



Cleantech Industry



An Assessment of Assets and Capabilities

in San Diego



By

GlobalCONNECT
A Program of
UC San Diego Extension

Prepared for



THE CITY OF SAN DIEGO
CITY PLANNING &
COMMUNITY INVESTMENT



San Diego
Regional
Economic
Development
Corporation



June 2007

Acknowledgments

Global CONNECT would like to acknowledge the following individuals for the information and assistance they provided during the course of this project:

Cecilia Aguillon, Kyocera Solar
Scott Anders, Energy Policy Initiatives Center (EPIC), University of San Diego
Jason Anderson, San Diego Regional Economic Development Corporation
Doug Augustine, Riverside Technologies, Inc.
John Balbach, Cleantech Group LLC
Max Dworkin, REC Solar
Rick Halperin, Advisory1
Jim Kelly, Riverside Technologies, Inc.
Phil Kopp, Energy Eye
Josh Lampl, EcoElectron Ventures
Irene Stillings, Center for Sustainable Energy
Adrienne Turner, Economic Development Division, City of San Diego

We would also like to thank all of the companies that responded to our requests for information.

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Photo Credit

Cover image of solar panels being installed at the Ruben H. Fleet Science Center courtesy of Ted Watson Photography and Kyocera Solar.

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Executive Summary

This study has been commissioned by the City of San Diego and the San Diego Regional Economic Development Corporation to assess the region's clean technology (or "cleantech") assets and capabilities. The report inventories companies in the region that offer cleantech products or services, and reviews issues relevant to the development of a cleantech cluster such as current higher education programs and research efforts, the business climate for technology companies, access to risk capital, policies and incentives, natural resources that may aid the development of cleantech, and related opportunities in agriculture.

Driven by concerns about climate change and high energy prices, there has been a tremendous amount of interest in clean technologies as an opportunity for addressing environmental challenges as well as for creating a new high technology industry. Overall, San Diego indeed has many of the elements to build a strong cleantech cluster.

- Using the definition and categories developed by the Cleantech Venture Network, there are 148 cleantech companies in San Diego. The majority, or 67 companies, offer products or services for energy generation. The next largest groupings are in water and wastewater, energy efficiency, and recycling and waste. Of the 148 cleantech companies in the region, 89 are within the City of San Diego. Among these companies are leaders such as Kyocera Solar, General Atomics, Hydranautics, and the Verenum Corporation.
- There is a talented pool of well-trained scientists and engineers for the emerging cleantech industry to draw upon thanks to the presence of other technology clusters, such as biotechnology, wireless telecommunications, and the defense industry.
- The region's support mechanisms, such as the newly formed CleanTECh San Diego industry association, CONNECT, the Center for Commercialization of Advanced Technologies (CCAT), the Center for Energy Sustainability, other technology trade associations, and a well-developed business services sector for high technology companies can help cleantech succeed in San Diego.
- San Diego's world-class research institutions, which include UC San Diego and San Diego State University and many leading non-profit research institutes, have the capabilities to lead the development of new clean technologies.
- With over \$1.2 billion in total investment in San Diego during 2006, there is potentially a large pool of risk capital to fuel the growth of cleantech startups. There are currently more than 90 risk capital firms with offices in the County and several angel investor networks, including the Tech Coast Angels and the Keiretsu Forum. In 2006, there were six cleantech deals valued at \$54 million in the region. Nationally, nearly \$3 billion was invested in cleantech, indicating a strong amount of interest in the sector by investors.
- Although complex, the federal, state, and local policy environment is rapidly becoming more favorable to supporting the development of a cleantech industry. Tax credits, incentive programs, and new laws that address environmental challenges, such as global climate change, are stimulating market demand for cleantech products and services.
- San Diego is endowed with certain natural resources, including solar radiation, wind power capacity, and energy generated from the ocean, that offer advantages for clean technology development. Wind and solar resources are more abundant in the eastern portion of San Diego County.
- Due to the limited amount of land under cultivation in San Diego County, it is not likely to become a major source of crops for biofuel production. However, there are distinct

opportunities for cleantech applications that support the current agricultural industry through natural pesticide development, plant propagation, and more efficient irrigation technologies.

- Cleantech helps San Diego's other technology clusters become more competitive through the supply of more efficient and environmentally-friendly products and services. For instance, ultra pure water is required by many biotechnology companies conducting research and development. Energy efficiency technologies and renewable power sources improve a business's bottom line, helping these firms become more competitive in a global economy.

San Diego's high technology industries are succeeding despite several challenges. In order for the potential of cleantech to be fully realized, the City and regional stakeholders will need to address the following:

- Unless a more holistic approach is taken, the patchwork of policies that regulate air, water, and energy will continue to complicate the development and adoption of clean technologies that span regulatory jurisdictions.
- The limited number of cleantech companies in San Diego that are attracting risk capital compared with other high technology industries in the region is a concern. However, opportunities for investment are likely to increase as regional support organizations develop targeted programs to link cleantech entrepreneurs with investors.
- The universities' strong research capabilities could be more explicitly focused on cleantech-relevant work. As funding agencies change their priorities, researchers will quickly seize the opportunity.
- Issues that affect San Diego's general business climate and competitiveness, such as housing affordability, traffic congestion, recruitment and retention, and other factors that make San Diego, and California, a high cost environment for high technology businesses, are ongoing challenges that need to be addressed by regional stakeholders.

With this assessment of San Diego's cleantech assets now completed, we recommend that San Diego benchmark itself against other developing cleantech hubs to determine best practices and the City's comparative advantages. In addition to learning more about the companies in these regions, this next step should look at public policy and efforts by regional utilities that support the growth of a cleantech industry. This information would be used to further inform the creation of an economic development strategy for cleantech in San Diego.

Introduction

In recent years, there has been an increasing amount of attention on the opportunities presented by “green” or “clean” technologies to simultaneously address environmental challenges and stimulate economic growth. Concerns about global issues such as climate change and high energy prices have helped to drive interest in these technologies, as have the efforts of companies to improve their competitiveness through more efficient operations that also reduce their environmental footprint. Venture capitalists are now investing heavily in companies focused on developing clean technologies. According to the Cleantech Venture Network, venture capital invested nationally in clean technology in 2006 totaled \$2.9 billion, making it the third largest category after software and biotechnology.¹

Many regions in the United States and other parts of the world view clean technology, or “cleantech”, as an emerging industry that will foster the growth of new companies and new high-wage jobs, with the added benefit of helping to improve the overall environment. Because cleantech is an emerging industry, no region in the US has clearly developed a cleantech cluster, with the possible exceptions of the San Francisco Bay Area and the Boston/Cambridge area. As such, the opportunity to become a leading region is essentially open.

This report has been commissioned by the City of San Diego and the San Diego Regional Economic Development Corporation (EDC) to determine the current assets in the San Diego region for the cleantech industry. This analysis is part of the Mayor of San Diego’s recently launched Cleantech Initiative to promote the expansion, attraction, and retention of businesses that develop products and technologies that provide environmentally sustainable solutions. The findings of this assessment will inform strategic efforts by the City, the EDC, and other stakeholders to cultivate the growth of a local cleantech cluster.

Report Overview

Because cleantech is an emerging industry, a definition of what technologies, products, and services constitute cleantech is presented at the beginning of this report for clarification purposes. This definition was used to guide the scope of the regional assessment. An overview of the cleantech companies identified by our research is presented in the next section, followed by a review of the business climate for technology companies in San Diego, relevant higher education programs and research efforts in the local universities, issues related to the accessibility of risk capital, state/locally funded incentives and initiatives that support cleantech development, a description of natural resources and weather that pertain to cleantech (e.g. solar radiation, wind, etc.), and agricultural resources and related opportunities for cleantech in the region’s agriculture industry. The report concludes with a listing of key findings and suggested next steps. The Appendix provides a directory of cleantech companies in the region, organized by the segment(s) in which they operate.

Methodology

Global CONNECT and its contributing partners relied on several different methods to collect information. Where possible, information from existing studies and market reports was used, such as those from the Cleantech Venture Network and the San Diego Regional Renewable Energy Study Group. Several databases were also mined for data on regional assets using search criteria provided by the Cleantech Venture Network. The databases include those

¹ Stack, James. *Cleantech Venture Capital: How Public Policy has Stimulated Private Investment*, Environmental Entrepreneurs (E2) and the Cleantech Venture Network, May 15, 2007.

managed by the Cleantech Venture Network, Thomson Financial's VentureXpert database of venture capital and private equity deals, the Rand Corporation's RaDiUS database of federally funded grant recipients, and online business directories, among others. Data mining to identify companies was supplemented by straightforward web-based key word searches, in-person interviews with domain experts, and word-of-mouth referrals from those involved in the industry.

