launched the Green Returns Initiative, an ambitious effort to make environmental management and innovation a standard best practice across the private equity industry.<sup>38</sup>

<sup>36</sup> <http://www.edf.org/page.cfm?tagid=22259>

<sup>37</sup> <http://blogs.edf.org/innovation/2010/06/25/the-green-portfolio-project-achieves-160-million-in-savings-after-two-years>

<sup>38</sup> <http://innovation.edf.org/home.cfm>

### E.3 EPA National Advisory Council for Environmental Policy and Technology Report

In April 2008, NACEPT released its third in a series of reports on environmental technologies—*EPA and the Venture Capital Community: Building Bridges to Commercialize Technology*.<sup>39</sup> Some of the report's findings dealt with drivers of environmental technology investment based on interviews with nine venture capital firm representatives. The most prevalent drivers identified among interviewees fell into three categories: (1) metrics—investment criteria for venture funds; (2) policy—federal and state legal and regulatory framework, and legislative outlook; and (3) market factors—technological obsolescence, customer resistance, etc.

NACEPT found that a variety of metrics, both “hard” and “soft,” drive investment decisions. Hard metrics are the fundamental criteria for investment decisions, such as: expected rate of return commensurate with risk; breakthrough technologies with good comparative advantage; market size, penetration, and growth prospects; and economic value propositions based on a business plan, the management team, and the eventual exit strategy for a positive capital return.

Soft metrics are considerations often employed by public pension funds, foundations, and public institutions for environmental and other clean technology investments. They include: investment transparency that withstands public scrutiny, socially responsible investing, sustainability or reduced environmental and resource impact, good will reputation for investing in companies that have a positive impact on the environment, and patient capital for longer term environmental improvements.

The role of the regulatory community is important for clean technology investment. Although government regulations are important, venture capitalists do not favor investments in technologies whose future markets could be eliminated with a regulation change. The legal framework is known as “policy risk” in the investment community. The legal framework is composed of many issues including applicable federal/state regulatory and enforcement regimes, tax policies, subsidy provisions, and other mandates.

Market considerations are an important metric in any investment decision. Nearly all of the venture capitalists interviewed for the NACEPT report agreed that environmental technologies are driven by global markets because they comprise the most basic functions of any economy: water treatment and delivery, agriculture and land use, effluents of basic manufacturing and materials processing, air pollution handling, and the instrumentation, design, monitoring, and services of these functions.

Anticipation of new laws and mandates (e.g., legislation on carbon emissions) also can create expectations for market growth. Interviewees agreed that climate change impact considerations, for example, can drive the market for water supply and treatment technologies. Some interviewees identified market opportunities in “cross-over” technologies. These are technologies that address both environmental and energy issues. One example of such a technology was provided by one of the interviewees; it involved the use of a wastewater treatment technology to convert a sugar-laden waste stream for the generation of ethanol. ●

<sup>39</sup> [http://www.epa.gov/ocem/nacept/reports/pdf/2008\\_04\\_28\\_venture\\_capital\\_report.pdf](http://www.epa.gov/ocem/nacept/reports/pdf/2008_04_28_venture_capital_report.pdf)



## VI. Obtaining Information About Venture Capital

### A. Information on Venture Capital Investments

Several private sector firms and online services offer information on venture capital investments. Perhaps the most comprehensive publicly available source of venture capital investment data is the *MoneyTree* Report. As described in Chapter III, Section A, the *MoneyTree* Report is developed by PricewaterhouseCoopers and the NVCA using data derived from Thomson Reuters.

Free online directories of venture capital firms, sorted by location, industry, and size, are available from a number of sources, some of which are described below. **Appendix D** contains a list of venture capital resources.

Although the U.S. venture capital industry is more than 60 years old, only in the past 15 years have comprehensive data on the industry been compiled and made publicly available. Although NVCA was established in 1973 and has collected venture capital investment data since 1980, it was not until 1995 that NVCA collaborated with PricewaterhouseCoopers and Thomson Reuters to create the *MoneyTree* Report.

The *MoneyTree* Report has become the definitive source of information on emerging companies that receive financing and the venture capital firms that provide it. *MoneyTree* offers a wide range of publicly available investment data on its Website (<http://www.pwcMoneyTree.com>) and through periodic reports and white papers.<sup>40</sup> *MoneyTree* venture capital investment data are tracked across 18 geographic regions (e.g., Silicon Valley); 17 industry classifications (e.g., biotechnology); 16 types of financing sequence (e.g., 1, 2, 3); 4 stages of development (i.e., seed/start-up stage, early stage, expansion stage, and later stage); and 3 sector classifications (i.e., clean technology, life sciences, and Internet). More information on this array of investment data and the *MoneyTree* Report definitions is available on the *MoneyTree* Website and in **Appendix A**.

**Figure 31** presents venture capital investments by *MoneyTree* regions for 2008 and 2009. During this 2-year period, 50 percent of all U.S. venture capital investments were derived from four California regions (Silicon Valley, Los Angeles/Orange County, San Diego, and Sacramento/Northern California). California's leadership in venture capital investments was established during the "dot-com" boom and remains to this day.

**Figure 32** provides information on venture capital investments by state for 2008 and 2009. California was the top state to receive funding in 2009—picking up 50 percent of total U.S. venture-backed investment for the second consecutive year. Massachusetts was in second place, capturing 11 percent of total U.S. venture capital investments. New York and Texas attracted 5 percent and 4 percent of total investment dollars, respectively. Only 9 of the 50 states recorded an increase in 2009 venture capital investments when compared to 2008. **Appendix C** provides more information on investments in and by states.

**Figures 33** and **34** present the amount of capital invested by state in 2008 and 2009, respectively. Notably, California received about \$14 billion in venture capital investments in 2008, and the amount fell below \$9 billion in 2009. Massachusetts was second in 2008, with about \$3 billion invested, and maintained its second place position in 2009, when venture capital investments in that state fell to \$2 billion.

<sup>40</sup> The *MoneyTree* Website provides historic data (back to 1995) and current quarterly investment data that can be sorted by region, industry, stage of development, and other criteria. See <http://www.pwcMoneyTree.com>.

**Figure 31. U.S. Venture Capital Investments by *MoneyTree* Regions, 2008–2009**

Region	2008		2009	
	Investment (\$ in Millions)	Number of Deals	Investment (\$ in Millions)	Number of Deals
Silicon Valley	\$10,731.97	1,233	\$6,990.41	866
New England	\$3,294.72	474	\$2,160.87	348
NY Metro	\$1,963.84	319	\$1,413.44	246
Southeast	\$1,220.25	213	\$985.92	138
LA/Orange County	\$2,009.59	243	\$943.24	157
San Diego	\$1,191.66	132	\$903.15	107
Midwest	\$1,278.45	285	\$740.12	221
Northwest	\$1,076.32	210	\$704.79	133
Texas	\$1,261.09	152	\$644.62	111
DC/Metroplex	\$984.73	206	\$545.54	119
Colorado	\$837.29	105	\$468.20	72
Philadelphia Metro	\$753.00	149	\$423.78	89
North Central	\$618.61	81	\$377.38	58
Southwest	\$466.36	81	\$310.34	69
South Central	\$78.66	42	\$23.78	37
Upstate NY	\$90.35	32	\$18.01	13
Sacramento/N. Cal	\$68.96	19	\$17.01	8
Unknown	\$0.00	0	\$12.98	8
AK/HI/PR	\$21.00	8	\$7.09	2
<b>Total</b>	<b>\$27,946.85</b>	<b>3,984</b>	<b>\$17,690.67</b>	<b>2,802</b>

Source: NVCA, 2010c

**Figure 32. U.S. Venture Capital Investments by State, 2008–2009**

State	2008		2009	
	Investment (\$ in Millions)	Percent of Total Investment	Investment (\$ in Millions)	Percent of Total Investment
California	\$14,002.2	50%	\$8,853.8	50%
Massachusetts	\$3,033.6	11%	\$2,032.6	11%
New York	\$1,392.2	5%	\$855.5	5%
Texas	\$1,261.1	4%	\$644.6	4%
Washington	\$875.2	3%	\$574.2	3%
New Jersey	\$707.6	3%	\$556.6	3%
Colorado	\$837.3	3%	\$468.2	3%
Pennsylvania	\$693.9	2%	\$407.0	2%
Georgia	\$417.7	1%	\$302.0	2%
Florida	\$236.0	1%	\$295.1	2%
All Others	\$4,490.0	17%	\$2,701.1	15%
<b>Total</b>	<b>\$27,946.8</b>		<b>\$17,690.7</b>	

Source: NVCA, 2010c

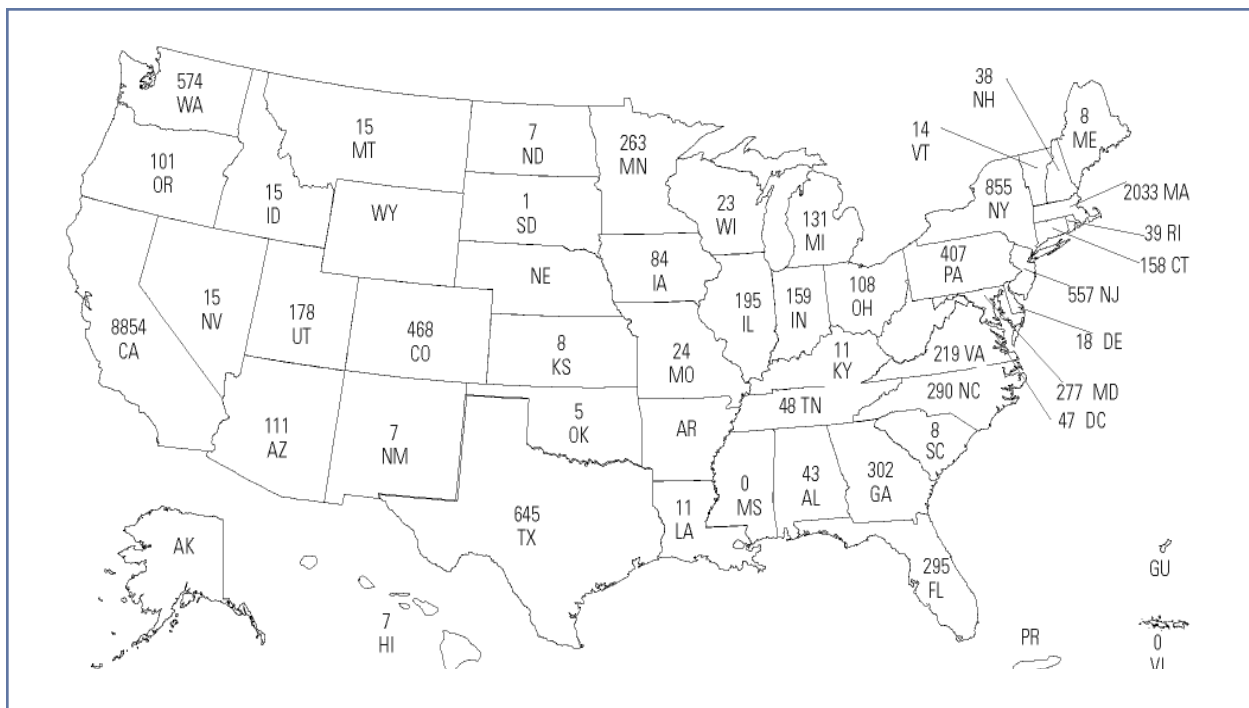


**Figure 33. Amount of Capital Invested by State in 2008 (\$ in millions)<sup>41</sup>**



Source: NVCA, 2009c

**Figure 34. Amount of Capital Invested by State in 2009 (\$ in millions)**



Source: NVCA, 2010c

<sup>41</sup> The amount of capital invested values in Figure 33 vary slightly from the amounts listed in Figure 32 because the data in Figure 33 are from the 2009 NVCA Yearbook and the data in Figure 32 are from the 2010 NVCA Yearbook, which has updated numbers.

**Figure 35** illustrates venture capital investments by *MoneyTree* industries for 2008 and 2009. During 2009, the Biotechnology and Software industries led investments, but these investment levels were substantially lower than those achieved in 2008, when the Industrial/Energy industry also had high investments. Although Software industry investments peaked during the “dot-com” boom in 1999-2001, they still remain a significant portion of total investments through 2009. In the past 5 years, Biotechnology investments have climbed steadily, to the point where, in 2009, they exceeded investments in the Software industry.

**Figure 35. U.S. Venture Capital Investments by Industry, 2008–2009**

Industry	2008		2009	
	Investment (\$ in Millions)	Number of Deals	Investment (\$ in Millions)	Number of Deals
Biotechnology	\$4,364.7	503	\$3,507.5	411
Software	\$5,144.2	949	\$3,115.6	628
Medical Devices and Equipment	\$3,410.3	384	\$2,506.4	309
Industrial/Energy	\$4,560.8	352	\$2,330.3	231
Media and Entertainment	\$1,728.8	408	\$1,172.8	251
IT Services	\$1,827.6	273	\$1,077.2	202
Semiconductors	\$1,645.5	196	\$771.6	119
Networking and Equipment	\$743.0	106	\$713.0	91
Telecommunications	\$1,617.2	249	\$558.7	140
Consumer Products and Services	\$410.5	104	\$370.8	81
Financial Services	\$499.8	72	\$364.0	52
Computers and Peripherals	\$448.0	75	\$338.0	58
Electronics/Instrumentation	\$574.3	93	\$305.2	60
Business Products and Services	\$483.7	124	\$253.3	81
Retailing/Distribution	\$238.4	40	\$172.2	31
Healthcare Services	\$182.6	50	\$102.4	34
Other	\$13.5	6	\$31.4	23
<b>Total</b>	<b>\$27,946.8</b>	<b>3,984</b>	<b>\$17,690.7</b>	<b>2,802</b>

Source: NVCA, 2010c

Beyond tracking venture capital investment statistics, *MoneyTree*, in affiliation with NVCA and PricewaterhouseCoopers, produces quarterly and annual reports on venture capital investments. They also produce special reports and white papers such as *Economic Turmoil Catches Cleantech* (May 2009); *Cleantech Nation: Cleantech Playing a Central Role in the National Recovery Agenda* (February 2009); and *Cleantech Comes of Age: A Discussion of the Trends in Clean Technology* (April 2008). Most of these reports are available as downloadable files from the *MoneyTree* Website; other reports are available as a subscription service from *MoneyTree*.

## B. National Associations

There are a number of national trade and professional associations that have been established to represent venture capital investors’ interests and provide marketing, networking, and educational opportunities for their members and other interested parties. Several of these associations have established regional and local chapters. The NVCA, ACA, and National Association of Small Business Investment Companies (NASBIC) have regional and state affiliated associations, contacts for which are available on their respective Websites. National, regional, and local conferences; forums; and meetings provide the best opportunity to interact with association members and learn about

venture capital investing. Because of the volume of venture capital activity within some states, such as California and Massachusetts, multiple association affiliates are listed within these states. For example, ACA lists 11 angel associations in California and Massachusetts, respectively. Similarly, NVCA lists three associations in California.

The NASVF has state affiliates and was formerly called the National Association of State Venture Funds. In May 2006, NASVF published the report entitled, *Seed and Venture Capital State Experiences and Options*. This report contains a wealth of information on state venture capital activity including: state strategies for mobilizing investment capital; types of state-sponsored seed and venture capital programs; objectives of state programs; various sources of money within states; and “lessons learned” from state investment funds. Further, the 2006 NASVF report presents a state-by-state distribution of venture capital, as well as an analysis of the effective use of tax credits in state venture capital programs.

Several of the national associations have education and training affiliates to help small companies learn about venture capital investment opportunities; brief descriptions of some of these association-related educational and training centers are provided in Chapter VII of this Guide.

Several commercial firms that specialize in venture capital and private equity financing provide information on national, regional, and state venture capital associations and groups. For example, BoogarAssociates maintains BoogarLists, which includes a list of associations and venture capital firms,<sup>42</sup> and the Venture Associates Website offers a list of venture clubs/groups by state.<sup>43</sup>

## **B.1 Angel Capital Association**

The Angel Capital Association (ACA) is a peer organization of angel investing groups in North America. This professional association focuses on networking and sharing of best practices among these angel groups. ACA was founded by angel groups throughout the United States and Canada to help maximize the performance of groups of angel investors.

ACA is a natural outgrowth of four Angel Organization Summits held in 2002 and 2003. Representatives from nearly 80 groups attended one or more of these Summits. The concept of ACA was presented at the 4th Summit in November 2003, and was endorsed by angel groups in attendance. ACA officially came into being in January 2004. In late 2005, ACA was incorporated as a membership organization. A companion program, the Angel Capital Education Foundation (ACEF), was initiated at the same time to focus on the charitable purpose of education and research in the field of angel investing. More information on the ACEF is provided in Chapter VII of this Guide.

ACA's mission is to support the growth, financial stability, and investment success of member angel groups. This mission is accomplished by providing professional development, best practices, networking, and collaboration opportunities for angel investors who belong to member angel groups. The organization also serves as the public voice of the angel community and is focused on advancing policies at the state and federal level that support and promote angel investing.

The ACA Website offers information about upcoming events, including regional meetings, Webinars, and the annual ACA Summit; updates on federal and state policy issues affecting angel investors and angel groups; ACA news releases; and information for entrepreneurs seeking capital. The resources available on the ACA Website include: information on angel investing and angel groups; practical information on starting, growing, and managing angel organizations; statistics and presentations on angels and angel groups; and a list of books and other publications of interest to investors and entrepreneurs. Additional information and resources are available to ACA members on the ACA Members Only area of the Website.

