



Cleantech Venture Capital: How Public Policy Has Stimulated Private Investment

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. America’s current advantage in cleantech is a huge asset, and one that must be protected and cultivated carefully. New research by Environmental Entrepreneurs (E2) and the Cleantech Venture Network shows continued strong growth in the U.S. cleantech industry. Smart state and national policies can help secure this advantage, while also addressing environmental and climate issues through solutions that will create jobs and provide significant economic benefits.

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This is the third report on cleantech venture capital by Environmental Entrepreneurs (E2) and the Cleantech Venture Network®, a Cleantech Group™ company. A full copy of the report can be found online at www.e2.org. Previous reports from 2004 and 2006 can be found at www.e2.org and www.cleantech.com.



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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.

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.

Cleantech Activity in Public Markets

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. 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.

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Finding 3: Public policies at the national and state level 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



Biofuels, such as ethanol made from switchgrass, represented a significant portion of investment growth in 2006. Photo courtesy of NRCS

\$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 for Continued Cleantech Growth

The broad group of investors interviewed for E2's 2007 cleantech report consistently recommend 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.