There are several important caveats to the information presented in this report, particularly concerning the identification of cleantech companies in the region. Companies that have headquarters, sales offices, R&D, or manufacturing operations within the boundaries of San Diego County were included in the inventory. Due to data gathering limitations, it is probable that there are more cleantech companies in the region than those listed in the Appendix. As such, the list should not be considered comprehensive. These limitations stem partially from the broad nature of what constitutes clean technologies, which leaves room for interpretation. Further, many companies do not identify themselves as cleantech, or the cleantech products they offer are a small part of their overall business. In terms of data mining, no dedicated industry codes, such as the North American Industry Classification System (NAICS) codes, or cluster definitions based on those codes, have been developed for the cleantech industry to facilitate database searches. Most clean technologies are small subsets of existing NAICS codes. Additionally, companies that have a wide range of products and services may span multiple Cleantech Venture Network categories. There are eight such firms included in our inventory. Lastly, where there were questions about which category of cleantech a company's products or services belonged to, we made our best attempt to select the one(s) that seemed most appropriate based on the Cleantech Venture Network definition.

Clean Technology Defined

To facilitate the compilation of companies, research, and assets in the San Diego region, Global CONNECT and its partners elected to use the definition of clean technology, or cleantech, developed by the Cleantech Venture Network LLC. The Cleantech Venture Network is a membership-based organization that has become one of the leading sources of information on this rapidly growing industry. The Network's founders introduced the term "cleantech" to the investment community in 2002.

Clean technologies, or cleantech, have been broken down into 11 different categories. As the Cleantech Venture Network notes, these categories cover a wide range of products and services, some of which have little in common with the others. However, all cleantech industries offer products or services that must:

- "Optimize use of natural resources, offering a cleaner or less wasteful alternative to traditional products or services;
- Have their genesis in an innovative or novel technology or application; and
- Add economic value compared to traditional alternatives."

As cleantech develops as an industry and more information is gained about the technologies involved, the definition will likely evolve. The following table describes the different categories of cleantech. The cleantech companies in San Diego that were identified as part of this study are listed in the Appendix and grouped by these categories.

Cleantech Categories:

Cleantech Segment	Example Industries
Agriculture	Bio-based materials; farm efficiency technologies; micro-irrigation systems; bio-remediation; non-toxic cleaners and natural pesticides. <i>Does not include organic, health food, or natural health products.</i>
Air & Environment	Air purification products and air filtration systems, energy efficient HVAC; universal gas detectors; multi-pollutant controls; fuel additives to increase efficiency and reduce toxic emissions.
Materials	Biodegradable materials derived from seed proteins; micro-fluidics technology for conducting biochemical reactions' nano-materials; composite materials; thermal regulating fibers and fabrics; environmentally-friendly solvents; nano-technology components for electronics, sensor applications and energy storage; electro-chromic glass; thermoelectric materials.
Energy	Energy Efficiency Energy management systems; systems that improve output of power generating plants; intelligent metering; solid state micro-refrigeration; control technology for HVAC systems; automated energy conservation networks.
	Energy Generation Distributed and renewable energy and conversion, including wind, solar/photovoltaic (PV), hydro/marine, biofuels, fuel cells, gasification technologies for biomass, and flywheel power systems.
	Energy Infrastructure Wireless networks to utilities for advanced metering, power quality monitoring and outage management; integrated electronic systems for the management of distributed power; demand response and energy management software.
	Energy Storage Batteries, e.g. thin film and rechargeable; power quality regulation; flywheels; electro-textiles.
Manufacturing/Industrial	Advanced packaging; natural chemistry; sensors; smart construction materials; business process and data flow mapping tools; precision manufacturing instruments & fault detectors; chemical management services.
Recycling & Waste	Recycling technologies; waste treatment; internet marketplace for materials; hazardous waste remediation; bio-mimetic technology for advance metals separation and extraction.
Transportation	Hybrid vehicle technology; lighter materials for cars; smart logistics software; car-sharing; temperature pressure sensors to improve transportation fuel efficiency; telecommuting.
Water & Wastewater	Water recycling and ultra-filtration systems (e.g. UV membrane & ion exchange systems); sensors and automation systems; water utility sub-metering technology; desalination equipment.

Source: Cleantech Venture Network

Cleantech Companies in the San Diego Region

The Companies

There is a total of 148 cleantech companies that have headquarters, R&D, manufacturing, service or sales functions in the San Diego region.² Of these, 89 or 60 percent, are within the City of San Diego, followed by Carlsbad with 11 companies, six in Poway, and five each in Escondido, San Marcos, and Vista.

Companies offering products or services related to energy generation make up the largest cleantech industry segment in the San Diego region, with 67 companies in this space. Nearly two-thirds, or 42 firms are service-based, offering integration, design, equipment sales, installation, and/or operations and maintenance of renewable energy power systems. The vast majority of these service providers deal with solar power, while six companies focus on wind power systems, and two are owner/operators of energy plants. There are 25 companies in the energy generation category involved in technology development, production of alternative fuels, or the manufacturing of power systems and components.

In comparison with the service side, solar energy is the focus of nine companies, or about one-third. The other companies are involved in a mix of gasification technologies, biofuels production, wave-powered energy, nuclear fusion, and wind.

Figure 1: Cleantech Companies by Location

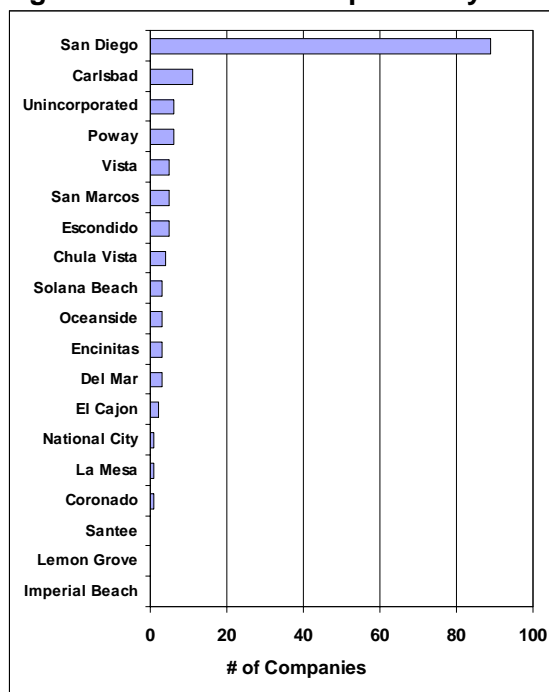


Table 1: Cleantech Companies by Segment³

Cleantech Segment	All San Diego County	City of San Diego
Agriculture	3	3
Air & Environment	6	3
Energy Efficiency	15	11
Energy Generation	67	41
Energy Infrastructure	7	6
Energy Storage	7	6
Manufacturing/Industrial	6	3
Materials	4	3
Recycling & Waste	13	7
Transportation	8	5
Water & Wastewater	19	6
Cleantech Solutions Providers	3	3

With 19 companies, water and wastewater makes up the second largest cleantech segment in the region. Energy efficiency (15 companies), recycling and waste (13 companies), and transportation (eight companies) round out the top five segments in the region. For the City, energy generation ranked first with 41 companies. Energy efficiency (11 companies) is second, followed by recycling and waste (seven companies), and then energy infrastructure, energy storage, and water and wastewater, each with six companies.

² See Appendix for directory of companies.

³ Six companies are double counted due to having products or services in two cleantech segments. Two companies, General Atomics and SAIC, fall within three categories by providing products or services related to energy generation, energy infrastructure, and hazardous waste remediation.

The research also identified three firms that help clients adopt clean technologies and more efficient processes that reduce their environmental footprint. Because their services potentially span all cleantech categories, we have created an additional category called “Cleantech Solutions Providers.” In contrast to environmental engineering firms, these cleantech solutions providers are not involved in the planning, design, and construction of large scale infrastructure projects. Instead they are more focused on the integration and deployment of clean technologies.

The companies that compose San Diego’s cleantech cluster span a wide range of technology products and services. Some are well-regarded science and engineering firms such as General Atomics and SAIC. Others are national and international leaders in their markets. Kyocera Solar is one of the largest manufacturers of solar energy products in the world. Similarly, Hydranautics and GE Osmonics are among the leading producers of water purification filters and membranes. Likewise, Solar Turbines, which designs and manufactures gas turbines, has been a cornerstone of San Diego’s economy for decades. San Diego Gas & Electric (SDG&E), a utility of San Diego-based Sempra Energy, is developing a network of digital meters, entering into contracts with new solar power facilities in Imperial County, and researching more efficient transmission lines. San Diego is also the home of the North American headquarters for Sanyo, which houses a unit, Sanyo Energy, focused on advanced rechargeable battery technologies. Other companies are developing innovative products for more efficient engine technologies, advanced recycling and material recovery, wireless sensor networks used to improve air and water quality, and improved energy management systems for buildings.