<sup>42</sup> See <http://www.boogar.com>

<sup>43</sup> See <http://www.venturea.com/clubs2.htm>

### **The Angel Capital Association**

8527 Bluejacket Street, Suite 216

Lenexa, KS 66214

Tel: (913) 894-4700; Website: <http://www.angelcapitalassociation.org>

## **B.2 Community Development Venture Capital Alliance**

The Community Development Venture Capital Alliance (CDVCA) is a nonprofit organization representing more than 100 venture capital firms in the field of community development venture capital (CDVC) investing. CDVC funds provide equity capital to businesses in underinvested regional and community markets. CDVCA was formed in 1993 and incorporated as a not-for-profit in 1995. CDVCA promotes use of the tools of venture capital to create jobs, entrepreneurial capacity, and wealth to advance the livelihoods of low-income people and the economies of distressed communities. CDVCA has member firms in every state that have detailed knowledge of government, corporate, and foundation programs for the CDVC industry.

The CDVCA Website offers information about upcoming events, including the annual conference and peer group meetings; CDVC funds and deals; policy initiatives and public programs that support the work of CDVCA member funds; the CDVCA Central Fund portfolio and investment criteria; articles about CDVC; CDVCA presentations, press releases, publications, and newsletters; and CDVCA's consulting services.

### **Community Development Venture Capital Alliance**

424 West 33rd Street

Suite 320

New York, NY 10001

Tel: (212) 594-6747; Fax: (212) 594-6717; Website: <http://www.cdvca.org>

## **B.3 Cleantech Group**

The Cleantech Group is an association of five organizations whose mission is to accelerate the market adoption of venture innovation and clean technology investment. The five Cleantech Group organizations are: the Cleantech Network, Cleantech Advisors, Cleantech Indices, Cleantech Search, and Cleantech China. Each of these organizations is described on the Cleantech Website referenced below. The Cleantech Network is a membership-based organization that connects venture, corporate, and institutional investors; entrepreneurs; and service providers active in clean technology through related information products, online services, and the Cleantech Venture Forum platform of events. The Cleantech Network serves more than 1,500 affiliate investor member firms worldwide. The organization has tracked more than \$15 billion invested in clean technology ventures since 1999, of which more than \$600 million has been raised by companies presenting at Cleantech Venture Forums. The Cleantech Network serves global markets via offices in Ann Arbor, Michigan; San Francisco, California; Toronto, Canada; London, England; and Beijing, China.

The Cleantech Group Website offers its members access to various reports on clean technology investment; the Cleantech Insights blog; updates on clean technology and business developments; insight reports; clean technology investment reports (the quarterly *Cleantech Investment Monitor*); directories of clean technology players; the market insight database; videos and Webinars; press releases and news articles; and upcoming events, including the Cleantech forums.

### **Cleantech Network, LLC**

322 West Grand Avenue

Brighton, MI 48116

Tel: (810) 224-4310; Fax: (810) 355-3024; Website: <http://www.Cleantech.com>

## **B.4 National Association of Seed and Venture Funds**

The National Association of Seed and Venture Funds (NASVF) is a nonprofit association of innovation investors—private, public, and nonprofit organizations—committed to building their local economies by investing in local entrepreneurs. NASVF began in 1993 as an ad hoc group of investors seeking the best models to encourage capital formation within their respective states, particularly for new technology ventures. These founders continued to meet each year, and in 1997, formally incorporated the group as a nonprofit association—the National Association of State Venture Funds. In 2000, the name was changed to reflect the Association’s expanding service to private-sector funds and programs.

NASVF members are some of the nation’s leading providers of innovation capital. They are committed to building their local economies by investing in local entrepreneurs. Members include: seed, start-up, and early stage venture capital funds; state and regional economic development organizations; university technology commercialization centers; public and private technology commercialization organizations; national laboratories; and centers for entrepreneurship.

The NASVF Website offers information on upcoming events, such as the annual NASVF conference; access to NetNews (videos and articles on angel and venture capital); the results of surveys of angel investors, angel funds, and early stage companies; a chart of state venture funds; news and press releases; and member benefits and services.

### **The National Association of Seed and Venture Funds**

28 E. Jackson Boulevard, Suite 1700

Chicago, IL 60604-2214

Tel: (312) 423-4545; Website: <http://www.nasvf.org>

## **B.5 National Association of Small Business Investment Companies**

The National Association of Small Business Investment Companies (NASBIC) is the professional association for the Small Business Investment Company industry and the oldest organization of venture capitalists in the world. For nearly 50 years, NASBIC has played a pivotal role in building, maintaining, and promoting a strong and profitable SBIC industry to better serve the growth-capital needs of America’s small businesses.

The SBIC Program is a unique public/private partnership that has provided \$48 billion in financing to more than 100,000 small U.S. companies since the program’s creation in 1958. SBICs are privately organized and managed venture capital firms licensed by SBA to make equity capital or long-term loans available to small companies. These small companies often require financing in the critical \$250,000 to \$5 million range that generally is not available through banks or non-SBIC private equity firms.

NASBIC also has four regional associations of SBICs. They include: the Northeastern Regional Association of Small Business Investment Companies; the Southern Regional Association of Small Business Investment Companies; the Midwest Regional Association of Small Business Investment Companies; and the Western Regional Association of Small Business Investment Companies.

The NASBIC Website provides information on upcoming events, such as regional private equity conferences and the NASBIC annual meeting; legal issues and legislation affecting SBICs; news and press releases; the SBIC Program; financing, training, and tax assistance resources for small businesses; a list of the SBICs by state; SBIC success stories; SBIC regulations and forms; professional forums; and membership benefits.

### **National Association of Small Business Investment Companies**

1100 H Street, NW, Suite 610

Washington, DC 20005

Tel: (202) 628-5055; Fax: (202) 628-5080; Website: <http://www.nasbic.org>

## B.6 National Venture Capital Association

The National Venture Capital Association (NVCA) is a trade association that has represented the U.S. venture capital industry since 1973. It is a member-based organization, which consists of nearly 500 venture capital firms that manage pools of risk equity capital designated to be invested in high-growth companies.

NVCA's mission is to foster greater understanding of the importance of venture capital to the U.S. economy, and support entrepreneurial activity and innovation. The NVCA represents the public policy interests of the venture capital community, strives to maintain high professional standards, provides reliable industry data, sponsors professional development, and facilitates interaction among its members.

The NVCA also works with regional (e.g., Mid-Atlantic Capital Alliance, New England Venture Capital Association, Western Association of Venture Capitalists) and state-affiliated venture capital chapters (e.g., Michigan Venture Capital Association, Colorado Venture Capital Association, Texas Venture Capital Association), and Midwest Health Investment Network (MHIN) in the Midwest, as well as international venture capital organizations (e.g., China Venture Capital Association, European Venture Capital Association, Canada's Private Equity and Venture Capital Association) that are referenced on the NVCA Website.

The Western Association of Venture Capitalists is a nonprofit association whose approximately 140 member firms represent virtually all professionally managed venture capital in the western United States.<sup>44</sup> The Mid Atlantic Venture Association represents venture capitalists in the District of Columbia, Maryland, and Virginia and has 375 members from 135 firms with more than \$10 billion in capital under management. The Michigan Venture Capital Association is a Michigan venture capital business association dedicated to educating, encouraging, and establishing private equity firms and small businesses in the Michigan area.<sup>45</sup>

The NVCA Website offers information on membership services; policies and legislation affecting the venture capital industry; access to research reports and venture capital databases (e.g., ThomsonONE.com); venture capital industry statistics; NVCA and venture capital industry events, including the NVCA annual meeting; NVCA articles and press releases; and frequently asked questions about venture capital. The resources available on the NVCA Website include: the Venture Capital 101 overview of the venture capital industry; a list of venture capital organizations; company valuation guidelines and model legal documents; NVCA publications; lists of service providers (e.g., accounting firms, investigation services, law firms); resources for entrepreneurs; and the Venture Voices video series and VentuReality video.

### The National Venture Capital Association

1655 Fort Myer Drive, Suite 850

Arlington, VA 22209

Tel: (703) 524-2549; Fax: (703) 524-3940; Website: <http://www.nvca.org>

## C. State and Local Associations

Many states have venture and entrepreneurial associations that represent the interests of venture capital investors and entrepreneurs and provide marketing, networking, and educational opportunities for their members and other interested parties. A few of these state organizations are described in this section.

### C.1 Illinois Venture Capital Association

Founded in May 2000, the Illinois Venture Capital Association (IVCA) advocates for a strong venture capital and private equity industry in Illinois by: (1) promoting pro-growth public policy

<sup>44</sup> See <http://www.wavc.net>

<sup>45</sup> See <http://www.michiganvca.net>

initiatives, (2) providing educational programming in private equity, (3) facilitating member networking, and (4) endorsing communication and shared programs with organizations of mutual interest. In addition, the IVCA works with entrepreneurial organizations in the Midwest to encourage a strong cycle of innovation and business creation leading to superior investment opportunities.

The IVCA enhances the growth of Illinois' \$77 billion venture capital/private equity community by advocating on behalf of the industry. The IVCA:

- ✧ Promotes institutional investment in local private equity firms.
- ✧ Provides networking opportunities for Midwest-based firms.
- ✧ Supports public policy initiatives that make Illinois an appealing financial center.
- ✧ Shares up-to-the-minute news on local venture capital/private equity firms and professional service providers.
- ✧ Facilitates intermediaries' and entrepreneurs' identification of appropriate venture capital or private equity firms for a given investment.
- ✧ Communicates the substantial economic value of a strong private equity community.

### **Illinois Venture Capital Association**

225 W. Wacker Drive, Suite 3000

Chicago, IL 60606

Tel: (312) 201-2813; Website: <http://www.illinoisvc.org/>

## **C.2 New England Venture Capital Association**

The New England Venture Capital Association (NEVCA) was established and is run by venture capital investors in New England. NEVCA is the region's premier organization for the venture capital industry. Its mission is to promote venture capital investing and entrepreneurship in New England. NEVCA represents the interests of venture capital firms with investment initiatives in New England to promote economic growth throughout the region. With more than 700 venture capital professionals from 100 firms, NEVCA's members collectively manage more than \$50 billion in capital.

NEVCA initiatives: (1) promote an entrepreneurial environment, (2) encourage investments in new and emerging companies, (3) educate on the benefits of venture capital investing to the New England economy, (4) promote the professional development of members, and (5) provide networking opportunities for members. The NEVCA maintains a Website that offers information on events, news, and employment opportunities as well as a chart of the industry (biotechnology, healthcare services, medical devices and equipment) and stage of investment of NEVCA members.

### **New England Venture Capital Association**

5 Wilson Avenue

Belmont, MA 02478

Tel: (617) 489-9888; Website: <http://www.newenglandvc.org/>

## **C.3 North Carolina Council for Entrepreneurial Development**

The North Carolina Council for Entrepreneurial Development (CED) was established in 1984 by a team of 24 business leaders, entrepreneurs, and academicians to capitalize on the technological and educational strengths of the Triangle (Raleigh, Durham, and Chapel Hill and the universities there). During that same year, CED sponsored the first "Southeast Financing Conference for Emerging Growth Companies" to showcase entrepreneurial companies to potential investors, initiated a monthly education and networking program for entrepreneurs, and began publishing a newsletter.

By 2001, CED's membership had reached 5,000, representing 1,200 companies, entrepreneurs, and institutions. In the past decade, CED has initiated the Entrepreneurial Stock Endowment Program; Capital Connections; the Engage program series; the Job Board; StartUps 24-7, an on-demand resource

for entrepreneurs; and the Venture Series, a two-part program to provide knowledge and resources to early-stage entrepreneurs. In 2003, CED collaborated with NCBIO (North Carolina's affiliate of the National Biotechnology Industry Organization) and other organizations to successfully extend the state's Qualified Business Venture (QBV) Tax Credit. NC Innovative Development for Economic Advancement (IDEA) and CED formed a strategic alliance in 2005, to make North Carolina a national leader in entrepreneurship. In 2007, CED partnered with the Research Triangle Regional Partnership (RTRP) to promote North Carolina's innovation economy to leading investors in Boston.

Since its creation, CED has published numerous resources for entrepreneurs including: Qualified Business Investment Tax Credit; Entrepreneurs Guide to Starting and Growing a Business in the Research Triangle; and the Research Triangle Venture Update. In addition, CED has sponsored, hosted, and organized numerous conferences, including its Annual Venture Conferences and Annual Biotech Conferences, the Southeast Bio Investor Conference, the Entrepreneurs Only Workshop™ series, and the Globalization and MedTech Conferences. In addition CED has formed several roundtables, including the Biotechnology Roundtable, Software Developers Roundtable, and International Roundtable.

#### **CED Entrepreneurship Center**

Alexandria Technology Center  
100 Capitola Drive, Suite 101  
Durham, NC 27713  
Tel: (919) 549-7500; Website: <http://www.cednc.org/>

### **C.4 Ohio Venture Association**

The Ohio Venture Association (OVA) is a private, nonprofit association of a group of northeast Ohio business people dedicated to providing an atmosphere for the interchange of ideas on entrepreneurship, new ventures, and venture capital. The Association provides a scheduled forum for this interchange. OVA's primary activity is to conduct luncheon programs designed to: (1) introduce members to each other and promote dialogue among them; (2) present speakers on subjects of importance in venture development; and (3) offer an opportunity to selected companies that seek venture capital or management support to describe their businesses.

OVA provides a forum for the exchange of ideas on entrepreneurship and approaches to venture development in the region. It brings together individuals from the public, private, academic, and government sectors who are interested in nurturing the development of new, young, small companies. The main purpose of OVA is to stimulate the interchange of ideas and information on the activities of others related to entrepreneurial endeavors. In addition, OVA maintains a directory of members, publishes a monthly newsletter, prepares position papers and press releases, and maintains its Website. The OVA Website provides links to government and private financial (venture capital, banks) and other resources (support organizations, technology centers, incubators), and events.

OVA meets on the second Friday of the month (except July and August) at The Union Club in Cleveland, Ohio. Meetings include lunch, networking, Five Minute Forum presentations by entrepreneurs and others, and a speaker on topics ranging from venture capital to growth strategies. OVA also sponsors an annual Venture Capital Summit and the Venture of the Year Award. OVA members also may support college and university entrepreneurship programs by participating as a guest lecturer and by supporting student entrepreneurial activities.

#### **Ohio Venture Association, Inc.**

1120 Chester Avenue  
Suite 470  
Cleveland, OH 44114  
Tel: 216-566-8884; Website: <https://www.ohioventure.org/>



## C.5 Silicon Valley Association of Startup Entrepreneurs

Founded in 1995, the Silicon Valley Association of Startup Entrepreneurs (SVASE) is the largest and fastest growing nonprofit association in Northern California dedicated exclusively to helping technology entrepreneurs—from the idea through product launch—build successful businesses, across a variety of technology driven industries (Clean Energy, Digital Media, Life Sciences, Mobility, Security, Software, Semiconductors and more).

SVASE accomplishes its mission through the work of almost 100 volunteers who build the Association's EVENTS and ON-LINE RESOURCES for members, affiliates, and the general public. SVASE hosts 10-15 events each month, attended by an average 500 technology executives, at venues around the San Francisco Bay area and occasionally in other cities and countries. Key events are the monthly StartUp-U lunches for first time entrepreneurs, the monthly Main Event & Business Interface Groups (for education and networking), the monthly CXO Forums (for collegial connections), the weekly VC Breakfast Club and bi-monthly First Impressions (for funding preparation), and the annual Launch: Silicon Valley (<http://www.launchsiliconvalley.org>) for product launch.

SVASE members have access to unique, proprietary online resources to build their businesses, including the “24 Hour Networking” mailing list, the “Startup Reference Guide,” and “VC Experts,” plus the SVASE Blog, EntrePedia, Special Offer and more. SVASE encourages cooperation among organizations serving the entrepreneurial community. SVASE co-promotes events and shares membership discounts with its partners, which currently include FEW, TEN, ASVC, Churchill Club, TiE, SV Web Guild, EBIG, and 50 more.

### Silicon Valley Association of Startup Entrepreneurs (SVASE)

P.O. Box 5646

South San Francisco, CA 94083

Tel: (650) 585-9577; Website: <http://www.svase.org/hot-svase>

## D. Nonprofit Environmental Organizations

There are nonprofit organizations that are associated with the venture capital community. The two organizations identified in this section—the Natural Resources Defense Council (NRDC) and the Environmental Defense Fund (EDF)—are environmentally oriented rather than socially oriented national organizations. Both NRDC and EDF have worked with the venture capital community on a number of projects. NRDC has prepared a number of reports and publications available as downloadable files from its Website. EDF has successfully worked with Kohlberg, Kravis, Roberts and Company, a large private equity firm, on the Texas Utilities project and is planning to extend this collaboration to the development of environmental investment metrics.

### D.1 Environmental Entrepreneurs/Natural Resources Defense Council

Founded in 2000, Environmental Entrepreneurs (E2) is a bipartisan business network with nearly 800 members who believe that good environmental policy makes economic sense. E2 members are involved in technology companies, consulting, venture capital, financial services, and other sectors. E2 members currently represent more than \$20 billion in private equity capital.

Working with the NRDC, an environmental advocacy group, E2 conducts research to offer economically sound approaches to environmental issues, and it works to promote policies that are economically viable and environmentally sound.

