



The Growth of Cleantech

Environmental Entrepreneurs is a national community of business people who promote sound environmental policies that stimulate economic growth. One way to measure the relationship between policy and growth is to track venture investments in the cleantech industry. The cleantech industry encompasses a broad range of products and services, from



In February 2004, the Green Wave initiative was announced. This was E2's first major cleantech initiative. Pictured above, from left, are California Treasurer Phil Angelides, Director of UC Berkeley's Renewable and Appropriate Energy Laboratory Dan Kammen, and NanoSolar CEO and E2 member Martin Roscheisen, at the Green Wave press conference.

alternative energy generation to wastewater treatment to more resource-efficient industrial processes. Although cleantech encompasses a wide variety of industries, 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.

At the end of May, E2 will release, in partnership with the Cleantech Venture Network, our third report on cleantech venture capital. Previous reports from 2004 and 2006 can be found at www.e2.org.

E2 History with Cleantech

E2 has been involved with cleantech since 2001. Our first major policy activity was in 2003, when we started working with California Treasurer Phil Angelides in examining whether California's public pension funds, CalPERS and CalSTRS, should allocate some private equity towards cleantech venture capital. The purpose of doing so was exclusively to provide economic returns to the pension funds. The result, a program called "Green Wave," was announced¹ and adopted by the boards of the pension funds in 2004. The program influenced investment in cleantech because CalPERS and CalSTRS investment decisions are highly visible and followed by many investors. Subsequently, E2 members Peter Liu and Bob Epstein served on an advisory board to CalSTRS.

Beginning in May 2004, E2 has partnered with the Cleantech Venture Network to document the investment activity in cleantech and present our findings each year to members of Congress as

¹ "California State Treasurer Launches \$1.5 Billion 'Green Wave' Investment in Clean Energy." *Clean Edge News*. 2004 February 4. Available online at <<http://www.cleantech.com/story.php?nID=2834>>.

well as various state legislatures. The reports have been referenced by many state agencies. This article summarizes the major findings and policy recommendations from the 2007 report *Cleantech Venture Capital: How Public Policy Has Stimulated Private Investment*.²

The clean technology, or "cleantech," industry has the potential to be a major economic driver for the United States - one that can also provide competitive solutions to environmental challenges. We focus on the connection between cleantech and public policies at both the national and state levels. America's current advantage in cleantech is a huge asset, and one that must be protected and cultivated carefully. Our research shows continued strong growth in the U.S. cleantech industry. Smart public policy can help secure this advantage, while also addressing environmental and climate issues through solutions that will create jobs and provide significant economic benefits.

There are five major findings contained in our 2007 report:

Finding 1: Growth in cleantech accelerated in 2006, with significant activity in the public markets.

In 2006, cleantech became the third-largest North American venture capital investment category, exceeding traditional segments such as telecommunications and medical devices. Total North American venture capital invested in cleantech companies reached \$2.9 billion in 2006, an increase of 78 percent over the \$1.6 billion invested in 2005.

A significant increase in investments during the second and third quarters of 2006 was driven by capital targeted for companies moving into production. Cilion, Altra, Bloom Energy, Renewable Energy Group and Nanosolar - all of which represent new renewable energy technology or biofuels - collectively accounted for more than \$600 million in investment in 2006. But this boom can also pose challenges: companies with new technologies have difficulty accessing capital for manufacturing build-outs. While established technologies, such as corn ethanol, can rely on debt financing, the first thin film solar or cellulosic ethanol facilities cannot as readily access debt financing because of the higher risks associated with first production facilities. These companies are forced to either raise additional equity capital and/or look to government assistance. As part of the 2005 Energy Act, the Department of Energy granted six cellulosic facilities special financing of up to \$385 million to help build their first production facilities that, in aggregate, should reach 130 million gallons per year.