The number of companies that utilize biotechnology in the creation of cleantech projects or wireless telecommunications technologies for smart grid applications were less common than anticipated, given the region’s existing strengths in these areas. However, companies such as Verenum (formerly Diversa Corporation), Synthetic Genomics, and Genomatica may be on the front end of the emerging intersection of biotechnology and cleantech. Similarly, Seacoast Sciences, Energy Eye, Talon Communications, and Ambient Control Systems are among those employing wireless technologies.

Although not formally counted as part of this inventory, San Diego is also home to the offices of many large environmental engineering firms. These include Dudek, Tetra Tech, URS Corp., MWH, Project Design Consultants, and CH2M Hill, among others. In addition to the services these companies provide in design, planning, and construction of infrastructure projects, several also offer their services in areas such as energy efficiency improvements, incorporation of co-generation systems, and water and wastewater treatment. The experience and engineering capacity of these firms could potentially be leveraged with the emerging cleantech industry’s capabilities here in San Diego to enhance the continued growth of this cluster.

Impact on Employment

This report does not attempt to put forth a reliable estimate of cleantech employment in the region due to the difficulties in gathering data from companies. Of the 24 firms (16 percent of the total) that provided data on employees, one-third reported that they were in the one-to-ten employee range. Another third, eight companies, had between 10 and 50 employees, with the remainder having more than 50. Large firms such as General Atomics, SAIC, Sempra Energy (parent company of SDG&E), and Solar Turbines have more than 1,000 employees working in the region, although not all of them are necessarily dedicated to cleantech.

Cleantech clearly has the potential to become an engine of job creation in San Diego. In its May 2007 report, the Cleantech Venture Network cites several studies that have examined the

impact of renewable energy's impact on employment. Notably, researchers at UC Berkeley found that the renewable energy sector creates more jobs per megawatt installed, per energy unit produced and per dollar of investment compared with the fossil fuel energy sector. More specifically, another study found that the solar power industry creates 35.5 new jobs in manufacturing, installation, sales, and servicing.⁴ Representatives of the solar power industry in San Diego stated that the bulk of the jobs are found on the sales, installation, and distribution side rather than in production. This is due to the highly automated nature of photovoltaic solar cell manufacturing.

Relationship to Other Clusters

Analysis found evidence that the cleantech industry is strongly connected to other clusters in the region and elsewhere through supplier relationships. For example, biotechnology companies often rely on ultra pure water for testing and manufacturing. Building and construction firms purchase energy-efficient materials, air filters, management control systems for HVAC and lighting, and co-generation power units. The growth of a cleantech industry would not only diversify San Diego's economic base, but also strengthen its existing clusters through bottom line cost improvements.

Location of San Diego Cleantech Companies

The locations of San Diego's cleantech companies were mapped to determine if there is geographic clustering. For many high technology industries, geographic proximity among firms and research institutions plays a role in collaboration and innovation.⁵ As shown in the map on page 13, the San Diego's cleantech industry appears to be fairly scattered throughout the County, as well as within the boundaries of the City of San Diego, which is not as densely concentrated as groupings of biotechnology companies near the Torrey Pines Mesa and telecommunications firms in the Sorrento Valley/Mesa area. A small number of cleantech firms do appear to be clustered in Kearny Mesa, Sorrento Mesa, and Mira Mesa. Outside of the City of San Diego, there is also a small grouping of cleantech firms in Carlsbad.

Baja California Connection

Several cleantech companies in the region have also established manufacturing operations in Baja California. These include Kyocera Solar, United Solar Ovonic, Sanyo Energy, Solar Turbines, and Innergy Power. While the crossborder "twin plant" operation is not nearly as predominant in cleantech as it is in other local industries, such as consumer electronics and biomedical devices, a few firms are taking advantage of a situation that no other emerging cleantech hub can offer, that of the close proximity of high technology R&D to competitively priced advanced manufacturing capabilities. This is also critically important as cleantech firms increasingly move into global markets. Baja California offers an option for firms that may find the amount of land available for large scale manufacturing limited in San Diego or prohibitively priced. However, the primary challenge posed by the border is the delay associated with moving goods and services across it. A recent report by the San Diego Association of Governments (SANDAG) found that an average 45-minute delay at the border cost the San

⁴ Cleantech Venture Network May 2007 report citations of:
Kammen, D., Kapadia, K., & Fripp, M. "Putting Renewables to Work: How Many Jobs Can the Clean Energy Industry Generate?" Energy and Resources Group/Goldman School of Public Policy, University of California, Berkeley, 2004;
Sterzinger, G. "Energy: Maximizing Resources; Meeting Our Needs; Retaining Jobs." Testimony to the House Government Reform Committee Subcommittee on Energy Policy, Natural Resources and Regulatory Affairs, 2002.
See http://www.crest.org/articles/static/1/binaries/repp_testimony_boston.pdf

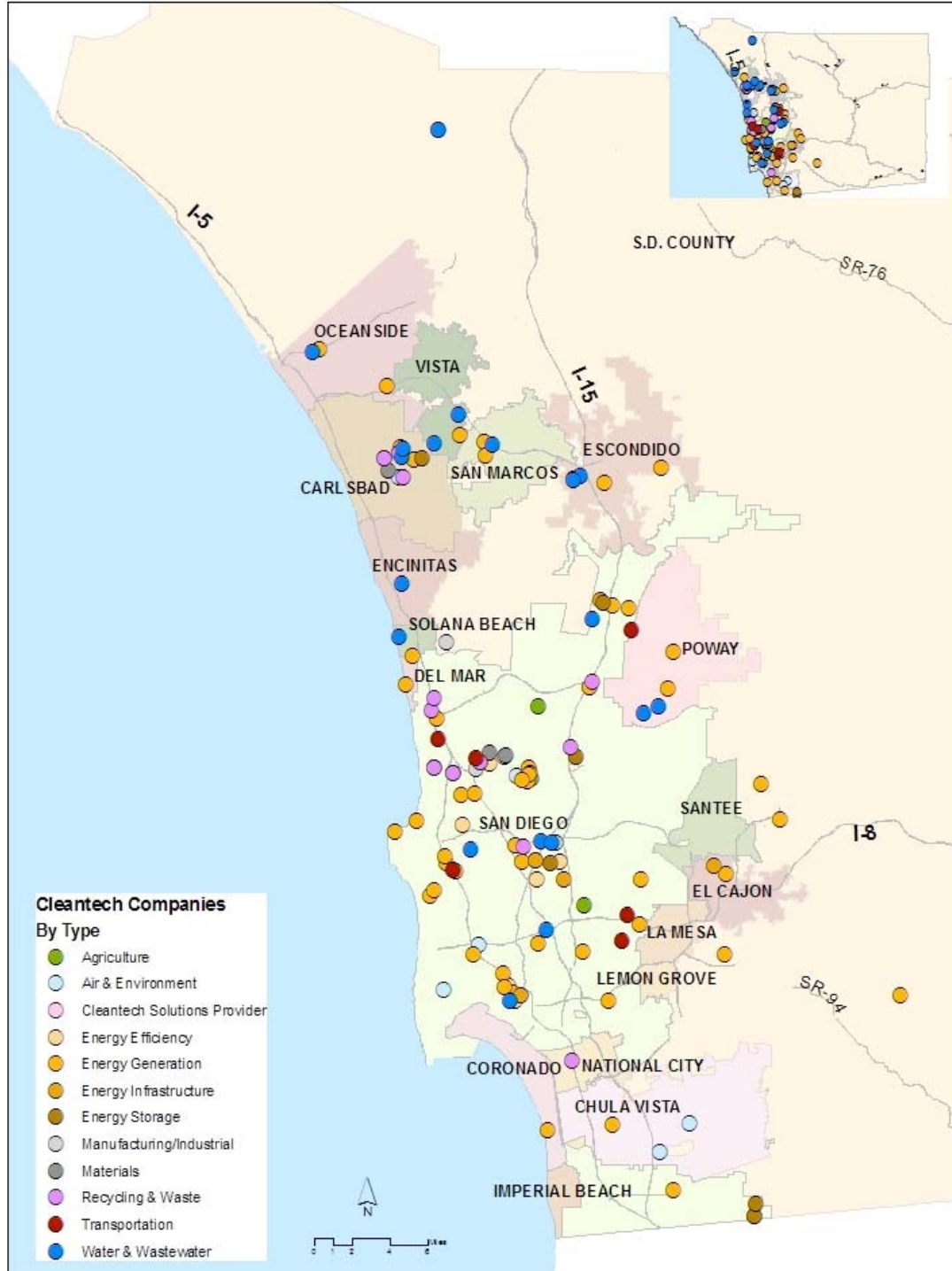
⁵ Michael Porter's work in the 1990's led to a better understanding of geographic clustering among industries and how it affects the dynamics of innovation and competitiveness. For an overview of Porter's studies, see <http://www.isc.hbs.edu/econ-clusters.htm>.