E2 works with NRDC's regional offices to provide chapters and programs in five metropolitan areas—Northern California, Southern California, Rocky Mountains, New England, and New York—and is developing chapters in the Pacific Northwest and the Midwest. Each chapter is led by E2 volunteers in collaboration with NRDC staff. With over 500 members, the founding Northern California E2 Chapter is the largest among its five chapters and has had notable successes in helping to pass the nation's first bill to limit global warming emissions: California's Assembly Bill 32.

**Environmental Entrepreneurs/Natural Resources Defense Council**  
111 Sutter Street, 20th Floor  
San Francisco, CA 94104  
Tel: (415) 875-6100; Fax: (415) 875-6161; Website: <http://www.e2.org>

## **D.2 Environmental Defense Fund**

Founded in 1967, EDF is a nonprofit environmental advocacy group based in the United States. The group focuses on environmental problems and has a background in science, innovative markets, corporate partnerships, and effective laws and policy. In early 2007, EDF helped negotiate the buyout of Texas Utilities (TXU), the largest energy provider in Texas, by Texas Pacific Group and Kohlberg Kravis Roberts (KKR), which at the time was the largest (\$45 billion) private equity buyout in history. The environmental agreement negotiated by EDF, which was a condition of the acquisition, reduced projected carbon dioxide emissions by TXU through cancellation of 8 of 11 planned coal-fired power plants.

In May 2008, building on its successful collaboration with KKR, EDF announced the establishment of the Green Portfolio Partnership. This first such partnership between a private equity firm and an environmental organization will develop a set of analytic tools by which companies can assess and track improvements on a series of environmental metrics. These tools will enable private equity managers to cost-effectively improve efficiency, reduce waste, and address environmental impacts, such as greenhouse gas emissions, the use of toxic substances, waste generation, or water consumption. Once developed, EDF and KKR will make the processes, tools, and results of their joint effort publicly available, with the mutual goal of having these tools implemented by other companies around the world. More information on the Green Portfolio Partnership is provided in Chapter V, Section E.2.

**Environmental Defense Fund**  
257 Park Avenue South  
New York, NY 10010  
Telephone: (212) 505-2100; Fax: (212) 505-2375; Website: <http://www.edf.org>

## **E. Databases of Venture Capital Firms**

There are more than 1,800 venture capital and private equity firms in the United States. Some firms concentrate on specific business sectors for their investments such as biotechnology, Internet-related products/technologies, or clean technologies. Firms specializing in these sectors can be found electronically by accessing some of the Web-based directories identified below as well as those identified in **Appendix D**. As mentioned in the previous section, many association Websites include lists of venture capital firms and angel investor groups. Many Web-based directories offer free general information about venture capital firms with detailed information such as partner names, portfolio company investments, and other data available on a subscription or one-time cost basis.

### **E.1 BoogarLists**

BoogarLists publishes directories of resources that cover a range of topics, including business operations, venture capital, financial services, conferences, associations, and marketing. With more than 1,800 venture capital and private equity firms listed, BoogarLists offers a starting point for entrepreneurs in their search for investment capital. BoogarLists is a wholly owned subsidiary of BoogarAssociates, a consulting firm that provides a range of strategic marketing, business development, and operations management expertise.

**BoogarLists**  
2160 Santa Cruz Avenue, Suite 26  
Menlo Park, CA 94025  
Tel: (650) 234-8428; Fax: (650) 234-8437; Website: <http://www.boogar.com>

## E.2 VCPro Database

VCPro Database offers a fee-based downloadable venture capital and private equity directory with profiles of more than 4,100 venture capital firms worldwide. The database is searchable by all the data fields including contact information (e.g., company name and executive names) and investment criteria (e.g., stage, geographic location, industry preferences, and types of financing).

### VCPro Database

10820 Abbotts Bridge Road, Suite 220

Duluth, GA 30097

Tel: (877) 734-7638; Fax: (800) 886-6030; Website: <http://vcprodatabase.com>

## E.3 vFinance Database

vFinance offers an online resource library of venture capital industry news and data on a fee basis. The vFinance directory contains a listing of more than 1,400 venture capital companies and private equity firms. vFinance is a subsidiary of vFinance, Inc., a financial services company that specializes in emerging opportunities, providing investment banking, trading, trend forecasting, and consulting services to micro, small, and mid-cap high-growth companies, and to institutional and high net-worth investors seeking above-market returns.

### vFinance, Inc.

3010 North Military Trail, Suite 300

Boca Raton, FL 33431

Tel: (561) 981-1000; Website: <http://www.vFinance.com>

## F. Published and Web-Based Resources

There is a variety of newsletters, publications, reports, and books on venture capital and private equity investing. Some of these materials are publicly available, others are available through subscription services, and others can be purchased online and at bookstores. Several trade associations and nonprofit organizations, such as NVCA, NASVF, E2/NRDC, and others offer free and fee-based reports and publications. Information on all of these materials is available on the relevant organizations' Websites.

NVCA offers several free publications such as the *2008 Venture Capital Yearbook*, *Patient Capital* (an overview about the pivotal role venture capital plays in novel medical innovation), and *Venture Impact* (a study about the economic impact of venture-backed companies). NVCA offers as part of its membership fees or on a subscription basis other publications such as the *2009 Membership Directory*, *The Venture Capital Review* (a semi-annual review of venture capital trends), and *NVCA Today* (a quarterly review of legislative and regulatory issues affecting venture capital).

The NASVF offers free publications such as its annual listing of *U.S. State-Supported Venture Capital Funds* and its May 2006 Report *Seed and Venture Capital: State Experiences and Options*. NASVF also offers a monthly listserv distribution of articles related to venture capital investments.

The E2/NRDC offers a free monthly newsletter and a broad range of free reports such as *Will the 110th Congress Address Climate Change?* (April 2008), *Cleantech Venture Capital: How Public Policy Has Stimulated Private Investment* (May 2007), and *The Growth of Cleantech* (April 2007).

Beyond associations and nonprofit organizations, there are several research organizations that offer online publications and reports, lists of conferences and events, and strategic consulting services. The *MoneyTree* Report, Clean Edge, and Lux Research are a few examples of these organizations; all of these organizations list the availability of their free and fee-based reports on their Websites.

*MoneyTree*, a collaboration of NVCA and PricewaterhouseCoopers, publishes quarterly and full year Summary Reports, special reports, and white papers. In its Summary Reports, *MoneyTree* provides analytical abstracts and overview charts and graphs of quarterly trends data of venture capital

investments by region, industry, stage of development, and other parameters. Special reports such as *The Exit Slowdown and the Venture Capital Landscape* and *Cleantech Comes of Age: A Discussion of the Trends in Clean Technology*, and white papers such as “Managing the Risks and Rewards of Collaboration,” and “10 Minutes on Mergers and Acquisitions: A New Scorecard, Sizing Up the Changes,” are available as downloadable files from the *MoneyTree* Website.

Clean Edge, Inc., a private research and marketing organization, tracks and analyzes venture capital and clean technology markets, trends, and opportunities.<sup>46</sup> Clean Edge offers a free newsletter, *CleanWatch*, as well as several free downloadable reports such as *Clean Energy Trends 2008* (March 2008), *Utility Solar Assessment Study* (June 2008), and *Harnessing San Francisco's Clean Tech Future Update* (November 2005). Some Clean Edge principals also have co-authored a book, *The Clean Tech Revolution: The Next Big Growth and Investment Opportunity*, published by Harper Collins Publishers in 2007.

There are a number of private-sector firms that offer a range of publications and services available to members or on a subscription or fee basis. For example, the Cleantech Group, through its membership Cleantech Network, publishes periodic reports tracking clean technology investments, as well as other information on technology investment trends and analyses. The Cleantech Group offers comprehensive members-only databases, new innovation pipeline and business opportunities, and discounted access to networking and investment events facilitating the Clean Technology Sector. Cleantech Forums are held periodically around the world. These forums bring together venture investors, entrepreneurs, academics, government officials, and other business officials interested in clean technologies.

Lux Research, an independent research and advisory firm, provides strategic advice and ongoing intelligence about venture capital and emerging technology markets. All of Lux Research publications and services are fee-based. In 2008, Lux released its Cleantech Report as a guide for investors and analysts interested in emerging energy and environmental technologies. Lux claims that its Cleantech Report is the first-of-its-kind resource to provide comprehensive analysis on clean technologies across a range of industry sectors.

## **G. Federal Government Sources**

As described above, there are federal and state agencies that provide either direct or indirect support (sources of investment) to the venture capital community for innovative technology development. Some government agencies only provide venture capital investment information that is associated with licensing, partnership, cooperative research and development, or export promotion opportunities. Brief descriptions of the information materials offered by these agencies are provided below.

### **G.1 Small Business Administration**

SBA offers a variety of information about programs and resources relating to venture capital. More than 50 years ago, as described in Chapter VI, Section B.5, SBICs were created to help small U.S. companies raise capital. SBICs are privately owned management investment firms that are licensed by the SBA to provide venture capital and start-up financing to small businesses. SBA supports the Business.Gov Website (<http://www.business.gov>), which is self-described as the “official business link to the U.S. Government.” This site contains information on SBIC financing, venture financing options for economically distressed communities, a nationwide listing service (i.e., Active Capital) that connects entrepreneurs with angel investors, and a number of other financial assistance programs.

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<sup>46</sup> <http://www.cleantedge.com>

## G.2 Department of Energy

Within the past few years, the Department of Energy (DOE) has assumed a prominent information role with respect to investment opportunities for energy technology development and commercialization projects. The DOE Loan Guarantee Program for innovative energy technologies and the Energy Efficiency and Renewable Energy (EERE) Commercialization and Deployment Programs offer a range of investment and partnership opportunities for developers and investors.

Under the Energy Policy Act of 2005 (EPAAct) and the Energy Independence and Security Act of 2007 (EISA), DOE has been authorized to provide federal loan guarantees for new and innovative technologies that avoid greenhouse gases and for fuel efficient automobile vehicles and parts, including advanced battery production. The EPAAct identified 10 discrete categories of energy technology projects that are eligible for loan guarantees, such as renewable energy systems, efficient end-use energy technologies, advanced nuclear and fossil fuel technologies, carbon capture and sequestration practices and technologies, and pollution control equipment. Since 2006, DOE has been authorized to provide up to \$35 billion in loan guarantees for projects across these categories, and various solicitations have been issued. Details on these solicitations and other information about the DOE Loan Guarantee Program are available on the DOE Website.<sup>47</sup>

The EERE Commercialization Programs are focused on building bridges to overcome four identified commercialization gaps—talent, information, capital, and strategy. The talent gap exists because DOE has found that its scientists are not sufficiently business oriented, and commercializing innovative energy technologies requires both technical and business skill sets. Two of the ways DOE hopes to bridge the talent gap are through its Entrepreneur in Residence (EIR) Program<sup>48</sup> and Commercialization Fellowships.<sup>49</sup> The EIR Program is a commercialization initiative that aims to develop viable technologies by allowing venture capital representatives to work directly in some of the DOE National Laboratories to identify and spin out relevant technologies. DOE's EERE Office created the National Renewable Energy Laboratory Commercialization Fellowships to accelerate the commercialization of laboratory-developed intellectual property and patents.

DOE is trying to bridge the information gap toward technology commercialization by conducting annual technology showcases.<sup>50</sup> Starting in 2007, DOE asked the National EERE Program Managers to identify 8 to 10 of their most promising portfolio technologies and create “venture-ready” descriptions of the development opportunity. Next, DOE invited prominent clean technology venture capital firms that are actively seeking investment opportunities to a 2-day conference to showcase these technologies and attempt to create commercialization opportunities. The second showcase was held in August 2008.

DOE is seeking to bridge the capital gap by offering cost-shared funding opportunities between the National Laboratories and prospective investors for development-ready technologies. Starting in 2007, DOE created the Technology Commercialization Fund (TCF) to find post-research, pre-venture capital funding for innovations that are no longer considered research projects but are not sufficiently prototyped to attract private investment. To bridge the commercialization “valley of death,” the TCF offers up to 50 percent in matching funds from DOE's National Laboratories to industry to jointly pursue development and deployment of innovative energy technologies. The TCF is designed to complement angel investment or early-stage corporate product development. The fund totaled more than \$14 million in FY 2007 and FY 2008 and is administered by National Laboratories selected by the EERE Office.

To bridge the strategy gap, DOE is pursuing a variety of mechanisms to spur the licensing and commercialization of DOE inventions and patents. One of the successful mechanisms to accelerate the

<sup>47</sup> <http://www.lgprogram.energy.gov/>

<sup>48</sup> [http://www1.eere.energy.gov/commercialization/printable\\_versions/entrepreneur\\_in\\_residence.html](http://www1.eere.energy.gov/commercialization/printable_versions/entrepreneur_in_residence.html)

<sup>49</sup> [http://www1.eere.energy.gov/commercialization/printable\\_versions/commercialization\\_fellowship.html](http://www1.eere.energy.gov/commercialization/printable_versions/commercialization_fellowship.html)

<sup>50</sup> [http://www1.eere.energy.gov/commercialization/printable\\_versions/technology\\_commercialization\\_showcase.html](http://www1.eere.energy.gov/commercialization/printable_versions/technology_commercialization_showcase.html)

licensing of a DOE patent is patterned after a Stanford University licensing agreement. Based on the Stanford model, DOE created the Equity Share License Agreement, which has been pre-negotiated among a triumvirate of leading Venture Capital firm General Counsels, the DOE National Laboratory General Counsels, and the DOE Headquarters General Counsel. The DOE Equity Share License Agreement is less than 20 pages long and offers the National Laboratories a fast-track mechanism to enlist venture capital support and a share in future royalties from DOE-based patents and inventions. To date, the agreement has been an attractive mechanism for establishing small businesses and attracting venture investments because of its clarity and ease of implementation; the only issue to be negotiated is the percent equity share between the patent holder and the investors.

### **G.3 National Institute of Standards and Technology**

The National Institute of Standards and Technology (NIST) of the U.S. Department of Commerce has been involved in several technology development programs such as the Advanced Technology Program (ATP) and, more recently, its successor, the Technology Innovation Program (TIP). Both of the NIST technology programs are designed to bridge the technology and funding gaps that exist between the research laboratory and the marketplace. Through cost-shared partnerships with the private sector, both programs are aimed at accelerating the development of innovative technologies that promise significant commercial payoffs and widespread national benefits.

To better understand how potential partners can support transformational research projects, NIST conducted a study in collaboration with NVCA on Corporate Venture Capital funding sources. In June 2008, NIST and the NVCA released their report entitled, *Corporate Venture Capital: Seeking Innovation and Strategic Growth*<sup>51</sup> (NIST, 2008). The report offers insights toward understanding corporate venture capital interests in investing in new technologies and businesses.

### **G.4 International Trade Administration**

Starting in 2007, the International Trade Administration (ITA) of the U.S. Department of Commerce established a Clean Technology Program to promote U.S. company exports of clean technologies. To provide U.S. exporters with market overviews for the Clean Energy Sector in China and India through 2020, ITA published two reports—*Clean Energy: An Exporter's Guide to China*<sup>52</sup> and *Clean Energy: An Exporter's Guide to India*<sup>53</sup> (ITA, 2008a; ITA, 2008b). Each of these reports provides information on opportunities for U.S. firms in these countries, as well as details on investment and financing of clean energy products and services. Project financing for companies seeking to export technologies is provided through the U.S. Export-Import (Ex-Im) Bank<sup>54</sup> and the Overseas Private Investment Corporation (OPIC).<sup>55</sup> Both Ex-Im Bank and OPIC are independent federal agencies that provide financing through insurance, loans, loan guarantees, and other programs. ●

<sup>51</sup> [http://www.atp.nist.gov/eao/gcr\\_08\\_916\\_nist4\\_cvc\\_073108\\_web.pdf](http://www.atp.nist.gov/eao/gcr_08_916_nist4_cvc_073108_web.pdf)

<sup>52</sup> <http://trade.gov/media/publications/pdf/china-clean-energy2008.pdf>

<sup>53</sup> <http://trade.gov/media/publications/abstract/india-clean-energy2008desc.html>

<sup>54</sup> <http://www.exim.gov/>

<sup>55</sup> <http://www.opic.gov/>



## VII. Training and Education Opportunities

The most popular form of training and educational opportunities for venture capital investing occurs in annual or semi-annual conferences and seminars sponsored by national trade and professional associations, as well as their regional, state, and local affiliates. These conferences and seminars include training sessions as well as extensive networking opportunities, sometimes called investor forums or capital networks, to allow entrepreneurs, inventors, and investors to exchange ideas and perspectives. Several associations also sponsor Webcasts and Webinars on specific regional or topical issues. All of these association conferences and seminars are identified on their relevant association Websites.

Several associations, such as NASBIC, NVCA, and ACA, also have designated affiliates such as the Venture Capital Institute, the American Entrepreneurs for Economic Growth, and the Angel Capital Education Foundation that sponsor training seminars. Brief descriptions of these affiliates are provided below.

Some associations, like NASBIC, also offer specialized training events. In conjunction with the SBA Investment Division, for example, the NASBIC conducts an SBIC Regulations Class in the fall of each year.

Academic institutions also offer a range of educational and training centers dedicated to the exploration and encouragement of entrepreneurship, new venture creation, and innovation. A number of academic centers are identified below; each of them is associated with a university that offers courses, workshops, coaching events, and mentoring and support services for developers, entrepreneurs, and investors.