Cleantech is now an established investment category in the public markets. There are multiple stock indices including the Cleantech Capital Indices (CTIUS), WilderHill's ECO, Ardour Capital's Alternative Energy Indexes (e.g. AGINA, AGIGL), and CleanEdge's CELS and CLEN indexes. The 45 public companies that make up the Cleantech Index (CTIUS) have an aggregate market capitalization of over \$300 billion. The performance of CTIUS over the past two years has been strong. In the two years through April 23, 2007, CTIUS has risen 38.9 percent, from 850 to 1180.6. This growth outpaced that of the S&P 500 Index (+28.6 percent), the NASDAQ Index (+29.9 percent) and the Dow Jones Industrial Average (+26.1 percent) over that period. After Sunpower and Suntech went public in late 2005, no fewer than seven photovoltaics companies (Canadian Solar, First Solar, PowerFilm, Akeena Solar, ReneSola, Trina Solar Limited and Solarfun Power Holdings) went public in 2006. Recent IPOs in the biofuels sector have included Aventine Renewable Energy, Pacific Ethanol, Verasun and U.S.

² Stack, James, et. al. *Cleantech Venture Capital: How Public Policy Has Stimulated Private Investment*. 2007 May. Available online at <<http://www.e2.org/ext/doc/CleantechReport2007.pdf>>.

BioEnergy. Perhaps because of this robust IPO market and the increase in publicly traded companies, in the past two years cleantech investing has moved from a specialty area of investment to one with broad participation from all major venture capital firms.

Finding 2: Energy prices, entrepreneurial talent and advances in technology are industry factors accelerating growth.

Several important factors accelerated cleantech's growth in 2006:

- Sustained high oil prices have driven investor interest in alternative fuels. Most alternative fuel business plans are designed to compete with oil prices above \$40 to \$45 per barrel.
- As the cleantech market matures, it is attracting entrepreneurial management talent from other venture sectors - especially from information technology and biotechnology. These experienced entrepreneurs make it both easier to attract investments and more likely the company will develop into a viable business.
- Advances in technologies have been the basis for many new companies, including nano-materials used in thin-film solar and new chemistry in battery technologies.

Finding 3: Public policies at the national and state levels have accelerated cleantech growth.

National and state policies have provided early foundations for many cleantech sectors, although investors do not expect those policies to continue in the long term. While the federal government has ramped up its efforts to promote ethanol, the current boom is primarily the result of states rapidly phasing out the MTBE gasoline additive and replacing it with ethanol. Venture activity in corn and cellulosic ethanol was a significant portion of investment growth in 2006, and investment in renewable electricity has been driven primarily by state renewable portfolio standards. Policies that provide long-term certainty are the most successful at driving business investment.

Finding 4: Climate change is beginning to influence growth in cleantech.

Many of the biggest news stories of the past few years have been tied directly to extreme weather phenomena-from disastrous hurricanes to record droughts, wildfires, heat waves and melting polar icecaps. The public has grown increasingly aware of environmental issues, judging by public opinion polls showing rising public concern about global warming and energy security. Investors, sensing the level of public interest in these stories - and therefore an opportunity in the market - are beginning to invest in industries that reduce human impacts on the ecosystem. Climate change policies will play a key role in the growth of cleantech as it becomes increasingly apparent that products and processes that reduce greenhouse gases will see increased demand.

Finding 5: Cleantech can create thousands of new jobs.

Analysis from the University of California at Berkeley concluded that "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." E2's own analysis found that every \$100 million in venture investment generates an average of 2,700 new jobs. We estimate

additional U.S. cleantech investment between 2007 and 2010 will be between \$14 billion and \$19 billion, resulting in 400,000 to 500,000 new jobs.

Policy Recommendations

The broad group of investors interviewed for E2's 2007 cleantech report consistently recommended three federal policies that will promote continued industry expansion:

1. a cap-and-trade system that sets limits on greenhouse gases,
2. a national renewable energy standard, and
3. increased public funding for research and development.

A cap on greenhouse gases would align public interest with the capital markets and send a clear signal that lower-carbon energy is more valuable to the nation than energy from high-carbon sources like fossil fuels. A firm, long-term cap-and-trade regime coupled with a national renewable energy standard would provide stability for the market development of cleaner energy regardless of a sudden or sustained decrease in fossil fuel pricing.

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