Diego region \$2.4 billion in economic losses in 2005, \$455 million of which was accounted by negative impacts on freight movement.⁶ Improvements that facilitate the safe and efficient movement of goods and people across the border could greatly enhance San Diego's position in attracting and growing clean technology businesses that rely heavily on manufacturing.

⁶ *Economic Impacts of Wait Times at the San Diego-Baja California Border*, SANDAG, 2006.

Figure 2:

San Diego Cleantech Companies



The Business Climate for Cleantech

Business climate is a term used to describe a region's perceived ability to compete for companies and jobs. According to the Economic Policy Institute, the factors most frequently cited to reflect a region's business climate include taxes and regulations. Policies and resources that contribute to fostering innovation and entrepreneurship are also factors. So business climate is effectively a combination of the cost of doing business and the business environment.

Evaluating the business climate for technology companies in the San Diego region is a study in contrasts. A positive environment for research and innovation is at odds with the high cost of doing business and the regulatory environment in California. What results is the constant threat of reaching a tipping point where the assets of the region fail to outweigh the burden of high costs and regulation in decision-making concerning location.

San Diego's Place in California

According to the Kosmont-Rose Institute Cost of Doing Business Survey, within California, the City of San Diego compares well to other major metropolitan areas.⁷ For example, of the other major cities in California, San Francisco, Los Angeles, Oakland and Stockton are rated as very high cost cities. Long Beach, Riverside, Sacramento, San Jose and Santa Ana are rated as high cost cities. Fresno is rated as a medium cost city. Anaheim, Bakersfield and San Diego are the only major cities in California to rate as low cost cities. There are no major California cities in the very low cost category. In Southern California, only Banning in Riverside County is ranked as a very low cost city.

But relative to the rest of the United States, it is expensive to do business in California. The 2006 Small Business Survival Index, published by the Small Business & Entrepreneurship Council, ranks the policy environment for entrepreneurship. Out of 50 states and the District of Columbia, California ranks 49th overall, 51st for the top personal income tax rate and 51st for the top capital gains tax rate.⁸ In addition, California ranks 49th for workers' compensation benefits and 44th for electric utility costs.

Companies and entrepreneurs already doing business in the region may have a different perception of the region's business climate than a company from outside the region evaluating locations for the purpose of expansion or relocation. A new index for measuring start-up activity in San Diego, the CONNECT-dex, indicates that 763 companies were formed between the first quarter of 2005 and the end of the third quarter of 2006.⁹ That is a significant amount of entrepreneurial activity.

San Diego's Strengths

San Diego's primary assets as a location for technology companies include access to research and development, access to capital and a highly skilled workforce. The presence of well-established technology clusters, such as biotechnology and wireless communications, is a reflection of these assets. Using these examples it is possible to foresee development of

⁷ The 2006 Kosmont-Rose Institute Cost of Doing Business Survey provides cost data on 398 cities in 49 states. The cost ratings are based on six factors: business taxes; telephone taxes; sales taxes; property taxes; electric and utility taxes; and state corporate income taxes. The survey used a scale that ranked cities from Very Low Cost to Very High Cost. See <http://rose.claremontmckenna.edu/kosmont/CODBS.asp>.

⁸ See http://www.sbsc.org/Media/pdf/SBSI_2006.pdf.

⁹ See <http://www.connect.org/programs/CONNECTdex/index.htm>.

additional technology clusters, such as a clean technology cluster. There are many opportunities for convergence. An example of convergence between biotechnology and clean technology is the use of biotechnology processes to create biofuels.

San Diego is recognized as having a very strong support system for start-up and entrepreneurial companies. In 2001, Harvard professor Michael Porter cited these networks, both formal and informal, in his research on "Clusters of Innovation."¹⁰ CONNECT was specifically mentioned for its contributions to fostering the growth of technology clusters in San Diego. San Diego was one of five regions included in the study which also included Atlanta, Pittsburgh, Wichita and the Research Triangle in North Carolina. At the time, Porter stressed the opportunities for San Diego to develop new technology clusters at the intersections of the established clusters, such as biotechnology, telecommunications, information technology and defense.

As recently as 2002, the San Diego region ranked first on Forbes' list of the "Best Places for Business and Careers."¹¹ At that time the rankings were determined using job and wage growth over one- and five-year periods. The percentage of technology jobs in the total economy and the diversity of technology industries was also a factor. The research was conducted for Forbes by the Milken Institute, a Los Angeles-based think tank. Starting in 2003, Forbes began working with Economy.com. Rankings were determined using additional factors including a business cost index which takes into consideration tax, energy and office space costs. The analysis also included, for the first time, housing, transportation, food and other household costs.

With the new analysis, San Diego began a decline to a 2007 ranking of 92 out of 200 large metros. Only two California cities, Santa Ana (70) and Sacramento (89) ranked higher than San Diego on the list. Los Angeles ranked 159, San Francisco ranked 175 and San Jose ranked 183 out of 200.

One survey that is still focused on job growth and investment is the AeA's 2007 "Cyberstates" survey.¹² Using data from 2005 (the most recent available), the survey shows that California employs more than twice as many technology workers as Texas (ranked number two) and three times as many as New York (ranked number three). California added 14,400 technology jobs in 2005 to bring its total to 919,300. California technology jobs also had the highest compensation, averaging \$95,300, which is 109 percent higher than the state's average wage.

With the growth of the biotechnology and wireless telecommunications industries, San Diego has developed a local base of specialized legal services that are critical to the success of knowledge-based businesses. As an example, a search of the Martindale-Hubbell law directory returned slightly more than 750 intellectual property attorneys within San Diego County.¹³ A short list of some of the law firms that have strong competencies in assessing and protecting technology companies' intellectual property includes Heller Ehrman, Mintz Levin, Knobbe Martens, Fish & Richardson, Procopio Hargreaves, Morrison & Foerster, Latham & Watkins, Cooley Godward Kronish, DLA Piper, and Wilson Sonsini, among many others.

¹⁰ See http://www.compete.org/pdf/national_execsummary.pdf.

¹¹ See http://www.forbes.com/lists/2007/1/07bestplaces_Best-Places-For-Business-And-Careers_land.html.

¹² See http://www.aeanet.org/publications/idj_cyberstates2007_about.asp.

¹³ Internet search of the Martindale-Hubbell database performed on June 12, 2007.

The Challenge of Staying Competitive

In 2006, the San Diego Regional Economic Development Corporation asked local companies to describe both the advantages and the challenges of operating a business in San Diego. The major advantage reported was proximity to customers (37 percent of respondents) followed by a skilled workforce (17 percent of respondents), entrepreneurial spirit (13 percent of respondents) and collaborative networks (10 percent of respondents). Universities were named by six percent of respondents as an advantage and four percent of respondents cited ideal weather as an advantage.

Respondents overwhelmingly agreed on the challenges to doing business in San Diego. Housing affordability (90 percent of respondents) was followed by traffic congestion (75 percent of respondents), recruitment and retention (54 percent of respondents), business regulation (47 percent of respondents), workers' compensation costs (41 percent of respondents), and healthcare costs (38 percent of respondents). Frivolous lawsuits were cited by 24 percent of respondents as a challenge, as well as energy costs (21 percent of respondents) and an inadequate airport (18 percent of respondents).

This unanimity on the challenges makes protecting San Diego's competitive advantages even more important. But other regions are making significant strides in developing regional assets attractive to technology companies, including an increased emphasis on research and development. One striking example is Florida where more than \$1 billion of public and private money has been pledged in the last four years to accelerate the growth of a life sciences cluster through support for research institutions.

Since 2001, the San Diego Association of Governments (SANDAG) and the San Diego Regional Economic Development Corporation have been benchmarking the San Diego region against 18 other regions and the United States average. The regions are the ones with which San Diego competes the most for companies, employees and investment.

San Diego's competitor regions:

Atlanta	Austin	Boston
Dallas	Denver	Miami
Minneapolis	Orange County	Phoenix
Portland, OR	Raleigh	Sacramento
Salt Lake City	San Francisco	San Jose
Seattle	Tampa	Washington DC

The "Indicators of Sustainable Competitiveness" index includes economic elements, environmental elements and equity elements.¹⁴ Economic elements include measurements such as venture capital investment, initial public offerings and patents per million population. Environmental elements include measurements such as air quality, habitat preservation and management of water supply and waste and hazardous substances. Equity elements include measurements such as housing affordability, average commute times, childhood education and investment in public transportation.

San Diego ranks ninth, with some of the region's toughest competitors ranking higher. Seattle tops the list, followed by Denver, Portland (OR), Raleigh, Austin, San Jose, Minneapolis and Boston. Comparing this list to the Kosmont-Rose Institute Cost of Doing Business Survey, Austin, Denver, Raleigh and Seattle all rank as very low cost cities.

¹⁴ See http://www.sandag.org/uploads/publicationid/publicationid_1151_4270.pdf.