### A. National and Regional Association Programs

Most of the association training and educational opportunities on private equity investments are for entrepreneurs and investors interested in gaining access to these investments. In addition, many of these training and educational opportunities also offer networking and communication venues to better understand and interact with the private equity investment industry and its various components. Some of the association-affiliated training and education programs are described below.

#### A.1 Angel Capital Education Foundation

The Angel Capital Education Foundation (ACEF) is a charitable organization devoted to education and research in the field of angel investing. Information, education, data, and research analysis are available to investors, entrepreneurs, policy makers, state and local entrepreneurial support professionals, university faculty and students, and others interested in learning more about angel investing. The programs of the ACEF include conferences, regional meetings, educational workshops and seminars, and research projects and reports. ACEF was founded by the Ewing Marion Kauffman Foundation and leaders of angel groups in the United States and Canada.

##### **Angel Capital Education Foundation**

8527 Bluejacket Street

Lenexa, KS 66208

Tel: (913) 894-4700; Website: <http://www.angelcapitaleducation.org>

## **A.2 Center for Venture Education**

In 1994, the Ewing Marion Kauffman Foundation founded the Kauffman Fellows Program—an educational program designed to educate, develop, and network leaders in venture capital and high-growth start-up companies. In July 2002, the Program spun out from the Kauffman Foundation and created the Center for Venture Education (CVE), a nonprofit, post-graduate educational institute. CVE offers a 2-year apprenticeship program that features a case-based, structured educational curriculum with an individual development plan and development coaching, facilitated mentoring by a senior partner in a venture capital firm, and peer learning and networking. Scholarships are available from the Kauffman Fellowship Program to help CVE students defray costs to participate in CVE educational programs.

### **The Center for Venture Education**

4200 Somerset, Suite 115

Shawnee Mission, KS 66208

Tel: (913) 648-0002; Fax: (913) 648-0052; Website: <http://www.kauffmanfellows.org>

## **A.3 Silicon Valley Association of Startup Entrepreneurs**

The Silicon Valley Association of Startup Entrepreneurs (SVASE) is a Northern California business association dedicated to helping early-stage entrepreneurs across all technology sectors build successful companies. Founded by a group of software engineers in 1995, SVASE hosts 10 to 15 events each month, attended by 400 to 600 technology entrepreneurs and others. SVASE's Web-based services include the "24-Hour Networking," the online "SVASE Yellow Pages," and the unique, searchable "Startup Reference Guide." SVASE has a partnership with Venture Capital Experts to help entrepreneurs build and expand their businesses.

### **Silicon Valley Association of Startup Entrepreneurs**

P.O. Box 5646

South San Francisco, CA 94083

Tel: (650) 585-9577; Website: <http://www.svase.org>

## **A.4 The Young Venture Capital Society**

The Young Venture Capital Society (YVCS) is a not-for-profit educational organization created for young professionals under the age of 35. The Society's goal is to help educate and equip the next generation of venture capitalists with a variety of technical and administrative skills. These skills include: technical knowledge, financial astuteness, industry perspective, and a network of contacts about the venture capital industry as a whole. Overall, YVCS aspires to aid in the creation of successful venture capitalists by establishing various networking events, extensive industry teach-ins, detailed business plan evaluations, and in-depth discussions with industry players, academics, and personnel from a multitude of professional service industries.

### **Young Venture Capital Society**

100 Sullivan Street, Suite 5F

New York, NY 10012

Website: <http://www.yvcs.org>

## **A.5 Venture Capital Institute**

The Venture Capital Institute is part of the NASBIC education and training activities. The Institute sponsors an annual training seminar for anyone interested in venture capital investing. This seminar consists of a streamlined 3-day education program that takes an interactive approach with detailed lectures, question/answer sessions, case studies, and networking events.

### **Venture Capital Institute**

National Association of Small Business Investment Companies

1100 H Street, NW, Suite 610

Washington, DC 20005

Tel: (202) 628-5055; Fax: (202) 628-5080; Website: <http://www.vcinstitute.org>



## A.6 Venture Capital Experts

Venture Capital (VC) Experts is a training and educational organization for private equity and venture capital investments. VC Experts' anchor product is its "Encyclopedia of Private Equity and Venture Capital," which includes substantive, interactive commentary on the private equity and venture capital industries with online learning courses. VC Experts also offers an online university of courses covering U.S. and European venture capital investments; buyouts, mergers, and acquisitions; limited partnership liabilities; and other issues related to start-up business financing. In addition, VC Experts maintains a private equity data center to help establish and advise general and limited partnerships for venture capital funds, and offers expert management teams to assist small businesses with financing and growth development.

### Venture Capital Experts

747 Third Avenue, 18th Floor

New York, NY 10017

Tel: (212) 921-1442; Website: <http://www.vcexpert.com>

## B. Academic Centers/Schools of Business

Academic institutions, particularly those at the college and university levels, have a long history of offering courses on private equity investing and finance. General Georges Doriot, known as the father of the modern venture capital industry, was a professor at the Harvard Business School when he started his venture capital firm AR&DC. Some of the Academic Centers offering education and training programs on private equity investments, entrepreneurship, and business development, as well as networking opportunities, are described below.

### B.1 Babson College

Babson College, located in Wellesley, Massachusetts, is recognized internationally for its entrepreneurial leadership in a changing global environment. Babson grants BS degrees through its innovative undergraduate program. It grants MBA and custom MS and MBA degrees through the F.W. Olin Graduate School of Business at Babson College. Both programs are accredited by the AACSB International—The Association to Advance Collegiate Schools of Business, and the New England Association of Schools and Colleges. Additionally, Babson offers distinct executive education programs to help companies reach their strategic goals: Custom Degree and Credit Programs, Consortium Programs, and Open-Enrollment Programs. By infusing the spirit of innovation into its academic programs, Babson educates leaders capable of anticipating, initiating, and managing change. Moreover, the College continues to be recognized for its curricular reform. Babson's flagship course, Foundations of Management and Entrepreneurship, was recognized by the United States Association for Small Business and Entrepreneurship as having the most innovative entrepreneurship education course in the country. *U.S. News & World Report* ranked Babson's MBA program #1 in entrepreneurship for the 15th straight year. In addition, Babson was ranked No. 23 in *BusinessWeek's* 2009 ranking of "The Best Undergraduate Business Schools."

#### Babson College

231 Forest Street

Babson Park, MA 02457-0310

Tel: (781) 235-1200; Website: <http://www3.babson.edu/>

### B.2 California State University—San Bernardino

The California State University Office of Technology Transfer and Commercialization (OTTC) hosts Active Capital (formerly ACE-Net), a national organization of venture investors. OTTC and Active Capital provide workshops and online educational programs to assist entrepreneurs and investors with the commercialization of their technologies. OTTC was developed through a partnership with the Center for Commercialization of Advanced Technology in San Diego, California. OTTC and the Commercialization Center are funded primarily by the U.S. Department of Defense (DOD).

In return, both programs assist DOD in adapting new technologies in areas such as homeland security, defense, environmental restoration, and other environmental issues.

#### **Office of Technology Transfer and Commercialization**

California State University, San Bernardino

550 University Parkway

San Bernardino, CA 92407

Tel: (909) 537-7766; Fax: (909) 537-7450; Website: <http://ottc.csusb.edu>

### **B.3 Dartmouth College, Tuck School of Business**

Located in Hanover, New Hampshire, on the campus of Dartmouth College, the Tuck School of Business is the first graduate school of management in the country. It was established at the turn of the 20th century, when the plan to establish a school of business with the status of a graduate department was bold and unorthodox. The Tuck School of Business has two overarching goals: to provide the world's best educational preparation for a career of business leadership, and to have a faculty of acknowledged thought leaders who are outstanding teachers. Tuck offers a full-time MBA program as well as business courses for Dartmouth undergraduates and Master of Engineering Management students at Dartmouth's Thayer School of Engineering. Tuck also offers non-degree programs for executives and other specialized groups. In addition, the Tuck School conducts research activities led by a faculty of thought leaders and disseminates research findings through publications and presentations. Today, much of the important thought leadership about venture capital and private equity is occurring at Tuck, which has hosted a number of international and topical conferences.

#### **Dartmouth College, Tuck School of Business**

100 Tuck Hall

Hanover, NH 03755

Tel: (603) 646-8825; Website: <http://www.tuck.dartmouth.edu/>

### **B.4 Harvard University, Harvard Business School**

Many courses on financing and entrepreneurship are offered at the Harvard Business School. Dr. Joel Lerner, Professor of Investment Banking, Harvard Business School, and a widely published author on equity financing, introduced an elective course on private equity finance in the 1993-1994 academic year. In recent years, his course, "Venture Capital and Private Equity," has become one of the most widely attended elective courses at the Harvard Business School.<sup>56</sup> The Venture Capital and Private Equity course and other financing and entrepreneurship courses are offered as part of the Harvard Business School Executive Education Program.

#### **Harvard Business School**

Harvard University

Soldiers Field

Boston, MA 02163

Tel: (617) 495-6000; Website: <http://www.hbs.edu>

### **B.5 Massachusetts Institute of Technology (MIT)**

MIT offers a range of courses, educational forums, and investment networking opportunities on capital investments. In 2002, MIT began OpenCourseWare, which offers free online MIT course materials. More than 1,700 courses across all MIT departments are available through OpenCourseWare. Financial courses are available through the MIT Sloan School of Management.<sup>57</sup> Several MIT-affiliated organizations such as the MIT Enterprise Forum and the Technology Capital Network at MIT also offer educational assistance to entrepreneurs and investors.

<sup>56</sup> See <http://www.people.hbs.edu/jlerner> for a detailed description of the course and related materials on private equity financing.

<sup>57</sup> See <http://ocw.mit.edu/OcwWeb/web/courses/courses/index.htm> for more details.

Founded in 1978, the MIT Enterprise Forum is a nonprofit organization dedicated to promoting and strengthening the way new technology-oriented companies get their start, and to providing information needed for them to grow and prosper. Membership is provided through a network of 24 chapters across the United States and in Toronto, Taiwan, Israel, Japan, and the United Kingdom. Forum chapters offer advice, support, and educational services for emerging technology-based companies. They also offer networking opportunities with venture capitalists, private investors, and industry experts. The Forum's Global Broadcasts are available via satellite, Webcast, and podcasts.

**MIT Enterprise Forum, Inc.**

201 Vassar Street, Building W59-230

Cambridge, MA 02139

Tel: (617) 253-0015; Fax: (617) 258-0532; Website: <http://enterpriseforum.mit.edu>

The Capital Network (TCN) at MIT was founded by Dr. William Wetzel while he was at the Center for Venture Research at the University of New Hampshire in 1984. In 1991, TCN moved from New Hampshire to Boston and became affiliated with MIT. TCN was created as one of the first venues for entrepreneurs to present their business plans to angel investors. TCN programs are a mix of formal and informal skill building combined with opportunities to connect with entrepreneurs, investors, and sponsors. In the past 10 years, approximately 4,500 entrepreneurs have attended Financing Roundtables, while approximately 300 companies have been included in the TCN Funding Forums. Recently, TCN separated from MIT and changed its name to The Capital Network.

**The Capital Network, Inc.**

P.O. Box 39

Groton, MA 01450

Tel: (978) 846-3972; Website: <http://www.thecapitalnetwork.org/home.php>

## **B.6 New York University, Stern School of Business, The Berkley Center for Entrepreneurial Studies**

The Berkley Center for Entrepreneurial Studies at the New York University Stern School of Business is dedicated to the exploration and encouragement of entrepreneurship, new venture creation, and innovation. The Center offers programs that are designed to complement course-related learning and to encourage the creation of new ventures, either in start-up or established businesses. The Center provides practical guidance through workshops, networking events, coaching events, seminars, boot camps, funding sources (e.g., Business Plan Competition and the Satter Program), and mentoring opportunities through the New Venture Mentor Program.

**New York University, Stern School of Business**

44 West Fourth Street

New York, NY 10012

Tel: (212) 998-0074; Website: <http://w4.stern.nyu.edu/berkley>

## **B.7 Pennsylvania State University, Smear School of Business, Farrell Center for Corporate Innovation and Entrepreneurship**

The Farrell Center was formed in 1992 through an endowment from Michael J. Farrell. The center has three major roles: (1) the creation and management of educational programs in corporate innovation and entrepreneurship, (2) research, and (3) outreach. The Center's mission is to contribute to and interpret the best in academic research in the fields of entrepreneurship, including innovation and knowledge management, and to translate this into actionable best practices in the commercial and government sectors. The Center brings reality to the teaching of entrepreneurship and venture capital by enabling MBA students to become actively involved in the process of equity investment and new ventures through the management of the Garber Venture Capital Fund.

## **Farrell Center for Corporate Innovation and Entrepreneurship**

Smeal College of Business

The Pennsylvania State University

451 Business Building

University Park, PA 16802

Tel: (814) 865-4593; Fax: (814) 865-3372; Website: <http://www.smeal.psu.edu/fcfe/>

## **B.8 Tulane University, Levy-Rosenblum Institute for Entrepreneurship**

The Levy-Rosenblum Institute for Entrepreneurship (LRI) at Tulane University trains and inspires entrepreneurs through coursework, community service projects, and internships. The academic branch of the Levy-Rosenblum Institute for Entrepreneurship strives to form new enterprise-creators in alliance with the A.B. Freeman School of Business. The associated faculty of the Levy-Rosenblum Institute for Entrepreneurship offers courses at both the undergraduate and graduate levels. Freeman School students are provided the opportunity to work with experienced faculty members of entrepreneurship, network with a regional board of entrepreneurs, and participate in a student-based entrepreneurial association that provides a training ground for business development. In addition, LRI coordinates joint academic, government, and business initiatives that stimulate private enterprise and regional economic growth. It also contributes to regional and economic development by assisting the corporate and family business communities in identifying and exploring business issues through shared learning experiences.

### **Levy-Rosenblum Institute for Entrepreneurship**

Tulane University

Goldring/Woldenberg Hall I

7 McAlister, Suite 401

New Orleans, LA 70118

Tel: (504) 865-5306; Website: <http://www.freeman.tulane.edu/centers/lri/default.php>

## **B.9 University of California–Berkeley, Haas School of Business**

The Haas School of Business at the University of California, Berkeley, is one of the world's leading producers of new ideas and knowledge for all areas of business, and a launching point for many new businesses. The school's programs benefit significantly from the university's practice of interdisciplinary research and teaching and the school's strong connections to nearby Silicon Valley.

The school's Venture Capital Executive Program is designed for investment professionals, economic policy advisors, and entrepreneurs striving to gain advanced, results-oriented training in the venture capital process. This week-long program introduces participants to expert venture capital investors, institutional investors managing venture capital portfolios, lawyers specializing in venture investing and venture fund formation, and entrepreneurs. The program utilizes varied educational settings including case studies, panel discussions, electronic database research tools, and small sub-group workshops.

### **Haas School of Business**

2220 Piedmont Avenue

University of California at Berkeley

Berkeley, CA 94720-1900

Tel: (510) 642-7989; Website: <http://www.haas.berkeley.edu>

## **B.10 University of California–Berkeley, Lester Center for Entrepreneurship and Innovation**

The Lester Center was founded in 1991 through a gift from W. Howard Lester, Chairman of Williams-Sonoma, Inc. The Center's primary focus is the study and promotion of entrepreneurship and innovation in management and new enterprise development. The Center has multiple objectives. It fosters the teaching of successful entrepreneurship and innovation, encourages students in

the creation of new businesses, creates and disseminates knowledge on entrepreneurship and entrepreneurial finance to the business and university communities, and facilitates interaction between the entrepreneurial community and the university. The Lester Center's constituency is broad and consists of the founders, owners, and managers of innovative and high-growth companies, their investors and advisers, and young entrepreneurs.

#### **University of California**

Lester Center for Entrepreneurship and Innovation

Walter A. Haas School of Business, Room F450

Berkeley, CA 94720-1930

Tel: (510) 642-4255; Fax: (510) 643-4110; Website: <http://entrepreneurship.berkeley.edu/contact.asp>

### **B.11 University of California–San Diego, CONNECT**

Nearly 25 years ago, CONNECT was launched at the University of California, San Diego, with a vision to accelerate the nascent innovation economy in San Diego. Today, CONNECT is an independent nonprofit organization serving the entire San Diego region. Its programs and initiatives continue to evolve to fulfill the original mission set out by the founders. The high tech conferences have evolved into more than a dozen educational programs that resulted in 300+ events in 2009. CONNECT has identified legislative issues, developed positions, and taken action on policies that impact investment in early stage innovation. Over the past year, CONNECT has opened access to new sources of capital, assisted in increasing the number of new businesses, and provided entrepreneur education, networking, and recognition to continue building San Diego's innovation economy. Today, commercialization of innovation means helping to source and expand funding for San Diego's academic and research community; increasing access to all forms of capital for early-stage companies; supporting the development and marketing of a local contract service cluster; and effectively representing San Diego's innovation economy in Washington, DC. These are the major strategic priorities for CONNECT in the coming months and years.

The CONNECT Innovation Report provides an economic indicator of the strength and impact of the innovation economy. The report includes: (1) the number of new innovation start-ups in key regions across California; (2) VC investment across the United States; (3) merger and acquisition activity across California; (4) new patent applications and patents granted in San Diego; (5) NIH, NSF, NASA, and NOAA research grants in San Diego; and (6) research employment and wages in San Diego. CONNECT offers numerous programs including: CEO Strategy Forum, CONNECT-assist, Entrepreneurs-in-Residence, Deal Network, Financial Forum, Frameworks Workshops, Most Innovative New Product Awards, Research and Innovation Summit, the Springboard (mentoring program), Tech Transfer Roundtable, and Venture Roundtable.

#### **CONNECT**

8950 Villa La Jolla Drive

Suite A124

La Jolla, CA 92037

Tel: (858) 964-1300; Website: <http://www.connect.org/>

### **B.12 University of Chicago, Graduate School of Business, Polsky Center for Entrepreneurship**

Entrepreneurship is ranked among the top two most popular concentrations at the Chicago Graduate School of Business. The Polsky Center promotes research on entrepreneurial efforts as well as factors and trends affecting start-up companies and those who fund them. The Center has helped foster the creation of 30 companies. In developing its educational and outreach programs, the Polsky Center has created a broad network of institutional investors, venture capitalists, buy-out investors, corporate venture specialists, and angel investors, as well as industry lawyers and accountants, who are available to assist entrepreneurs.

### **Polsky Center for Entrepreneurship**

University of Chicago Graduate School of Business

5807 S. Woodlawn Avenue

Chicago, IL 60637

Tel: (773) 834-4525; Fax: (773) 834-4046; Website: <http://www.chicagogsb.edu/entrepreneurship/>

### **B.13 University of Houston, Center for Entrepreneurship**

The Center for Entrepreneurship at the University of Houston continues to develop and implement courses that build from content and exposure to real-world situations. The Center trains its students to develop new business opportunities, whether working for existing organizations or in new start-ups. The Center offers courses such as “An Introduction to Entrepreneurship,” which is designed to help students learn how to explore entrepreneurial opportunities, generate ideas for potential businesses, and determine the feasibility of their concepts. Another course, “Intrapreneurship,” allows students to hear perspectives of the professionals who are a part of a business owner’s team as well as successful entrepreneurs and investors. Speakers include lawyers, accountants, public relations consultants, bankers, investors, and owners of ongoing businesses. Teams of students prepare and present business and marketing plans, plus sales forecasts, for a local business to a panel of local entrepreneurs. The Center’s courses ensure that students understand how to research, think through, communicate, and make a case for a viable business concept and execution strategy to potential investors. Another goal of the Center is to fill the unmet educational needs of local entrepreneurs.

#### **Center for Entrepreneurship**

University of Houston-Downtown

One Main Street

Houston, TX 77002

Tel: (713) 222-5368; Website: [http://www.uhd.edu/academic/colleges/business/Institutes%20and%20Centers/ctr\\_for\\_entrepreneurship.htm](http://www.uhd.edu/academic/colleges/business/Institutes%20and%20Centers/ctr_for_entrepreneurship.htm)

### **B.14 University of Iowa, John Pappajohn Entrepreneurial Center (JPEC)**

In 1996, JPEC was created at the University of Iowa from a gift by John and Mary Pappajohn of Des Moines, Iowa, founders of Pappajohn Pizza. JPEC offers a Certificate in Entrepreneurship and advanced courses in entrepreneurship and finance. The Center sponsors several programs each year designed to bring successful entrepreneurs and business leaders together to discuss issues facing start-up and growing companies.

#### **John Pappajohn Entrepreneurial Center**

The University of Iowa

108 Pappajohn Business Building, Suite S160

Iowa City, IA 52242-1994

Tel: (319) 335-1022; Fax: (319) 353-2445; Website: <http://www.iowajpec.org>

### **B.15 University of Michigan, Ross School of Business, Center for Venture Capital and Private Equity Finance**

The Center for Venture Capital and Private Equity Finance oversees the finance and investment component of entrepreneurial studies at the University of Michigan Ross School of Business. The Center’s initiatives include connecting the school’s entrepreneurial network to the financial community through its annual Michigan Growth Capital Symposium.<sup>58</sup> The Center offers its core knowledge of entrepreneurial finance, venture capital, and private equity investment for the benefit of its constituent community. This community includes entrepreneurs, managers, investors, public policy makers whose decisions affect the entrepreneurship and equity investment environment, and university students, alumni, and staff.

<sup>58</sup> See <http://www.michiganGCS.com>

### **Center for Venture Capital and Private Equity Finance**

Stephen M. Ross School of Business

University of Michigan

701 Tappan Street

Ann Arbor, MI 48109-1234

Tel: (734) 936-3528; Fax: (734) 615-8929; Website: <http://www.bus.umich.edu>

### **B.16 University of New Hampshire, Center for Venture Research**

The Center for Venture Research is a multidisciplinary research unit of the Whittemore School of Business and Economics at the University of New Hampshire. The Center's principal area of expertise is in the study of early-stage equity financing for high-growth ventures. Since its inception in 1984, the Center has undertaken and published numerous studies in the area of early-stage equity financing of entrepreneurial ventures.

#### **Center for Venture Research**

University of New Hampshire

Whittemore School of Business & Economics

15 College Road, McConnell Hall

Durham, NH 03824

Tel: (603) 862-3885; Fax: (603) 862-4468; Website: <http://wsbe2.unh.edu/center-venture-research>

### **B.17 University of North Carolina, The Kenan-Flagler Business School**

The Kenan Institute of the Kenan-Flagler Business School at the University of North Carolina (UNC) develops and provides education, research, and programs that promote entrepreneurship and the creation of new businesses and nonprofits. The institute directs the Carolina Entrepreneurial Initiative, UNC's campus-wide entrepreneurship education, research, and venture-creation program. The Kenan Institute offers: (1) research into the issues that affect entrepreneurial success; (2) entrepreneurship education for students, faculty, and business and community leaders; (3) networks of scholars and practitioners who can help promote entrepreneurial success in the global marketplace; and (4) public policy analysis and recommendations to create a fertile environment for innovation and new venture creation.

The Center for Entrepreneurial Studies at UNC's Kenan-Flagler Business School trains the leaders of tomorrow's entrepreneurial companies. The Center develops the knowledge of and spirit for entrepreneurship in its students, fosters significant academic research in the field of entrepreneurship, and promotes entrepreneurship and economic development through outreach programs, both locally in the Research Triangle Park region and globally in emerging markets. The Center for Entrepreneurial Studies supports research in entrepreneurship at UNC Kenan-Flagler by providing entrepreneurial communities for data collection, sponsoring access to data sets, supporting conference participation, and offering research symposia. The Center works with the various Kenan-Flagler degree programs to offer courses on a variety of entrepreneurial topics. Much of the curriculum is taught by practicing entrepreneurs, venture capitalists, venture lawyers, and others who have the most current and relevant perspective on the entrepreneurial experience.

#### **Frank Hawkins Kenan Institute of Private Enterprise**

Campus Box 3440, The Kenan Center

Chapel Hill, NC 27599-3440

Tel: (919) 962-8201; Fax: (919) 962-8202; Website: <http://www.kenan-flagler.unc.edu/KI/index.cfm>

#### **Kenan-Flagler Business School**

The University of North Carolina at Chapel Hill

Campus Box 3490

McColl Building

Chapel Hill, NC 27599-3490

Tel: (919) 962-5327; Website: <http://www.kenan-flagler.unc.edu/Programs/MBA/concentration/entrepreneurial/>

## **B.18 University of North Dakota, Center for Innovation**

The Center for Innovation at the University of North Dakota (UND) was among the first entrepreneur outreach centers in the nation when it was formed in 1984. The Center provides assistance to innovators, entrepreneurs, and researchers to launch new ventures, commercialize new technologies, and secure access to capital from private and public sources. The Center manages two tech incubators in the UND Tech Park, provides SBIR outreach to the state's tech community, and has formed three angel networks in Grand Forks, Fargo, and Bismarck. It also is home to the only student-managed venture fund in the nation, Dakota Venture Group, for which students make the actual investment decisions. The Center has fostered more than 400 start-ups, which employ more than 4,000 people and have attracted more than \$110 million in investment. The Center was named a Center for Excellence in Economic Development in 2003, while securing funds for the \$4.2 million Ina Mae Rude Entrepreneur Center.

The Center for Innovation's vision and mission is to maintain national leadership in entrepreneur outreach and education, and become the leader in tech entrepreneurship in rural America. Its goals are to: (1) grow entrepreneur ventures, (2) foster innovation, (3) secure access to entrepreneur capital, (4) provide superb entrepreneur infrastructure, and (5) provide world-class entrepreneur education with the UND Entrepreneur Program.

### **Center for Innovation**

Ina Mae Rude Entrepreneur Center

University of North Dakota

4200 James Ray Drive

Grand Forks, ND 58203

Tel: (701) 777-3132; Website: [http://www.innovators.net/innovators/public\\_html/](http://www.innovators.net/innovators/public_html/)

## **B.19 University of Southern California, Marshall School of Business, Center for Technology Commercialization**

The Center for Technology Commercialization's (CTC) primary purpose is to identify, encourage, and support entrepreneurial activities. CTC offers graduate courses that prepare students to team with scientists and engineers to create new business ventures. The Marshall School of Business offers a Certificate in Technology Commercialization. CTC assists inventors and companies with initial public stock offering issues, business feasibility analysis, business plan development, start-up financing, management team acquisition, and related issues. The CTC Website offers a portal and clearinghouse for information on the technology commercialization process and attempts to match scientists, researchers, and engineers with business development experts.

### **The Center for Technology Commercialization**

Grief Entrepreneurial Center

Marshall School of Business

Bridge Hall One

University of Southern California

Los Angeles, CA 90089-0801

Tel: (213) 740-0659; Fax: (213) 740-2976; Website: <http://www.marshall.usc.edu/ctc>

## **B.20 University of Washington, Center for Innovation and Entrepreneurship**

The Center for Innovation and Entrepreneurship at the Michael G. Foster School of Business promotes entrepreneurial learning and discovery to students—from undergraduates to Ph.D. candidates—across the University of Washington. The Center brings business and scientific minds together in the classroom and provides the framework and incentives to convert student ideas into thriving businesses. More than 70 businesses have launched as a result of the Center's academic and practical experience programs. The Business Plan Competition, for example, is a premier Foster School event involving more than 300 alumni and entrepreneurs as judges, mentors, and support-



ers. The new Environmental Innovation Challenge combines solutions to environmental problems with emerging market opportunities. While studying business, engineering, or other fields, University of Washington undergraduate and graduate students can prepare for the unstructured world of entrepreneurship. Coursework, competitions, events, Seattle start-up connections, fellowships, and consulting projects in early-stage companies are just a few ways the center advances entrepreneurial education.

### **Center for Innovation and Entrepreneurship**

University of Washington

Michael G. Foster School of Business

320 Lewis Hall, Box 353200

Seattle, WA 98195

Tel: (206) 616-3691; Fax: (206) 616-3915; Website: <http://www.foster.washington.edu/centers/cie/>

## **C. Other Organizations**

### **C.1 Investors' Circle**

The Investors' Circle is one of the oldest and largest angel investor networks in the country and the only one dedicated to accelerating the transition to a sustainable economy. From organic cotton consumer goods and inner-city businesses, to environmental and medical technologies, to educational software and woman-owned businesses, no other angel group in the country is devoted specifically to sustainability.

Since 1992, Investors' Circle has facilitated the flow of more than \$111 million into 182 private companies and small venture funds focusing on: energy and the environment, food and organics, health and wellness, media and education, and community development.

Investors' Circle accomplishes its mission by bringing together investors and entrepreneurs in bi-annual venture fairs in Boston and San Francisco and by circulating each month an organized stream of investment opportunities, addressing a wide variety of social and environmental challenges. Investors' Circle hosts a searchable, online database of company summaries that is accessible only to its membership of accredited investors. An application from a company that has been accepted into the Investors' Circle network will be activated or posted in this database. A \$150 fee is charged upon activating an application. Investors' Circle also sends monthly e-newsletters to its membership announcing the new companies that have joined its database with a short description and logo. In addition, Investors' Circle holds two venture fairs each year as part of its spring and fall conferences. The venture fairs serve as its most productive avenue for deal flow. The Spring Venture Fair takes place in San Francisco, and the Fall Venture Fair takes place in Boston. Companies that are invited to present at the fairs are charged a \$995 presentation fee.

#### **Investors' Circle**

165 11th Street

San Francisco, CA 94103

Tel: (415) 863-6844; Fax: (415) 863-1356; Website: <http://www.investorscircle.net>

320 Washington Street, 4th Floor

Brookline, MA 02445

Tel: (617) 566-2600; Fax: (617) 739-3550; Website: <http://www.investorscircle.net>

### **C.2 Springboard Enterprises**

Springboard Enterprises is a national not-for-profit organization dedicated to accelerating women's access to the equity markets. The organization produces programs that educate, showcase, and support entrepreneurs as they seek equity capital and promote their companies' growth. Springboard employs a community building approach to preparing and presenting new women-led technology companies to investors and business partners.

**Springboard Enterprises**

2100 Foxhall Road, NW

Washington, DC 20007

Tel: (202) 242-6282; Fax: (202) 242-6284; Website: <http://www.springboardenterprises.org> ●

## Acronyms and Abbreviations

AARCC	Alternative Agricultural Research and Commercialization Corporation
ACA	Angel Capital Association
ACEF	Angel Capital Education Foundation
ACE-Net	Angel Capital Electronic Network
AEEG	American Entrepreneurs for Economic Growth
AR&DC	American Research and Development Corporation
ATP	Advanced Technology Program
AVCC	Army Venture Capital Corporation
CalPERS	California Public Employees Retirement System
CalSTRS	California State Teachers' Retirement System
CDVC	Community Development Venture Capital
CDVCA	Community Development Venture Capital Alliance
CED	Council for Entrepreneurial Development
CESA	Clean Energy States Alliance
CIA	Central Intelligence Agency
CO <sub>2</sub>	Carbon Dioxide
CRF	Common Retirement Fund
CTC	Center for Technology Commercialization
CVE	Center for Venture Education
CVR	Center for Venture Research
DC	District of Columbia
DOD	Department of Defense
DOE	Department of Energy
E2	Environmental Entrepreneurs
ECG	Environmental Capital Group
EDF	Environmental Defense Fund
EERE	Energy Efficiency and Renewable Energy
EIR	Entrepreneur in Residence
EISA	Energy Independence and Security Act
EPA	Environmental Protection Agency
EPAct	Environmental Policy Act
EPRS	Environmental Performance Reporting System
ERISA	Employee Retirement Income Security Act
ETC	Environmental Technology Council
ETVAS	Environmental Technology Verification and Assessment Staff
Ex-Im	Export-Import
FY	Fiscal Year
GP	General Partner
GSIP	Green Strategic Investment Program
IDEA	Innovative Development for Economic Advancement
IETO	Interagency Environmental Technology Office
INCR	Investor Network on Climate Risk
IPO	Initial Public Offering
IRR	Internal Rate of Return
IT	Information Technology
ITA	International Trade Administration
IVCA	Illinois Venture Capital Association
JPEC	John Pappajohn Entrepreneurial Center
KKR	Kolberg Kravis Roberts
LLC	Limited Liability Corporation
LP	Limited Partnership

## Acronyms and Abbreviations (continued)

M&A	Mergers and Acquisitions
MAVA	Mid-Atlantic Venture Association
MIT	Massachusetts Institute of Technology
MVF	Maryland Venture Fund
NACEPT	National Advisory Council for Environmental Policy and Technology
NASA	National Aeronautics and Space Administration
NASBIC	National Association of Small Business Investment Companies
NASDAQ	National Association of Security Dealers Automated Quotations
NASVF	National Association of Seed and Venture Funds
NEVCA	New England Venture Capital Association
NIST	National Institute of Standards and Technology
NSF	National Science Foundation
NSTC	National Science and Technology Council
NO <sub>x</sub>	Nitrogen Oxides
NRDC	Natural Resources Defense Council
NREL	National Renewable Energy Laboratory
NRMRL	National Risk Management Research Laboratory
NVCA	National Venture Capital Association
NYCIF	New York City Investment Fund
NYSERDA	New York State Energy Research and Development Authority
OIC	Oregon Investment Council
OIF	Oregon Investment Fund
OPERF	Oregon Public Employees Retirement Fund
OPIC	Overseas Private Investment Corporation
ORD	Office of Research and Development
OSWER	Office of Solid Waste and Emergency Response
OTTC	Office of Technology Transfer and Commercialization
OVA	Ohio Venture Association
PWC	PricewaterhouseCoopers
QBV	Qualified Business Venture
RBIC	Rural Business Investment Company
RGGI	Regional Greenhouse Gas Initiative
RPC	Red Planet Capital
RTA	Regional Technology Advocate
RTRP	Research Triangle Regional Partnership
SBA	Small Business Administration
SBIA	Small Business Investment Act
SBIC	Small Business Investment Company
SBIR	Small Business Innovation Research
SEC	Securities and Exchange Commission
SO <sub>x</sub>	Sulfur Oxides
STTR	Small Business Technology Transfer Program
SVASE	Silicon Valley Association of Startup Entrepreneurs
TCF	Technology Commercialization Fund
TCN	The Capital Network
TIP	Technology Innovation Program
TXU	Texas Utilities
US	United States
USDA	U.S. Department of Agriculture
VC	Venture Capital
YVCS	Young Venture Capital Society

## Glossary<sup>59</sup>

Acquisition	Process through which one company takes over the controlling interest of another company.
Angel Investor	An individual who provides capital to one or more start-up companies. Unlike a partner, the angel investor rarely is involved in management. Angel investors usually can add value through their contacts and expertise.
Buyout	The purchase of a company or a controlling interest of a corporation's shares or product line or some business. A leveraged buyout is accomplished with borrowed money or by issuing more stock.
Carried Interest	The term used to denote the profit split of proceeds to the general partner(s) in a venture capital firm. This is the general partners' fee for carrying the management responsibility plus all the liability and for providing the needed expertise to successfully manage the investment. <sup>60</sup>
Cleantech	Any knowledge-based product or service that improves operational performance, productivity, or efficiency; while reducing cost, inputs, energy consumption, waste, or pollution. <sup>61</sup>
Compound Annual Growth Rate	The year over year growth rate applied to an investment or other aspect of a firm using a base amount.
Deal Flow	The measure of the number of potential investments that a venture capital fund reviews in any given period.
Debenture	A long-term debt instrument used by governments and large companies to obtain funds. It is similar to a bond except that a debenture is unsecured in the sense that there are no liens or pledges on specific assets.
Early Stage	The second stage of business development in which venture capital might be invested. Second Stage Capital is the capital provided to expand marketing and meet growing working capital needs of an enterprise that has commenced production but does not have positive cash flows sufficient to take care of its growing needs. At this stage, the company has a product or service in testing or pilot production. In some cases, the product may be commercially available, but it may or may not be generating revenues for the company. The company usually has been in business for less than 3 years. <sup>62</sup>
Equity	Ownership interest in a company, usually in the form of stock or stock options

<sup>59</sup> These definitions of venture capital terms are drawn largely from FundingPost, an organization that introduces entrepreneurs to interested venture capitalists and angel investors (see <http://www.fundingpost.com>) and the Venture Capital Experts, a training and education organization for venture capital investments (see <http://vcexpert.com>). A private equity glossary also is available on the Web from Dartmouth's Tuck School of Business (see <http://mba.tuck.dartmouth.edu/pecenter/resources/glossary.html>).