San Diego must continue to invest in its regional assets, including its unique network of support for entrepreneurial companies. San Diego must also address the critical issues of housing affordability and traffic congestion if the region is to continue to attract and retain technology companies.

Business Climate for Cleantech Companies

In addition to the overall issues that affect the business climate for any technology company in the San Diego region, there are also several that are specific to many segments of the cleantech industry. These issues include the regulatory environment, the presence or lack of incentive programs (e.g. solar power rebates), land-use decisions, and the policies of the local utilities (water and/or power) among others. Other sections of this report describe these issues in more detail.

Cleantech is somewhat differentiated from other technology industries in that market demand for some sectors, such as air, water, and energy, can be heavily affected by federal, state, and/or local regulations. New policies, such as cap-and-trade mechanisms for emissions credits can create market incentives for new clean technologies. Traditional pollution control measures push markets in certain directions, but have tended to be viewed as increasing costs rather than reducing them. Governmental policy decisions in terms of rebates and incentives can stimulate demand, or dampen it if incentives are expected to expire, as can government procurement policies that promote the adoption of clean technologies.

One of the aspects that sets the current interest in clean technologies apart from other sectors is that many companies and consumers are interested in the benefits that cleantech may have on their bottom line. Companies benefit from more energy-efficient manufacturing processes or the recycling of waste materials that lead to reduced expenses. Home owners gain from lower utility bills. Consumers benefit from purchasing products that are more environmentally friendly.

The cost and accessibility of land is an important element to the business climate for cleantech. The City of San Diego has approximately 1,400 acres of vacant developable land for industrial use and an annual net absorption rate of 265 acres per year.¹⁵ The County has an additional 4,500 acres available. The prime considerations for industry in determining location are the intensity of use and the cost per square foot. Different types of clean technology industries will have differing intensities of use. Portions of the cluster working in materials creation and recycling may need zoning permitting particularly intensive use and often times open air storage of materials. This limits them to portions of the city which may or may not be conducive to reaching their customer base. Additionally, one must consider the “not in my backyard” types of campaigns that can be expected for some types of cleantech industries, such as wind farms and biomass systems. The high cost and limited supply of land in ideal locations may be a non-regulatory barrier to the growth of a clean technology cluster for San Diego.

Lastly, utilities can also impact parts of the cleantech industry through their policies and procedures. Quality standards, tariff rates, technology adoption, and incentive programs all come into play. Electric and water utilities are themselves affected by the requirements of state regulators. In California, the Public Utilities Commission (PUC) is the primary agency responsible for regulating privately owned electric, natural gas, water, railroad, rail transit, and passenger transportation.¹⁶ California also has regional quality control boards for both air and

¹⁵ City of San Diego, City Planning & Community Investment Department

¹⁶ See www.cpuc.ca.gov.

water.¹⁷ These boards are responsible for setting and enforcing standards for clean air and water, which can impact transportation, water supply, and agriculture.

¹⁷ See www.arb.ca.gov and www.swrcb.ca.gov.

Research and Training Assets

The research and educational institutions within the region are active in a wide range of areas that provide research and other support for clean technology innovation. These institutions, the University of California, San Diego, San Diego State University and the University of San Diego, have a rich history of innovative research. In addition, other organizations, such as The Scripps Research Institute, the Salk Institute for Biological Studies and the trans-institutional San Diego Center for Molecular Agriculture also contribute to the clean technology-related output of the region.

However, formal program activity specifically targeted at the development and commercialization of clean technology is not as prevalent as research devoted to biotechnology or wireless telecommunications. There are some notable exceptions, most of which have recently been started by individuals or groups at the schools, and these are described below. Since the traditional academic funding sources are not organized to specifically fund clean technologies as much as supporting infrastructure and more fundamental research, it is expected that much of the potentially relevant work is not yet focused on commercialization or presented as clean technology relevant by the researchers. Increased interest in the area by both the investment sector and state and now federal government is expected to change in the coming months. Stronger financial incentives (and effective technology transfer) will clearly yield a wealth of innovative and well-developed technologies, processes and methods.

Despite the limited number of formally identified clean technology activities, the institutions have numerous groups, many with strong relationships with the business community, individual researchers working in the area, and many graduates of these institutions are quite active in clean technology activities. These activities, organized by institution, are summarized below. First the organizational units are identified that address components of the broad family of clean technology and then some of the representative research is listed, both within and outside of these units.

University of California, San Diego

The University of California, San Diego, is a major teaching and research institution with departments in virtually all major disciplines.¹⁸ A feature of UC San Diego is its openness to interdisciplinary studies and research, which is reflected in organizations such as Calit2 and the Scripps Institution of Oceanography. The University, under the direction of Chancellor Mary Anne Fox, has also created a campus-wide Environment and Sustainability Initiative.

The Environment and Sustainability Initiative (ESI)¹⁹ is an interdisciplinary effort to apply the vast intellectual resources of UC San Diego to developing sustainability solutions in partnership with government, industry, and the non-profit sector. ESI facilitates connections across the UC San Diego campus and the broader community. The Scripps Institution of Oceanography (SIO) is considered to be one of the world's leading research centers for basic and applied research in all areas of earth and ocean sciences, including interdisciplinary work on marine biodiversity and conservation; the impacts of air pollution and climate change on ecosystems, agriculture, and health; and ocean energy potential.

¹⁸ UC San Diego ranked fifth in the nation among R&D expenditures at public universities in FY 2005 according to the National Science Foundations. See <http://www.nsf.gov/statistics/nsf07318/pdf/tab32.pdf>.

¹⁹ See <http://esi.ucsd.edu>.

UC San Diego's School of International Relations and Pacific Studies (IR/PS) combines programs in international relations, focusing on nations bordering the Pacific Ocean, with policy and technology. It includes projects on international environmental policy, political risk analysis related to energy and other sectors, telecommunications, data storage and critical infrastructure protection, as well as international finance. Dr. Robert Wilder, a visiting faculty member at IR/PS, is head of WilderShares and creator of a financial product called the WilderHill Index that tracks the cleantech sector.

The Jacobs School of Engineering (JSOE) combines work in a broad range of engineering disciplines, including electronic/computer, and bioengineering, structural and mechanical/aerospace together with a history of strong corporate partnerships. There are ten Institutes affiliated with JSOE, including Calit2, the San Diego Supercomputer Center, the Center for Wireless Communications and the Center for Energy Research (CER). CleanTech related research includes green buildings, energy and combustion, bioengineering of alternative fuels, green chemistry, wireless sensor networks, and hydrology. CER also performs research in the fields of fusion energy, combustion, and related disciplines.²⁰

The San Diego Supercomputer Center (SDSC) is one of the largest and best known advanced computing centers in the world. While there are no major programs specifically focusing on clean technology the Center is active in large-scale modeling and visualization of complex events including climate change, earthquakes, energy containment, transportation networks, and biological processes at the molecular level.

The California Institute for Telecommunications and Information Technology (Calit2), a multi-campus initiative (UC Irvine and UC San Diego), is a highly multi-disciplinary research center that utilizes the tools of telecommunications and information technologies in the exploration of a wide range of fields. Current work on intelligent transportation systems, wireless sensor networks, and even the \$24.5 million microbial genomics program may have implications for clean technology.

Other relevant activities can be found in the Department of Chemistry and Biochemistry and the Division of Biological Studies. Dr. Clifford Kubiak has begun work on using semiconductors to convert carbon dioxide (CO²) into fuel. While still early in the research phase, this is promising for both the capture and use of CO² and alternative fuel supply. Within the Division of Biological Sciences, faculty members such as Drs. Steve Briggs and Maarten Chrispeels are involved in research to better understand the biological process that could lead to the production of biofuels.

UC San Diego Extension provides a variety of workforce training, including courses in sustainability to help facility managers identify ways to use materials and energy more efficiently.

San Diego State University

San Diego State University (SDSU) is the largest university in San Diego and the third largest in California. It includes a wide array of programs and has a very active research component. Recently SDSU was named the number one small research university in the nation, according to a new ranking index based on the 2005 Faculty Scholarly Productivity Index.²¹ The school is active in greening the campus, with activities including mass transit, cogeneration, solar electric

²⁰ See <http://cer.ucsd.edu>.

²¹ See <http://www.academicanalytics.com/>.

and conservation. This extends into the research and academic culture, and such activities as the environ-business society²² a student group looking at the commercial and environmental aspects of sustainability.

Within the College of Sciences, there are numerous programs, institutes, and research centers that are undertaking work relevant to clean technology and sustainable development. These include the Center for Energy Studies, the Global Change Research Group, the Center for Inland Waters, and the Coastal and Marine Institute among others. Currently directed by Dr. Alan Sweedler, the Center for Energy Studies (CES) was founded in 1981 to support research related to energy and its impact on society. CES is primarily focused on the San Diego-Baja California region and has participated in studies with SANDAG and the San Diego Regional Renewable Energy Group. Dr. Sweedler is also serving as the co-administrator of the new National Energy Center for Sustainable Communities that will be located in Chula Vista.