<sup>60</sup> *The Venture Capital Industry—An Overview*, NVCA, 2007 (see <http://www.nvca.org>).

<sup>61</sup> This is one of the most often cited definitions of cleantech offered by the Cleantech Group, Ann Arbor, MI (see <http://www.cleantech.com>).

<sup>62</sup> The stage of development classifications are used in the *MoneyTree* Report. See <http://www.pwcmoneytree.com> for additional information on definitions and methodology.

## Glossary (continued)

Equity Financing	A method of financing in which a company issues shares of common or preferred stock and receives money in return.
Expansion Stage	The third stage of business development in which venture capital might be invested. Third Stage Capital is the capital provided to a company that has established commercial production and basic marketing set-up, typically for market expansion, acquisitions, product development, etc. At this stage, the business product or service is in production and commercially available. The company demonstrates significant revenue growth but may or may not be showing a profit. The company usually has been in business for more than 3 years. <sup>63</sup>
Exit Strategy	The plan by which a venture capitalist or business owner intends to liquidate an investment. Exit Strategy also refers to the liquidity event.
Fund of Funds	A fund set up to distribute investments among a selection of private equity fund managers, who in turn invest the capital directly. Fund of funds are specialist private equity investors and have existing relationships with firms. They may be able to provide investors with a route to investing in particular funds that would otherwise be closed to them. Investing in a fund of funds also can help spread the risk of investing in private equity because they invest the capital in a variety of funds.
General Partner	The partner in a limited partnership responsible for all management decisions of the partnership. The general partner (GP) has a fiduciary responsibility to act for the benefit of the limited partners (LPs) and is fully liable for its actions. Typically, venture capital firms organize their partnerships as pooled funds; that is, a fund made up of the general partner and the investors or limited partners. These funds are organized as fixed life partnerships, usually having a life of 10 years. Each fund is capitalized by commitments of capital from the limited partners. <sup>64</sup>
Initial Public Offering	The first sale of stock by a private company to the public. Initial Public Offerings (IPOs) often are sought by smaller, younger companies seeking capital to expand their businesses.
Later Stage	The fourth stage of business development in which venture capital might be invested. At this stage, the business product or service is widely available. The company is generating on-going revenue, probably positive cash flow, more likely to be but not necessarily profitable. <sup>65</sup> Later stage investing may provide financing to help a company grow to a point where it will attract public financing through a stock offering or attract a merger or acquisition with another company.

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<sup>63</sup> *MoneyTree* Report, op. cit.

<sup>64</sup> NVCA, op. cit.

<sup>65</sup> *MoneyTree* Report, op. cit.

## Glossary (continued)

Limited Partnership	An organization composed of a general partner, who manages a venture capital fund, and limited partners, who invest money but have limited liability and are not involved with the day-to-day management of the fund. In the typical venture capital fund, the general partner receives a management fee and a percentage of the profits (or carried interest). The limited partners receive income, capital gains, and tax benefits.
Liquidity Event	The way in which an investor plans to close out an investment. Liquidity event also is known as exit strategy.
Merger	Combination of two or more companies and/or corporations in which greater efficiency is supposed to be achieved by the elimination of duplicate plant, equipment, and staff, and the reallocation of capital assets to increase sales and profits of the enlarged company.
Net Asset Value	Calculated by adding the value of all the investments in a fund and dividing by the number of shares of the fund that are outstanding.
Portfolio Company	A company or entity in which a venture capital firm or buyout firm invests. All the companies currently backed by a private equity firm compose the firm's portfolio.
Private Equity	Equity securities of unlisted companies. Private equities generally are illiquid and thought of as a long-term investment. Private equity investments are not subject to the same high level of government regulation as stock offerings to the general public. Private equity also is far less liquid than publicly traded stock.
Seed/Start-Up Stage	The initial stage of business development in which venture capital might be invested. Seed capital is the money used to purchase equity based interest in a new or existing company. At this stage, the company has a concept or product under development but probably is not fully operational. <sup>66</sup>
Small Business Investment Companies	Lending and investment firms that are licensed and regulated by the Small Business Administration. The licensing enables them to borrow from the Federal Government to supplement the private funds of their investors. Small Business Investment Companies prefer investments between \$100,000 to \$250,000 and have much more generous underwriting guidelines than a venture capital firm.
Venture Capital	Money and resources made available to start-up firms and small businesses with exceptional growth potential. Venture capital funds pool and manage money from investors seeking private equity stakes in these small and medium-size businesses. Most venture capital funds come from wealthy investors such as: public and private pension funds, finance and insurance companies, and endowments and foundations.

<sup>66</sup> *MoneyTree* Report, op. cit.





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# Appendix A: Understanding the *MoneyTree* Report

## 1. Description and Report Methodology

### Summary Description

The *MoneyTree* Report measures cash-for-equity investments by the professional venture capital community in private emerging companies in the United States. It is based on data provided by Thomson Reuters.

The report includes the investment activity of professional venture capital firms with or without a U.S. office, SBICs, venture arms of corporations, institutions, investment banks, and similar entities whose primary activity is financial investing. Where there are other participants such as angels, corporations, and governments in a qualified and verified financing round, the entire amount of the round is included.

Qualifying transactions include cash investments by these entities either directly or by participation in various forms of private placement. All recipient companies are private and may have been newly created or spun out of existing companies.

The report excludes debt, buyouts, recapitalizations, secondary purchases, IPOs, investments in public companies such as PIPES (private investments in public entities), investments for which the proceeds are primarily intended for acquisition such as roll-ups, change of ownership, and other forms of private equity that do not involve cash, such as services-in-kind and venture leasing. Investee companies must be domiciled in one of the 50 U.S. states or Washington, DC, even if substantial portions of their activities are outside the United States.

### Specific Methodology

The focus of the report is on cash received by the company. Therefore, tranches not term sheets are the determining factor. Draw downs on commitments are recognized at the time the company receives the money rather than recorded as a lump sum amount at the time the term sheet is executed. Convertible debt and bridge loans are recognized only when converted to equity.

Once a company has received a qualifying venture capital financing round, all subsequent equity financing rounds are included regardless of whether the round involved a venture capital firm as long as all other investment criteria are met (e.g. cash-for-equity, not buyout or services in kind).

Angel, incubator, and similar investments are considered pre-venture financing if the company has received no prior qualifying venture capital investment and are not included in the *MoneyTree* results. Angel, incubator, and similar investments that are part of a qualifying venture capital round or follow a qualifying venture capital round are included to the extent that such investments can be fully verified as meeting all other criteria (cash for equity, not buyout or services in kind).

Direct investment by corporations (not through a corporate venture capital arm) is excluded unless (a) the investment is clearly demonstrated to be primarily a financial investment rather than outsourced research and development or market development, (b) it is a co-investment in an otherwise qualifying round, or (c) it follows a qualifying venture round in a company and meets all other criteria (cash for equity, not buyout or services in kind).

Data primarily are obtained from a quarterly survey of venture capital practitioners conducted by Thomson Reuters. Information is augmented by other research techniques including other public and private sources. All data are subject to verification with the venture capital firms and/or the investee companies.

Only professional independent venture capital firms, institutional venture capital groups, and recognized corporate venture capital groups are included in venture capital industry rankings.

# Appendix A: Understanding the *MoneyTree* Report (continued)

Sections 2 through 4 identify the industry categories, sectors, and geographic classifications used in *MoneyTree*. Section 5 defines the investment stages used in *MoneyTree*.

## 2. Industry Categories

### Biotechnology

Developers of technology promoting drug development, disease treatment, and a deeper understanding of living organisms. Includes human, animal, and industrial biotechnology products and services. Also included are biosensors, biotechnology equipment, and pharmaceuticals.

### Business Products and Services

Offers a product or service targeted at another business such as advertising, consulting, and engineering services. Also includes distributors, importers, and wholesalers.

### Computers and Peripherals

Includes manufacturers and distributors of PCs, mainframes, servers, PDAs, printers, storage devices, monitors, and memory cards. Also included are digital imaging and graphics services and equipment such as scanning hardware, graphics video cards, and plotters. Integrated turnkey systems and solutions also are included in this category.

### Consumer Products and Services

Offers products or services targeted at consumers such as restaurants, dry cleaners, automotive service centers, clothing, toiletries, and housewares.

### Electronics/Instrumentation

Includes electronic parts that are components of larger products and specialized instrumentation, including scientific instruments, lasers, power supplies, electronic testing products, and display panels. Also included are business and consumer electronic devices such as photocopiers, calculators, and alarm systems.

### Financial Services

Providers of financial services to other businesses or individuals including banking, real estate, brokerage services, and financial planning.

### Healthcare Services

Includes both in-patient and out-patient facilities as well as health insurers. Included are hospitals, clinics, nursing facilities, managed care organizations, Physician Practice Management Companies, child care, and emergency care.

### Industrial/Energy

Producers and suppliers of energy, chemicals, and materials; industrial automation companies; and oil and gas exploration companies. Also included are environmental, agricultural, transportation, manufacturing, construction, and utility-related products and services.

### IT Services

Providers of computer and Internet-related services to businesses and consumers including computer repair, software consulting, computer training, machine leasing/rental, disaster recovery, web design, data input and processing, Internet security, e-commerce services, Web hosting, and systems engineering.



## Appendix A: Understanding the *MoneyTree* Report (continued)

### Media and Entertainment

Creators of products or providers of services designed to inform or entertain consumers including movies, music, consumer electronics such as TVs/stereos/games, sports facilities and events, and recreational products or services. Online providers of consumer content also are included in this category (medical, news, education, legal).

### Medical Devices and Equipment

Manufactures and/or sells medical instruments and devices including medical diagnostic equipment (X-ray, CAT scan, MRI), medical therapeutic devices (drug delivery, surgical instruments, pacemakers, artificial organs), and other health related products such as medical monitoring equipment, handicap aids, reading glasses, and contact lenses.

### Networking and Equipment

Providers of data communication and fiber optics products and services. Includes WANs, LANs, switches, hubs, routers, couplers, and network management products, components, and systems.

### Retailing/Distribution

Firms making consumer goods and services available for consumer purchase including discount stores, super centers, drug stores, clothing and accessories retailers, computer stores, and book stores. Also included in this group are e-Commerce companies: those selling their products or services via the Internet.

### Semiconductors

Design, develop, or manufacture semiconductor chips/microprocessors or related equipment including diodes and transistors. Also includes companies that test or package integrated circuits.

### Software

Producers of bundled and/or unbundled software applications for business or consumer use including software created for systems, graphics, communications and networking, security, inventory, or home, educational, or recreational use. Also included is software developed for specific industries such as banking, manufacturing, transportation, or healthcare.

### Telecommunications

Companies focused on the transmission of voice and data including long distance providers, local exchange carriers, and wireless communications services and components. Also included are satellite and microwave communications services and equipment.

### Other

If the classification criteria in all of the other categories do not appropriately describe the product or service offered, the firm may be categorized in this group.

## 3. Sectors

### Clean technology

This designation crosses traditional *MoneyTree* industries and comprises companies that focus on alternative energy, pollution and recycling, power supplies, and conservation.

# Appendix A: Understanding the *MoneyTree* Report (continued)

## Internet-specific

A discrete classification assigned to a company whose business model is fundamentally dependent on the Internet, regardless of the company's primary industry category.

## Life sciences

Includes all deals completed and dollars invested into Biotechnology and Medical Device companies.

## 4. Geographic Classifications

### Alaska/Hawaii/Puerto Rico

Alaska, Hawaii, and Puerto Rico

### Colorado

The state of Colorado

### DC/Metroplex

Washington, DC, Virginia, West Virginia, and Maryland

### LA/Orange County

Southern California (excluding San Diego), the Central Coast, and San Joaquin Valley

### Midwest

Illinois, Missouri, Indiana, Kentucky, Ohio, Michigan, and western Pennsylvania

### New England

Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and parts of Connecticut (excluding Fairfield County)

### New York Metro

Metropolitan NY area, northern New Jersey, and Fairfield County, Connecticut

### North Central

Minnesota, Iowa, Wisconsin, North Dakota, South Dakota, and Nebraska

### Northwest

Washington, Oregon, Idaho, Montana, and Wyoming

### Philadelphia Metro

Eastern Pennsylvania, southern New Jersey, and Delaware

### Sacramento/Northern California

Northeastern California

### San Diego

San Diego area

### Silicon Valley

Northern California, San Francisco Bay area, and coastline

# Appendix A: Understanding the *MoneyTree* Report (continued)

## South Central

Kansas, Oklahoma, Arkansas, and Louisiana

## Southeast

Alabama, Florida, Georgia, Mississippi, Tennessee, South Carolina, and North Carolina

## Southwest

Utah, Arizona, New Mexico, and Nevada

## Texas

Texas

## Upstate New York

Northern New York State, except Metropolitan New York City area

## 5. Stages of Development

### Seed/Start-Up Stage

The initial stage. The company has a concept or product under development, but is probably not fully operational. Usually in existence less than 18 months.

### Early Stage

The company has a product or service in testing or pilot production. In some cases, the product may be commercially available. May or may not be generating revenues. Usually in business less than 3 years.

### Expansion Stage

Product or service is in production and commercially available. The company demonstrates significant revenue growth, but may or may not be showing a profit. Usually in business more than 3 years.

### Later Stage

Product or service is widely available. Company is generating on-going revenue; probably positive cash flow. More likely to be, but not necessarily profitable. May include spin-outs of operating divisions of existing private companies and established private companies.