At SDSU, the College of Engineering is quite active in the field of energy storage with activities ranging from the theoretical to applied in hybrid electrics²³, to work in new storage technologies. Additional work on hybrids is performed by the Facility for Applied Manufacturing Enterprise.²⁴ At the Powder Technology Laboratory²⁵ research is underway that may lead to improvements in energy storage in non-chemical storage devices, an important clean technology area.

SDSU is also home to the San Diego State University Research Foundation.²⁶ While clean technology is not its primary focus, it has programs active in this area, ranging from support for creating communities that are energy efficient and environmentally friendly to administering the Energy Innovations Small Grant (EISG) Program for the California Energy Commission.²⁷ Managed by SDSU's Entrepreneurial Management Center (EMC), the EISG provides up to \$95,000 for hardware projects and \$50,000 for modeling projects to businesses, non-profits, individuals, national laboratories, utilities, and academic institutions to conduct research that establishes the feasibility of new, innovative energy concepts. A follow-on grant has been awarded to the EMC to provide technology transition assistance to the EISG recipients. This comes in the form of assistance with market studies, technology transfer, and business development activities, among others. EMC is also the base for the San Diego office of Center for Commercialization of Advanced Technologies (CCAT). CCAT provides awards to companies that pursue commercial applications for defense and homeland security technologies, which include clean technology applications.

University of San Diego

The University of San Diego's primary clean technology focus is in the policy arena. The Energy Policy Initiatives Center²⁸ at the School of Law integrates research and analysis, law school study, and public education, serving as a source of legal and policy expertise and information in the area of sustainable energy. The Center tracks legislation in the area and conducts research on policy components of clean technology from the smart grid to energy credits.

²² See <http://www.clube3.org>.

²³ See <http://www.engineering.sdsu.edu/~hev>.

²⁴ See <http://fame.sdsu.edu>.

²⁵ See <http://www.ptl.sdsu.edu>.

²⁶ See <http://www.foundation.sdsu.edu>.

²⁷ See <http://www.energy.ca.gov/research/innovations/>.

²⁸ See <http://www.sandiego.edu/epic>

*The Salk Institute for Biological Studies*²⁹

The Salk Institute is best known for its work in disease treatment. Research is conducted in the areas of Molecular Biology and Genetics; Neurosciences; and Plant Biology. Scientists work on cellulosic ethanol, which is important for biofuel production, and a few serve as members of the San Diego Center for Molecular Agriculture.

*San Diego Center for Molecular Agriculture*³⁰

A self-defined research center without walls, the SDCMA's stated research focus is to uncover the genetic basis of plant growth, and the interactions of plants with the environment and other organisms (pathogens, symbionts, pests). This genetic information underlies the creation of crops that have improved traits through biotechnology. This work has been increasingly focused on the area of cellulosic ethanol. Nine researchers from UC San Diego, five researchers from the Salk Institute, and two researchers from The Scripps Research Institute are members of SDSMA.

Other Educational Resources in the Region

Community colleges play a valuable role in providing education and training to a large portion of a region's workforce, such as technicians in the automotive, electrical, and construction industries. Within the San Diego Community College District (SDCCD), Miramar College is home to the Advanced Transportation Technology Center which works to integrate new and clean fuel technologies into the school's transportation technology programs as well as works with other educational institutions and industry to provide clean technology programs in the community. The District also offers several courses relevant to cleantech. These include Introduction to Alternative Fuels and Electric Vehicles as part of its Diesel Technology program and courses for the construction trades. The school also supports apprenticeship programs in the construction industry and individual companies such as SDG&E and Solar Turbines. Lastly, SDCCD has adopted a green building policy that applies to the construction of all new buildings and major renovations, and supports participation in the Leadership in Energy and Environmental Design (LEED) certification program and SDG&E's Sustainable Communities Program.

At the high school level, there are efforts underway to increase student awareness of clean technology and sustainable development. Since December 2006, San Diego High students have been producing biodiesel from used cooking oil to power cars and trucks. This program is a partnership between San Diego High, New Leaf Biofuel, and Miramar College's Advanced Transportation Technology Center.³¹ Beginning in the fall of this year, High Tech High will open its Chula Vista campus. The emphasis of High Tech High Chula Vista's curriculum will be on environmental science and sustainability. Lastly, Scripps Ranch High School is working with Miramar College to develop a Power, Energy, and Transportation career track that includes a course dedicated to Power and Energy.

Foundation-based Initiatives

Local philanthropic foundations are also contributing to a more sustainable future for the San Diego region. The San Diego Foundation recently launched its Climate Smart program as part of its Climate Change Initiative to increase awareness of the impacts of climate change and to foster locally-based action. Its partners include the San Diego Natural History Museum, the Birch Aquarium, the Center for Sustainable Energy, and the Reuben H. Fleet Science Center.

²⁹ See <http://www.salk.edu>.

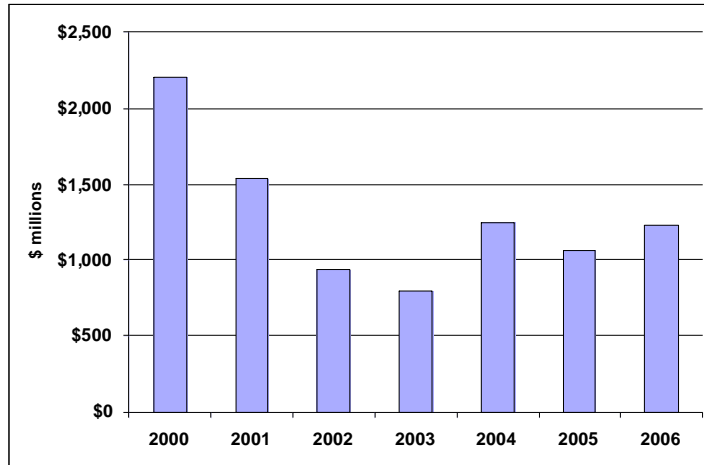
³⁰ See <http://www.sdcma.org>

³¹ See <http://www.signonsandiego.com/news/education/20070320-9999-1m20fuel.html>.

The San Diego Foundation is also supporting research on climate change through its Blasker-Miah-Rose Grant Program. In addition to the San Diego Foundation, the NextEarth Foundation and the Scripps Foundation for Science and the Environment have also become active supporters of efforts to promote sustainability. Collectively, these three foundations support the Greenovation Forum at UC San Diego that brings together academia, industry, and government to discuss practical solutions for sustainability.

Access to Risk Capital

Figure 3: Venture Capital Investments in San Diego, 2000-2006



Source: PWC MoneyTree

Risk capital plays a vital role in the growth of high technology companies, providing the financing to meet critical milestones, such as further technology development, hiring additional staff, expansion of office or lab space, and conducting in depth market research or marketing campaigns, among other activities. This capital comes from different sources, such as angel investors, managed venture capital funds, or corporate venture arms, which vary depending on the stage of company development, with higher degrees of risk associated with the earlier stages. Clean technologies span a wide range,

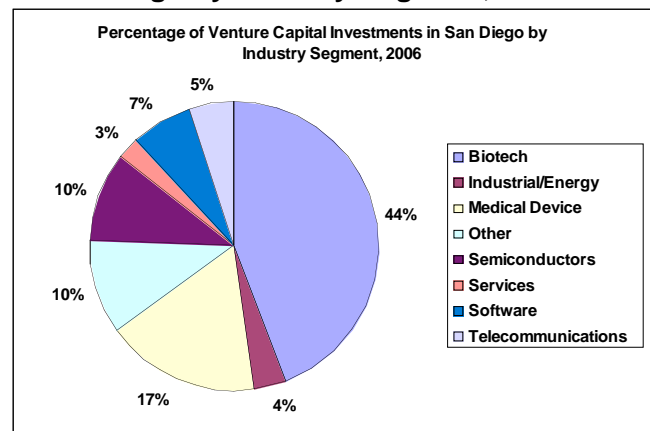
from IT to advanced materials to bioprocesses. The amount of capital required will depend on the amount of research and development needed and the nature of the product.

The information below describes the overall venture capital environment for high technology companies in California, with more detailed information on the types of investments that have been made in San Diego. This is followed by an overview of the investment climate nationally, in California, and in San Diego for the cleantech industry. Lastly, several issues related to access to capital for cleantech companies in San Diego are discussed.

Overall Risk Capital Environment

According to data from PricewaterhouseCoopers, Venture Economics, and the National Venture Capital Association, \$25.5 billion of venture capital was invested in 2006 in the United States. Software captured the largest share with approximately \$4.7 billion in 809 deals. Biotechnology was second with \$4.2 billion invested in 398 deals. Medical devices, telecommunications, and media and entertainment rounded out the remaining top 5 categories.³² Nearly half of the total US venture capital in 2006, or \$12 billion, was invested in California companies. As at the

Figure 4: Percentage of Venture Capital Investments in San Diego by Industry Segment, 2006



Source: PWC MoneyTree

³² "MoneyTree Venture Capital Profile for the United States", Q1-Q4 2006, PricewaterhouseCoopers (PWC)/Venture Economics/National Venture Capital Association (NVCA).

national level, software, biotechnology, media and entertainment, telecommunications, and medical devices were the primary recipient industries.³³

Companies located in the San Diego metropolitan region received \$1.2 billion in 2006 spread over 128 deals. Of this amount, \$544 million, or 44% of the total, was invested in 40 biotechnology deals. The next largest category was medical devices with \$214 million invested in 21 deals. The 2006 total was an improvement over the approximately \$1 billion the year before. The increase also continues a mostly upward trend since the venture capital market bottomed out in 2003 following the technology bust.

In comparison to other regions in the US, San Diego ranked seventh in the amount of venture capital received. Silicon Valley was the national leader by a wide margin, with one-third of all investments taking place there. New England (Boston/Cambridge) was next, followed by the New York City metro area, Los Angeles/Orange County, the entire state of Texas, the Southeast, and then San Diego. If combined, the \$3.1 billion total for Los Angeles/Orange County and San Diego would essentially equal New England as the second largest region.

Although San Diego may not outrank Silicon Valley and Los Angeles/Orange County, the amount of venture capital it does receive is significant given that such investments were rare 20 years ago. Over time, the growth of the biotechnology and telecommunications industries attracted venture capital from outside of the region and led to the development of a local venture capital industry. There are now approximately 94 venture capital, private equity, and corporate venture funds with offices in San Diego County.³⁴ The angel investor community is also strongly represented. In addition to private angel groups, the Tech Coast Angels, Imporium Angels, Keiretsu Forum, and the Life Science Angels are a few of the organized angel networks with a presence in San Diego.

Table 2: Venture Capital Investments by Region, 2006 (\$ millions)

Region	Investment	Deals
Silicon Valley	\$9,444	1,147
New England	\$3,099	427
NY Metro	\$1,997	255
LA/Orange County	\$1,866	213
Texas	\$1,387	179
Southeast	\$1,270	226
San Diego	\$1,234	128
Northwest	\$1,181	170
DC/Metroplex	\$1,167	209
Midwest	\$956	164

Source: PWC MoneyTree

Investments in Cleantech

Cleantech has recently received a lot of attention from the venture capital community. According to Dow Jones VentureOne, \$1.28 billion was invested in the industry in 2006.³⁵ The Cleantech Venture Network, which uses a different definition for what technologies constitute cleantech, estimates that the amount was \$2.9 billion, a dramatic rise from \$1.6 billion in 2005. This made cleantech the third largest investment category after software and biotechnology. Within cleantech, energy-related technology (generation, storage, efficiency, and infrastructure) attracted \$2.14 billion. Recycling and waste technologies came in second with \$192 million.³⁶

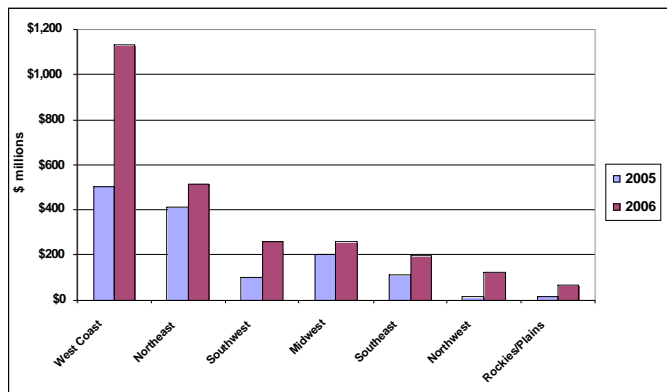
³³ "MoneyTree Venture Capital Profile for California", Q1-Q4 2006, PWC/Venture Economics/NVCA.

³⁴ *Southern California Venture Capital and Private Equity 2007 Directory*; San Diego Venture Group; VentureXpert

³⁵ "Cleantech Companies Garner US\$1.28 Billion in Global Venture Capital Investment in 2006", Dow Jones VentureOne. See http://www.ey.com/global/content.nsf/International/Media_Press_Release_CleantechFeb07.

³⁶ Cleantech Venture Network report, May 2007.

Figure 5: US Cleantech Venture Capital by Region, 2005-2006



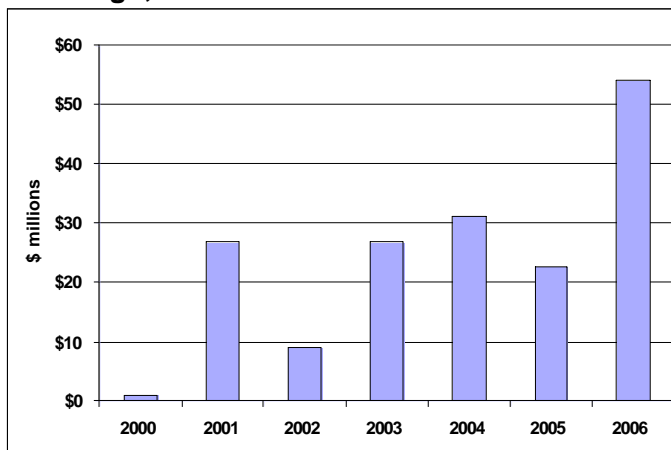
Source: Cleantech Venture Network

The West Coast, defined as California and Hawaii by the Cleantech Venture Network, received the majority of cleantech investments, totaling \$1.13 billion. This was nearly twice the amount of the Northeast, which includes the Boston/Cambridge area, with \$516 million. Although specific numbers are not given for the San Francisco Bay Area, the Cleantech Venture Network states that it is the leading cleantech hub in California and the nation. Boston/Cambridge in Massachusetts was listed as next largest hub after the Bay Area.³⁷

Cleantech investments in San Diego County were a small fraction of the total for California. In 2006, six companies received a total of \$54 million in funding, which was approximately 4.7% of California’s cleantech funding and 4.5% of the overall venture capital invested in San Diego.³⁸ These companies are 3E Company, CEYX Technologies, Clean Air Power, ISE Corporation, PowerGenix, and Wildcat Discovery Technologies. Two companies - ISE Corporation, a developer of hybrid electric engines for large vehicles such as buses and trucks, and PowerGenix, a developer of advanced battery technologies - received \$42 million between them or 78% of the 2006 cleantech funding in San Diego County.

From 2000 to 2006, \$171.7 million was invested in nine cleantech companies in San Diego. In addition to the six companies listed above, three others received funding - Enviance, Innergy Power Corporation, and Yulex Corporation. During that time, these companies received their funding over 26 deals, with an average of \$6.6 million per deal. This capital was supplied by 25 investor groups, four of which were funds with offices located in San Diego. The local investors were Enterprise Partners, Mission Ventures, Shepherd Ventures, and the Tech Coast Angels.

Figure 6: Cleantech Venture Investments in San Diego, 2000-2006



Source: Global CONNECT analysis of data from the VentureXpert database.

Access to Capital Issues for Cleantech in San Diego

In accessing capital for San Diego cleantech ventures, there are positive and negative issues to be aware of. However, given San Diego’s experience with developing life science and telecommunications industries, these negative issues may well be resolved as a local cleantech sector grows.

³⁷ Cleantech Venture Network report, May 2007, page 14.

³⁸ VentureXpert database search with criteria supplied by the Cleantech Venture Network.

As a general statement, one of the positive aspects of San Diego is that there is no overall shortage of risk capital funding for high technology ventures. The region now has many local investors of different types with funding available for different stages of company development. As noted above, there are now more than 90 funds with offices in the region, as well as a strong local angel investor community. Besides the local risk capital, San Diego is often referred to as a “suburb of Silicon Valley funding.” Being only a one-hour flight way, San Diego has a long history of attracting funding from Silicon Valley investors to support technology companies.

Despite the general availability of risk capital, investors have anecdotally stated that there appears to be a lack of cleantech “deal flow”, or the volume of attractive business opportunities, in San Diego, which may inhibit growth of this sector. With only nine cleantech companies having been funded between 2000 and 2006, the data lends some support to this claim. Out of 128 total deals in San Diego in 2006, only six were in cleantech. Attractive investment opportunities within the region are important particularly for angels who do not typically invest in companies outside of their local area, as opposed to later stage venture capitalists who are not as limited geographically. Should more angels find San Diego companies to invest in, they can help them get to the point where they become visible to the venture capital community, which then grows the industry as well as attracts other investors to the region.