## Appendix B: Definitions of Clean Technology Segments

Segment and Description	Clean Technology Examples
<p><b><i>Agriculture:</i></b> Natural pesticides, land management, and aquaculture</p>	<p>Natural pesticides and herbicides (e.g., organic fungicides, beneficial insects, anti-microbial) Natural fertilizers (e.g. organic fertilizers) Farm efficiency technologies (e.g., sensors and monitoring of controlled insecticide and fertilizer use) Micro-irrigation systems (e.g., drip irrigation) Erosion control Crop yield improvements</p>
<p><b><i>Air &amp; Environment:</i></b> Cleanup/safety, emissions control, monitoring/compliance, trading and offsets</p>	<p>Air purification and filtration products Multi-pollutant controls (e.g., sorbents) Catalytic converters Fuel additives to reduce toxic emissions Remediation Leak detection Pollution sensors and gas detectors</p>
<p><b><i>Energy Efficiency:</i></b> Lighting, buildings, materials, and other</p>	<p>Smart metering, sensors and control systems in applications Energy efficient appliances (e.g., light emitting diode lighting) Chemical and electronic glass Energy efficient building materials (e.g. windows, insulation) Smart and efficient heating, ventilation and air conditioning systems (HVAC) Building automation and smart controls Automated energy conservation networks</p>
<p><b><i>Energy Generation:</i></b> Wind, solar, hydroelectric/marine, biofuels, geothermal, and other</p>	<p>Renewable energy conversion technologies (marine, tidal, solar, wind, biomass) Geothermal heat and electricity generation Waste to energy generation Cogeneration (combined heat and power units) Biofuel technologies (e.g. cellulosic fermentation, ethanol) Clean coal technologies Micro-power generators (e.g. vibrational energy) Electro-textiles</p>
<p><b><i>Energy Infrastructure:</i></b> Management and transmission</p>	<p>Power conservation Power quality monitoring and outage management Power monitoring and control Integrated electronic systems for the management of distributed power Demand response and energy management software Advanced metering and sensors for power, e.g., using active radio frequency identification networks, wireless technology, Mesh Networks</p>
<p><b><i>Energy Storage:</i></b> Fuel cells, advanced batteries, and hybrid systems</p>	<p>Fuel cells for stationary and mobile storage Micro-fuel cells Advanced rechargeable batteries (NiMH, Li-Ion, Zinc Air, Thin-film, enzyme catalyzed, etc.) Heat storage Flywheels Super and Ultra capacitors</p>
<p><b><i>Manufacturing &amp; Industrial:</i></b> Advanced packaging, monitoring and control, and smart production</p>	<p>Chemical management services Sensors for industrial controls and automation Advanced packaging (e.g., packing and containers) Precision manufacturing instruments and fault detectors Process intensification</p>

## Appendix B: Definitions of Clean Technology Segments (continued)

Segment and Description	Clean Technology Examples
<p><b>Materials:</b> Nanomaterials, biomaterials, chemicals, and other</p>	<p>Green chemistry Advanced and composite materials (e.g. electro-chromic glass, thermoelectric materials) Bio materials (e.g., bio-polymers, catalysts) Nanomaterials with cleantech applications (e.g. nanopowders, adhesives, gels, coatings, additives) Thermal regulating fibers and fabrics Environmentally friendly solvents</p>
<p><b>Recycling &amp; Waste:</b> Recycling and waste treatment</p>	<p>Recycling technologies Waste exchanges and resource recovery Bio-mimetic technology for advanced metals separation and extraction Waste destruction (plasma, gasification, biological/composting)</p>
<p><b>Transportation:</b> Vehicles, logistics, structures, and fuels</p>	<p>Different modes of transport (e.g. electric and battery vehicles, hybrid vehicles) Efficient engines Hybrid drive technologies Lightweight structures for vehicles Car-sharing tools Temperature pressure sensors to improve transportation fuel efficiency Logistics management software and radio frequency identification devices Fleet tracking Traffic control and planning technology</p>
<p><b>Water &amp; Wastewater:</b> Water treatment, water conservation, and wastewater treatment</p>	<p>High purity water Desalination Filtration and purification Contaminant detection and monitoring Control systems and metering for water use Advanced sensors for water pollutants Separation of water into use-types (i.e., gray water separated from drinking water) Wastewater recycling and re-use Biological and mechanical (non-chemical) wastewater treatment</p>

Source: Jones and Berry, 2007; Parker, et al., 2007

## Appendix C: State Venture Investments

States	2009 VC Investment in State (\$ in millions) <sup>1</sup>	2008 VC Investment in State (\$ in millions) <sup>1</sup>	2008: Top 10 State-Supported VC Funds (\$ in millions) <sup>2</sup>	2007: Top 10 States for Venture Investment <sup>3</sup>	September 2006: Top 10 Pension Funds Based on Asset Market Value <sup>4</sup>	1995-2005: Top 10 States for Venture Investment <sup>5</sup>	Investor Network on Climate Risk Members <sup>6</sup>	Clean Energy States Alliance Members <sup>7</sup>
California	\$8,853.8	\$14,002.2		1	1. CalPERS 2. CalSTRS	1	CalPERS CalSTRS CA State Controller CA State Treasurer	CA Energy Commission
Massachusetts	\$2,032.6	\$3,033.6		2		2	MA State Treasurer	MA Renewable Energy Trust
New York	\$855.5	\$1,392.2		5	3. NY Common Retirement Fund 7. NY State Teachers Retirement System	4	NY State Comptroller NY State Teachers' Retirement System NY City Comptroller NY City Employees Retirement System	NY State Energy Research and Development Authority
Texas	\$644.6	\$1,261.1	2 - \$290M	3	5. TX Teacher Retirement System	3		
Washington	\$574.2	\$875.2		4		6		
New Jersey	\$556.6	\$707.6	10 - \$65M	9	6. NJ Division of Pension and Benefits	7	NJ State Investment Council NJ State Treasurer	NJ Bureau of Public Utilities: Clean Energy Program and the NJ Department of Environmental Protection
Colorado	\$468.2	\$837.3				5		
Pennsylvania	\$407.0	\$693.9	9 - \$68M	6		8	PA State Treasurer	Sustainable Development Fund and the West Penn Power Sustainable Energy Fund

<sup>1</sup> National Association of Seed and Venture Funds Report, "U.S. Supported Venture Capital Funds," March 2008

<sup>2</sup> National Venture Capital Association press release, "NVCA Commemorates 35th Anniversary," February 5, 2008

<sup>3</sup> National Association of State Retirement Administrators, "Public Fund Survey: Summary of Findings for FY 2005," September 2006

<sup>4</sup> National Association of Seed and Venture Funds Report, "Seed and Venture Capital: State Experiences and Options," May 2006

<sup>5</sup> 2008 *Investor Summit on Climate Risk Final Report*, United Nations, Ceres, February 14, 2008. The Investor Network on Climate Risk is a \$7 trillion network of institutional investors and financial institutions that promotes better understanding of the financial risks and investment opportunities posed by climate change. INCR is coordinated by Ceres, a coalition of investors and environmental groups working with companies to address sustainability challenges such as climate change.

<sup>6</sup> *Clean Energy States Alliance (CESA) Year Six Strategic Plan, July 1, 2008 - June 30, 2009*, Clean Energy States Alliance. CESA membership is composed of "Clean Energy Funds" or "State Funds" whose objective is building markets for renewable energy and clean energy resources. CESA member programs will make available nearly \$3.5 billion to promote renewable and clean energy over the next decade.

## Appendix C: State Venture Investments (continued)

States	2009 VC Investment in State (\$ in millions) <sup>1</sup>	2008 VC Investment in State (\$ in millions) <sup>1</sup>	2008: Top 10 State-Supported VC Funds (\$ in millions) <sup>2</sup>	2007: Top 10 States for Venture Investment <sup>3</sup>	September 2006: Top 10 Pension Funds Based on Asset Market Value <sup>4</sup>	1995-2005: Top 10 States for Venture Investment <sup>5</sup>	Investor Network on Climate Risk Members <sup>6</sup>	Clean Energy States Alliance Members <sup>7</sup>
Georgia	\$302.0	\$417.7						
Florida	\$295.1	\$236.0		8	4. FL Retirement System	10	FL State Board of Investment FL State Treasury	Anticipated to become new member in year 6
North Carolina	\$289.6	\$435.1		10	9. NC Retirement System			Anticipated to become new member in year 6
Maryland	\$277.1	\$455.7		7			MD State Retirement Agency MD State Treasurer	MD Energy Authority
Minnesota	\$263.2	\$478.6						Xcel Energy Renewable Development Fund
Virginia	\$218.8	\$463.5				9		
Illinois	\$195.4	\$440.7					IL State Board of Investment	IL Clean Energy Community Foundation
Utah	\$177.6	\$186.8	6 - \$100M					
Indiana	\$159.4	\$94.8	8 - \$70M					
Connecticut	\$158.2	\$115.3					CT State Treasurer	CT Clean Energy Fund
Michigan	\$131.2	\$251.4	4 - \$204M					
Arizona	\$110.6	\$208.8						
Ohio	\$108.4	\$221.7	3 - \$212M		10. OH State Teachers Retirement System			OH Energy Office
Oregon	\$101.4	\$162.3					OR State Treasurer	Energy Trust Fund of OR
Iowa	\$83.6	\$55.1	5 - \$100M					
Tennessee	\$48.0	\$73.3						
District of Columbia	\$46.7	\$35.6						
Alabama	\$43.2	\$24.1						
Rhode Island	\$39.1	\$40.7					RI State Treasurer	
New Hampshire	\$37.7	\$170.1						
Missouri	\$23.9	\$79.5						
Wisconsin	\$23.0	\$64.0			8. WI Retirement System			WI Focus on Energy
Delaware	\$17.7	\$62.7						

## Appendix C: State Venture Investments (continued)

States	2009 VC Investment in State (\$ in millions) <sup>1</sup>	2008 VC Investment in State (\$ in millions) <sup>1</sup>	2008: Top 10 State-Supported VC Funds (\$ in millions) <sup>2</sup>	2007: Top 10 States for Venture Investment <sup>3</sup>	September 2006: Top 10 Pension Funds Based on Asset Market Value <sup>4</sup>	1995-2005: Top 10 States for Venture Investment <sup>5</sup>	Investor Network on Climate Risk Members <sup>6</sup>	Clean Energy States Alliance Members <sup>7</sup>
Nevada	\$15.4	\$12.6						
Idaho	\$14.7	\$21.7						
Montana	\$14.5	\$15.6						
Vermont	\$14.2	\$42.3					VT State Treasurer	VT Clean Energy Development Fund
Unknown	\$13.0	\$0.0						
Louisiana	\$11.4	\$17.2						
Kentucky	\$11.1	\$29.8					KT State Treasurer	
Maine	\$8.2	\$4.1					ME State Treasurer	
South Carolina	\$8.0	\$34.0						
Kansas	\$7.9	\$44.8						
Hawaii	\$7.1	\$7.2						
North Dakota	\$6.8	\$4.5						
New Mexico	\$6.7	\$58.1	1 - \$536M					NM Energy Conservation and Management
Oklahoma	\$4.5	\$16.6	7 - \$100M					
West Virginia	\$3.0	\$30.0						
South Dakota	\$0.8	\$0.5						
Mississippi	\$0.0	\$0.0						
Alaska	\$0.0	\$0.0						AK Energy Authority
Arkansas	\$0.0	\$0.0						
Nebraska	\$0.0	\$16.0						
Puerto Rico	\$0.0	\$13.8						
Wyoming	\$0.0	\$1.5						



## Appendix D: Venture Capital Data Resources

Resource	Description	URL	Cost
Dow Jones Venture Source	Real-time database of U.S., European, and Israeli venture-backed companies and their investors	<a href="http://www.ventureone.com">http://www.ventureone.com</a>	Available on a subscription only basis.
Infon	Online directory of venture capital companies, sorted by location, industry, and size	<a href="http://www.infon.com">http://www.infon.com</a>	Free searchable database for over 3,000 firms. Subscription service of \$99 per year allows export of venture capital firm communication and investment information
Lux Research	Lux Research is an independent research and advisory firm providing strategic advice and ongoing intelligence for emerging technologies. In 2008, Lux released their Cleantech Report as an authoritative guide to emerging energy and environmental technologies. Lux claims that the Cleantech Report is the first information resource to provide comprehensive analysis of cleantech—offering proprietary data, unbiased analyses, and fresh insights in emerging energy and environmental technologies.	<a href="http://www.luxresearchinc.com">http://www.luxresearchinc.com</a>	Cleantech Report cost and other services available on a publication cost and/or fee basis.
Thomson Financial (Thomson ONE Private Capital)	Real-time and historical global market data on equity backed companies. Thomson Financial is exclusively endorsed by the National Venture Capital Association and the Canadian Venture Capital Association and has a relationship with the European Venture Capital Association	<a href="http://www.thomsonreuter.com">http://www.thomsonreuter.com</a>	Available on a subscription only basis.
VCgate	Software directory of venture capital companies	<a href="http://www.vcgate.com">http://www.vcgate.com</a>	Directory contains over 4,200 venture capital and private equity firms world wide. Periodic special offers available.
VCLocator	Online directory of venture capital companies, sorted by location, industry, and size	<a href="http://www.vclocator.com">http://www.vclocator.com</a>	Free view of 6,000 + venture capital firm directory worldwide; subscription fee for targeted searches and updates.
VCPro Database	Software directory of venture capital companies	<a href="http://vcprodatabase.com">http://vcprodatabase.com</a>	Free downloadable trial version of venture capital database; entire database available on a subscription basis.
vFinance	Financial services company that offers online directory of venture capital companies and private equity firms, sorted by location, industry, and size	<a href="http://vfinance.com">http://vfinance.com</a>	\$3.00 per contact
VentureDeal	Database that provides up-to-date information about venture-backed technology companies, venture capital firms, and transactions in the United States. VentureDeal is updated daily and offers convenient access to detailed and actionable information for business development, funding search, and venture investment goals.	<a href="http://www.venturedeal.com">http://www.venturedeal.com</a>	Free 14-issue trial subscription for up to 10 contacts. \$25.00 per month self-search subscription fee. \$149.00 3-month fee with company provided search assistance. Customized searches available on a fee basis.

# Appendix E: Environmental Due Diligence Process<sup>1</sup>

## Clean Energy and Technology Investments

The Environmental Capital Group (ECG) provides environmental due diligence, performance monitoring, and reporting services that account for the real environmental impacts created by the private equity investments in clean energy and technology.

Clean energy and technology investments include those that provide economic value while improving the sustainable use of natural resources and reducing waste and emissions as compared to existing products, services, or technologies. This includes alternative and renewable energy (clean energy), water technologies (clean water), advanced materials or nanotechnology (clean material), air purification technologies (clean air), and transitional infrastructure opportunities.

## Environmental Due Diligence

The purpose of environmental due diligence as conducted by ECG for its client businesses is to answer two key questions:

1. If the technologies of the portfolio companies are successfully commercialized, will the fund result in significant net environmental benefits?
2. Does the fund management have the capability and willingness to implement its environmental strategy and measure the resultant environmental benefits?

Each candidate fund responds to a set of questions about the fund's potential environmental benefits, environmental strategy, prior experience in environmental investments, environmental and technical expertise, and experience and knowledge of measurement of environmental results. For a fund to be recommended, it has to meet expectations according to specific criteria in each of the following categories:

- Priority and scope of environmental problems addressed.
- Magnitude of potential environmental benefits.
- Environmental strategy of fund.
- Likely environmental performance of fund.
- Management team environmental experience.
- Environmental performance monitoring capability.

## Successful Investment Proposals

ECG believes the most successful investment proposals have the following characteristics:

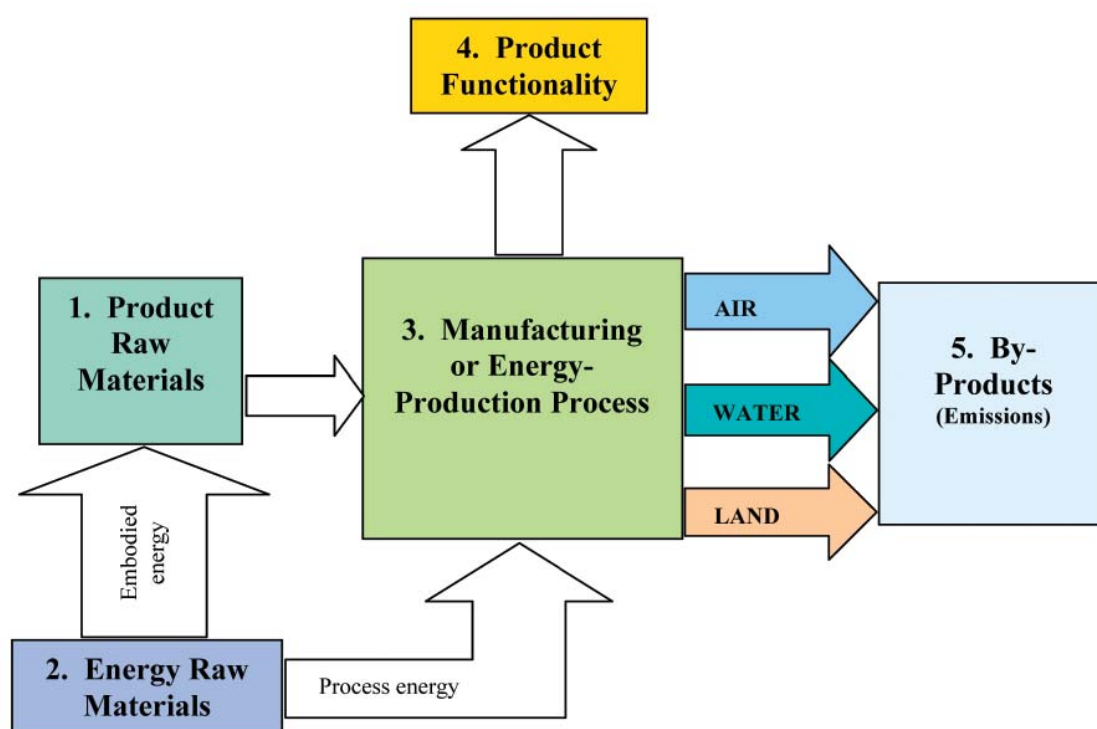
- The prospective portfolio companies are likely to result in significant environmental benefits because of the potential for breakthrough technologies and/or because the technology might be transferred to multiple companies.
- The fund management demonstrates an understanding of: a) the environmental problems that it will address, b) the importance of considering positive and negative environmental impacts, c) the legal/regulatory environment, and d) the need to have a plan to commercialize technologies to achieve actual environmental benefits.
- The proposal explicitly describes how the fund management will consider the potential environmental impact prior to selection of portfolio companies, in addition to financial considerations.
- The fund management includes people with sufficient technical depth and willingness to undertake a quantitative analysis of net environmental benefits of its portfolio companies.

<sup>1</sup> This appendix was provided by the Environmental Capital Group (<http://www.environmentalcapitalgroup.com/>).

## Appendix E: Environmental Due Diligence Process (continued)

### Net Environmental Benefits

ECG has developed analytical methods to measure and report significant net environmental benefits created by the portfolio companies. To analyze net environmental benefits, we consider how the “new” process or product compares to the “existing” process or product. This requires an understanding of not only the environmental impacts of the company’s technology, but also of the technology that it seeks to replace. It also requires establishing the boundaries of the analysis and considering significant positive and negative environmental impacts within those boundaries. For example, when analyzing how an electric car benefits the environment, we must first answer the question: “Compared to what?” Usually, the comparison is made to the industry standard or typically used product, which we call the “base case.” We must then address the question of how the new technology compares environmentally to the base case, both positively and negatively. The diagram below shows potential sources of environmental benefits relating to consumption of energy and raw materials and manufacture of product and by-products.



- 1. Product Raw Materials:** The technology may require either a smaller amount of raw material or a more environmentally benign raw material to achieve the same result compared to the industry-standard (e.g., a manufacturing process that recycles by-products to be used as raw material).
- 2. Energy Raw Materials:** The energy used to make the raw materials (embodied energy) or to convert the raw materials to the final product (process energy) may be from a renewable energy source instead of a fossil carbon energy source (e.g., liquid fuels produced from agricultural waste).
- 3. Manufacturing or Energy-Production Process:** The technology may improve the efficiency of a manufacturing or energy-production process so that less energy is consumed (e.g., energy storage devices that allow for load-shifting and improved efficiencies in power plants).
- 4. Product Functionality:** The product itself may be more environmentally benign than the product it replaces (e.g., a less toxic insecticide).
- 5. By-Products (Emissions):** The technology may result in fewer by-products or emissions (air, water, and/or land) compared to the industry-standard (e.g., a cleaner burning coal).

## Appendix E: Environmental Due Diligence Process (continued)

ECG believes that all five of these areas must be considered in an analysis of net environmental benefits and are usually linked. Consider solar energy as an example. The *product functionality* is electrical power, which is similar to that produced from traditional sources, but with significantly less *by-products* because the absence of combustion to produce the electricity also means the absence of greenhouse gas and other air emissions. In addition, the *energy raw material* (the sun) is renewable, so fossil carbon resources aren't depleted. However, the solar panels are manufactured from *product raw materials* that consume energy to produce (embodied energy, which may be fossil carbon based and which will vary in amount and type depending on the panel technology employed). The amount of energy produced in the *energy-production process* will also depend on the technology employed.

ECG believes that the extent of such an analysis depends upon the detail in which each area is considered (do you count the energy required to make the machinery for a manufacturing process?) and the boundaries selected for the analysis (do you count the fuel burned by the workers driving to an ethanol plant?). This process has to be mindful of the costs associated with capturing and accounting for the net environmental benefits. Toward this end, ECG considers only those elements that significantly affected the results compared to the base case, what we call the "80/20 rule". For example, for a portfolio company producing a new building insulation product from recycled materials, ECG includes the savings in *product raw material embodied energy* because making the recycle-based product required at least 20% less fossil carbon-based raw materials than making the traditional material.

ECG also includes the difference in *product functionality* (insulating capability) because the insulating capability of the recycle-based product was at least 20 percent better than the traditional material, resulting in building energy savings and reducing associated air emission *by-products*. ECG does not go to the detail of comparing the embodied energy of the machinery used to produce the recycle-based and traditional products. In most cases, ECG only considers the direct raw materials and energy used in the manufacturing process and the direct emissions from the process, not raw materials, energy, and emissions further downstream or upstream. As ECG follows these companies over the investment period, they will continue to check if all the material net environmental benefits are captured.

Another example of the ECG approach is small-scale wind-powered electricity generation. These wind turbines are sold throughout the US. ECG selected as a base case the production of electricity from all sources in the US (natural gas, coal, nuclear, etc.) and assumed that any power generated from the wind turbines would displace power generated from a weighted average of these sources. ECG then calculated the total amount of power displaced and an associated reduction in air emissions (e.g., CO<sub>2</sub>, NO<sub>x</sub>, SO<sub>x</sub>, Hg) based on the weighted average emissions from all sources. This is obviously an approximation. If ECG could determine exactly where each wind turbine was installed, we could identify whether it was replacing natural gas-based power or coal-based power, which have different emission profiles, but this is beyond the scope of the analysis (and data available). ECG also did not include the energy required to make the turbines. In other cases, such as photovoltaic-based solar power, the embodied energy in the solar panels varies significantly between technologies and is significant compared to the energy produced by the panels. As such, it is included in these calculations.

ECG believes that a defensible analysis of net environmental benefits must include consideration of significant negative environmental impacts. There is a difference in net greenhouse gas emissions (CO<sub>2</sub>) between growing crops in an empty field to feed an ethanol plant and cutting down a rain forest to make room for such crops. In fact, the analysis of the net environmental impact of biofuels depends on careful consideration of each element in the model (raw materials, process energy type and requirements, end-product functionality, by-products, etc.).

# Appendix E: Environmental Due Diligence Process (continued)

## Environmental Performance Reporting System

To move from concepts about environmental benefits to specific results for each portfolio company, ECG developed an Environmental Performance Reporting System (EPRS). The objectives of this system are to:

1. Measure the net environmental benefits of each fund and portfolio company investment; and
2. Establish an environmental performance basis for proactively choosing future clean energy and technology investments.

The first step in this process takes place upon the initial investment in each portfolio company. During due diligence, the General Partner of the fund identifies the significant environmental impacts of each company and determines whether they are consistent with the overall environmental objectives of the fund. Within 90 days of the initial investment, the Venture Capital General Partner establishes an environmental performance framework for each portfolio company, including selecting the appropriate base case and preparing a sample net environmental benefit calculation.

The calculation of net environmental benefits can be thought of as an engineering or technical report that links a business result, such as the number of product units sold or amount of material processed, to the associated environmental result, such as tons of emissions avoided or gallons of water saved. ECG works with the General Partner to conduct this analysis, including assessing which environmental impacts should be included, identifying respected literature sources, and checking the analysis for consistency with similar technologies based on our broad understanding of the market. In some cases, the analysis is reviewed with an expert in the appropriate field.

At the end of each fiscal year, the General Partner collects business results data from each portfolio company and calculates the associated net environmental benefits using the analysis framework established at the time of investment. ECG collects and reviews this information and works with the General Partner to update and refine the analysis framework.

## Appendix F: Clean Technology Venture Capital Investments by State, 1999–2005

State	Investment (in millions)	Number of Deals
CA	\$2,720	278
MA	\$1,005	105
TX	\$397	52
NY	\$235	42
CO	\$216	37
FL	\$193	23
WA	\$180	30
IL	\$171	44
CT	\$164	27
NC	\$163	21
NJ	\$142	29
MD	\$140	24
GA	\$134	20
MI	\$126	23
PA	\$109	35
WI	\$97	11
NH	\$88	11
MN	\$79	18
OR	\$71	12
OH	\$58	17
VA	\$54	17
IN	\$47	9
OK	\$30	2
NM	\$25	10
AZ	\$24	6
ID	\$18	4
DC	\$17	4
SD	\$17	1
VT	\$14	2
TN	\$13	3
MO	\$12	8
AL	\$7	4
UT	\$7	5
HI	\$6	3
DE	\$6	1
NE	\$6	3
ME	\$4	4
RI	\$4	2
KY	\$4	2
KS	\$4	2
MT	\$3	2
WV	\$3	2
WY	\$3	2
SC	\$2	1

Source: NASVF, 2006

## Appendix G: Examples of Corporate Investment and Activity in the Clean Technology Industry, 1990–2006

Name	Activity
3M	<ul style="list-style-type: none"> <li>Since 1990, reduced its carbon emissions by 12.8%, removing 1.85 million metric tons primarily by cutting its energy consumption</li> </ul>
Alcoa	<ul style="list-style-type: none"> <li>Since 1995, reduced its carbon emissions by 26%, removing 8.9 million metric tons from aluminum smelters in the past decade</li> </ul>
BP	<ul style="list-style-type: none"> <li>In November 2005, announced an “Alternative Energy Initiative” and committed \$8 billion in investment over the next 10 years to wind, solar, hydrogen, and natural gas power projects around the globe</li> <li>Plans to grow its wind power capacity from 30MW to 450MW by 2008 and also add 73MW of new solar power capacity by the end of 2008. (To help meet this goal it recently expanded its solar panel manufacturing facility in Fredrick, Maryland.)</li> <li>Announced plans to construct the Carson Hydrogen Power Project in California, a 500MW facility that will eliminate 4 million tons of carbon per year</li> <li>In addition to these investments, BP made a symbolic gesture by re-branding itself from British Petroleum to Beyond Petroleum</li> </ul>
Catalyst Paper	<ul style="list-style-type: none"> <li>Since 1995, reduced its carbon emissions by 61%, removing 280,000 metric tons during the past decade as a result of efficiency gains</li> </ul>
Citigroup	<ul style="list-style-type: none"> <li>Recently invested in Balrampur Chini Mills Ltd. (ethanol related in India) and Chrysalix Energy (cleantech VC fund)</li> <li>In early 2006, announced a goal to reduce its global emissions by 10%, from 2005 level, by the year 2011</li> <li>In 2005, purchased 10,478 MW of certified green electric power, and expects to purchase more than 30,000 MW for its operations around the world by 2007</li> </ul>
Conservation Services Group	<ul style="list-style-type: none"> <li>Pledged to achieve net zero U.S. GHG emissions by 2006 and maintain that level through 2010</li> </ul>
Corning Inc.	<ul style="list-style-type: none"> <li>In 2004, opened a \$370 million manufacturing plant in Erwin, NY, producing catalytic converter substrates and advanced particulate filters for medium- and heavy-duty diesel applications, such as trucks and buses</li> </ul>
Cummins Inc.	<ul style="list-style-type: none"> <li>Pledged to reduce global GHG emissions by 25 percent per dollar revenue from 2005 to 2010</li> </ul>

## Appendix G: Examples of Corporate Investment and Activity in the Clean Technology Industry, 1990–2006 (continued)

Deutsche Bank	<ul style="list-style-type: none"> <li>60 Wall Street headquarters certified as environmentally compliant under ISO 14001 at beginning of 2006</li> </ul>
DuPont	<ul style="list-style-type: none"> <li>In 2006, allocated 10% of its \$1.3 billion research budget to extract ingredients from carbohydrates (which are renewable) rather than hydrocarbons<sup>1</sup></li> <li>Expects 25% of its products will be derived from non-petrochemical substances by 2010 (up from 10% in 2005)</li> <li>Since 1995, reduced its carbon emissions by 72%, removing 65 million metric tons as a result of reduced energy consumption</li> <li>Pledged to reduce total global GHG emissions by 15 percent from 2004 to 2015</li> <li>Has set \$6 billion revenue goal for “sustainability” products (expand its business offerings addressing safety, environment, energy, and climate challenges in the global marketplace)</li> </ul>
Ecoprint	<ul style="list-style-type: none"> <li>Pledged to achieve net zero U.S. GHG emissions by 2006 and maintain that level through 2010</li> </ul>
Entergy Corporation	<ul style="list-style-type: none"> <li>Pledged to reduce total U.S. GHG emissions by 20 percent from 2000 to 2010</li> </ul>
General Electric	<ul style="list-style-type: none"> <li>In May 2005, announced its “Ecomagination” Initiative and pledged to double revenue from green products from \$10 billion in 2004 to \$20 billion in 2010 and to double research spending to \$1.5 billion by 2010 for environmentally friendly technologies</li> <li>GE Financial Services is establishing \$3 billion renewable energy fund by 2008<sup>2</sup></li> <li>Has committed to increase the energy efficiency of company operations by 30% by 2012. To help meet these targets, GE is currently developing a wind farm in upstate New York</li> </ul>
Goldman Sachs	<ul style="list-style-type: none"> <li>Committed to investing \$1 billion in renewable energy<sup>3</sup>; purchased Zilkha Renewable Energy (wind-energy facilities) in mid-2005</li> <li>In May 2006, invested \$30 million (CDN) in Iogen Corp’s renewable cellulose ethanol technology</li> <li>Pledged to take environmental considerations more seriously when considering investment opportunities, for instance refusing to invest in projects that do not comply with local environmental laws</li> <li>Intends to become more active in shaping environmental public policy, including the establishment of a think-tank to promote market-based approaches for dealing with environmental concerns</li> </ul>

<sup>1</sup> DuPont looking to displace fossil fuels as building blocks of chemicals. *The New York Times*, February 28, 2006.

<sup>2</sup> VCs get pumped. *Bloomberg Markets*, August 2006.

<sup>3</sup> Investors are tilting toward windmills. *The New York Times*, February 15, 2006.



## Appendix G: Examples of Corporate Investment and Activity in the Clean Technology Industry, 1990–2006 (continued)

HSBC	<ul style="list-style-type: none"> <li>• In 2006, its operations became “carbon neutral”</li> </ul>
IBM	<ul style="list-style-type: none"> <li>• Since 1995, reduced its carbon emissions by 38%, removing 1.7 million metric tons</li> </ul>
Intel Corporation	<ul style="list-style-type: none"> <li>• Pledged to reduce global GHG emissions by 30 percent per production unit from 2004 to 2010</li> </ul>
Interface Flooring	<ul style="list-style-type: none"> <li>• Introduced the carpet industry’s first climate neutral carpet, Cool Carpet, as well as the only carpet created from bio-based, plant-derived fiber</li> <li>• In 2003, became the first carpet company to receive Environmentally Preferable Product (EPP) certification for its products</li> <li>• In 2003, announced a partnership to convert naturally occurring methane gas from a local landfill into a green energy source to fuel two heaters and a boiler at an Interface plant</li> </ul>
Johnson & Johnson	<ul style="list-style-type: none"> <li>• New Jersey facilities completed more than 40 energy and cost saving projects to avoid 4,391 tons of carbon dioxide emissions</li> <li>• Installed the most PV solar projects nationwide, including one of the largest projects in NJ</li> <li>• Committed to:               <ul style="list-style-type: none"> <li>○ 7% absolute reduction in carbon dioxide emissions from stationary sources, based on levels in 1990</li> <li>○ 30% decrease in fleet vehicle emissions per mile driven, based on levels in 2003</li> <li>○ 10% absolute reduction in hazardous and non-hazardous waste generation</li> </ul> </li> </ul>
J.P. Morgan Chase	<ul style="list-style-type: none"> <li>• Committed to investing \$250 million in renewable energy<sup>4</sup></li> <li>• Established an internal carbon-reduction strategy and promulgated environmental guidelines for its investment and commercial bankers to use when making financing decisions:               <ul style="list-style-type: none"> <li>○ Added “carbon disclosure and mitigation” into its client review process;</li> <li>○ Began quantifying the financial cost of GHG emissions in financial analyses for prospective clients;</li> <li>○ Will report annually the aggregate GHG emissions from its power sector projects;</li> <li>○ Committed to accommodate higher debt-to-income ratios for homes that are energy efficient; and,</li> <li>○ Will actively seek investments in low-income green housing</li> </ul> </li> </ul>
Morgan Stanley	<ul style="list-style-type: none"> <li>• Over the next 5 years, plans to invest in about \$3 billion of carbon/emissions credits, projects, and other initiatives aimed at lowering greenhouse gas emissions</li> </ul>
North Bay Construction	<ul style="list-style-type: none"> <li>• Pledged to reduce total U.S. GHG emissions by 20 percent from 2005 to 2010</li> </ul>

<sup>4</sup> Investors are tilting toward windmills. *The New York Times*, February 15, 2006.

## Appendix G: Examples of Corporate Investment and Activity in the Clean Technology Industry, 1990–2006 (continued)

Novartis	<ul style="list-style-type: none"> <li>• In April 2006, Syngenta (the combination of Novartis and AstraZeneca’s agribusiness unit) launched \$100 mm fund, LSP BioVentures, with focus on biomaterial and biofuel technologies</li> <li>• It will be managed by Life Sciences Partners, a European VC, and based in Boston</li> </ul>
Raytheon Company	<ul style="list-style-type: none"> <li>• Pledged to reduce U.S. GHG emissions by 33 percent per dollar revenue from 2002 to 2009</li> </ul>
Shaklee Corporation	<ul style="list-style-type: none"> <li>• Pledged to maintain net zero U.S. GHG emissions from 2006 to 2009</li> </ul>
Shell Oil Company	<ul style="list-style-type: none"> <li>• Invested \$1 billion in biofuels, wind, solar, and hydrogen projects in 2005</li> <li>• Currently progressing with wind projects in Texas, Wyoming, Idaho, West Virginia, California, and Hawaii and is in the process of perfecting the CIS “thin film” coating for solar installations</li> </ul>
Siemens	<ul style="list-style-type: none"> <li>• Offers a product line of 50 and 60 Hz gas and steam turbines (ranging from 4 to 340 MW for gas turbines and up to 1100 MW for steam turbines)</li> <li>• Stationary Fuel Cells division completing the commercialization of solid oxide fuel cells</li> <li>• VC arm has invested in SmartSynch (provider of wireless grid technology that gives users real-time energy metering information to help them conserve energy) and NGEN (an advanced materials VC with cleantech focus)</li> </ul>
Sonoma Wine Company	<ul style="list-style-type: none"> <li>• Pledged to reduce total U.S. GHG emissions by 15 percent from 2005 to 2010</li> </ul>
Sterling Planet	<ul style="list-style-type: none"> <li>• Pledged to achieve net zero U.S. GHG emissions by 2006 and maintain that level through 2010</li> </ul>
STM Microelectronics	<ul style="list-style-type: none"> <li>• Since 1995, reduced its carbon emissions by 50%, removing 850,000 metric tons</li> </ul>
Unilever	<ul style="list-style-type: none"> <li>• Formed €50 million, Unilever Technology Ventures to focus on nanotechnology and biotechnology within the cleantech space</li> </ul>
Walgreen’s	<ul style="list-style-type: none"> <li>• Announced the installation of solar photovoltaic systems on the roofs of 112 of its stores and distribution centers in California and New Jersey <ul style="list-style-type: none"> <li>○ Cited as the largest solar project undertaken in US</li> <li>○ Installations will generate more than 13.8 million kWh of electricity per year and provide up to 50% of each store’s energy needs</li> </ul> </li> </ul>

Source: NYCIF, 2007