The limited number of local investors who have either an explicit focus on clean technologies or prior experience investing in cleantech companies may also be an issue in the short term. Given the often technical and complex nature of the products and/or services offered by cleantech companies, having investors who understand the technology, the business environment, the regulatory environment, and who can assist the company’s management team is critical. Energy Capital Partners, Enterprise Partners, Finistere Partners, Lightsource Ventures, Mission Ventures, and Shepherd Ventures are among the few who are actively looking at cleantech or companies with technology with cleantech applications. Other local funds are beginning to expand to the cleantech space. For now, however, most venture firms with dedicated cleantech funds are located outside of the region, such as Nth Power and Khosla Ventures in the Bay Area, and Ngen Partners in Santa Barbara. While a possible shortage of cleantech expertise among local investors may present a challenge to growth in the industry, this situation is not unlike the history of biotechnology and telecommunications, where the initial investors were typically from outside the region. As these industries grew, specialized indigenous risk capital developed. This may be the case for San Diego as more “investable” cleantech start-up companies emerge.

The challenges of deal flow and access to local capital are beginning to be addressed by local organizations that provide assistance to technology companies, such as the newly formed CleanTECH San Diego industry association, CCAT, CONNECT and CommNexus. Locally managed by San Diego State University, CCAT works in partnership with CONNECT, UC San Diego, the Space and Naval Warfare Systems Center (SPAWAR) and members of the local investor community. CCAT awards up to \$25,000 to help companies with market assessments, business plan development, commercialization, and product development. Defense or security technologies with environmental applications are eligible for CCAT awards. In April 2007, entrepreneurs were provided an opportunity to pitch their business cases to investors during CONNECT’s first Cleantech Venture Roundtable. CONNECT will also serve to incubate CleanTECH San Diego during its initial development. CommNexus, the local trade association for the communications and IT industry, is forming a specialized forum around cleantech, to increase awareness of cleantech as a business opportunity for its members.

Where funding gaps remain for very early stage companies, the US Government's Small Business Innovation and Research (SBIR) program and the City of San Diego's Technology Fund may provide needed capital. The SBIR program is a budgetary set-aside for federal agencies and provides up to \$100,000 in competitively awarded grants to small technology development proposals. A follow-on phase is also available and offers up to \$750,000.³⁹ Operated by the City of San Diego's Economic Development Division, the San Diego Technology Fund provides qualified small businesses located within San Diego County loans of \$50,000 to \$250,000 at or below market rates to assist their growth.

Having an experienced and knowledgeable management team is often one of the key criteria investors look for in a company. For cleantech, the challenge may be finding managers who can shift from other technology industries where they have experience, such as biotechnology or telecommunications, to one in which the business model and regulatory environment, as found in the energy sector for example, may be somewhat difficult. However, many investors claim that lessons have been learned from the technology bust era and smart managers will be aware of what they do not know and hire accordingly. Likewise, investors are generally more likely to avoid the mistakes of the past, such as investing in companies with little more than an idea, and look for companies with good managers or will build good teams if necessary.

One item associated with access to capital is the hesitancy of some venture capitalists to invest in cleantech companies that will need large facilities, such as biofuel production plants or recycling facilities. Building these facilities requires project financing, which, being more complex and expensive versus other forms of financing, tends to produce returns at a lower level over a longer period of time to investors than venture capitalists typically prefer. As a result, these cleantech companies have to approach more conservative investors like investment banks to fund their companies through loans, lengthening the time it takes to get the business fully up and running.

Lastly, there have been some questions raised about what the exit model is for cleantech. Investors have a primary goal, which is to make a strong return on their investment and they do so through a liquidity event, or "exit", such as an IPO or M&A. Several companies, primarily in solar and biofuels, have gone public in the past couple of years, generating positive returns for their initial investors.⁴⁰ Among San Diego cleantech companies, the Diversa Corporation, which produces enzymes used in ethanol production, went public on the NASDAQ in 2000. Diversa merged with Celunol in June 2007 and has been renamed Verenium. More recently, Clean Air Power went public on the British AIM in February 2006. However, there have been general concerns about pursuing an IPO strategy for many technology companies. The IPO market is considered to be "closed" for biotechnology as result of the low valuations of recently listed companies, forcing many to consider an acquisition strategy instead. There has also been a discussion about the impact of the stringent financial reporting requirements under Sarbanes-Oxley Act of 2002. Due to the high costs associated with meeting these requirements, some companies have opted to list on foreign stock exchanges, such as the AIM. However, the effects of the changing dynamics of the IPO market on cleantech are uncertain. M&As have also become a popular exit strategy for many technology companies. Because cleantech involves a wide range of technologies and capital intensity, the exit strategy will likely mirror the strategy found in the related traditional industries.

³⁹ See <http://www.sba.gov/gopher/Innovation-And-Research/SBIR-Pro-Prep/book2.txt>.

⁴⁰ Cleantech Venture Network report, May 2007, page 32.

Cleantech Policy Issues and Incentives

The market for cleantech is, in large part, driven by public policy. For instance, Germany is the largest consumer of solar and wind energy products not because of a superior supply of solar radiation or wind, but because of the generous incentives provided under the German Renewable Energy Law (Erneubare-Energien-Gesetz, or EEG). In the US, increasing concerns about high energy prices and global climate change have again put environmental policies in the national limelight. This section of the report begins with a review of the overall policy framework with regard to cleantech, then details particular issues by cleantech segment, and concludes with highlights of relevant legislation and tax credits⁴¹.

Table 3: Comparison of Deployed Wind and PV Capacity in Europe, the United States, Germany, and California⁴²

	EU	US	Germany	California	CA% of Germany
Deployed Wind Capacity (MW)	48,000	11,699	20,622	2,361	12%
Deployed PV Capacity (MW)	3,418	615	3,000	220	7%

Policy Framework

The challenge for the development of a cleantech cluster in San Diego, from a policy perspective, is that federal, state and local regulations and incentives are complex, overlapping, somewhat incoherent, and constantly changing. The Federal Government oversees national energy policy, regulation of pollutants via the Clean Air Act and Clean Water Act, and employs other mechanisms such as tax policy, government procurement, and funding for research and development to support national goals. For its part, California's legislature has often pursued environmental policies that are more assertive than the Federal government in areas like vehicle emissions, water quality, the promotion of renewable energy sources, and greenhouse gas emissions. Local governments influence cleantech development through city ordinances, building codes, zoning decisions, economic development strategies, and expedited permitting processes, among other policy mechanisms.

Despite the complexity of multiple layers of policy, a clearer framework of laws and incentives is emerging, although in a piecemeal fashion. At the federal level, the Supreme Court recently ruled that the Environmental Protection Agency has the authority to regulate greenhouse gas emissions, which is expected to impact future federal regulations in areas such as transportation and energy.⁴³ Additionally, as noted below, new legislation proposes raising national fuel efficiency standards and biofuel production levels. Congress has also adopted several tax credit and incentive programs to stimulate energy efficiency and renewable energy. In the area of research, the US Department of Energy has launched a \$375 million bioenergy research

⁴¹ This is not intended to be a comprehensive report on relevant policy, which is beyond the scope of this project. The most salient points are addressed, and references to more comprehensive sources provided.

⁴² Sources: American Wind Energy Association; California Energy Commission; EurObsersv'ER, *Wind Energy Barometer February 2007* and *Photovoltaic Energy Barometer April 2007*; Solar Energy Industries Association, *US Solar Industry Year in Review 2006*.

⁴³ See <http://www.supremecourtus.gov/opinions/06pdf/05-1120.pdf>.

program that will fund three centers, one of which will be led by Lawrence Berkeley National Laboratory.⁴⁴

The State of California has been moving towards a more coherent overall policy environment in recent years. One of the most notable policy changes was the 2006 law to limit greenhouse gas emissions (AB 32), which put California out in front of the national government. Related to energy, in 2003 the State adopted the Energy Action Plan to coordinate efforts to ensure a reliable, cost-effective, and environmentally sound energy supply. This was followed by a Bioenergy Action Plan in 2006 to coordinate state agency efforts around biofuel and biomass production.⁴⁵ The California Energy Commission (CEC) is responsible for issuing its Integrated Energy Policy Report every two years to assess trends that may affect the State's energy use.⁴⁶ The CEC also oversees compliance with the State's Title 24 energy efficiency standards. In other areas, the State Air and Water Resource Control Boards ensure compliance with State air and water quality laws. Lastly, the Governor, who is internationally recognized as a strong proponent of government stimulation of cleantech, has issued executive orders that support cleantech development, such as the Low Carbon Fuel Standard.

Within the region, many jurisdictions have begun adopting green building codes, implementing faster permitting process for green projects, recycling programs, and stimulating demand through incentive programs. Examples include the City of San Diego's Sustainable Building Policy Expedite Program, the numerous services and rebate programs facilitated by the Center for Sustainable Energy (formerly the San Diego Regional Energy Office), and the County of San Diego's Homeowners Relief Act. San Diego Gas & Electric also has several programs that promote energy efficiency and conservation.

Yet, policymaking for cleantech is evolving very rapidly, and therefore presents a challenge for business in estimating costs and demand. This is clearly evidenced in the numerous starts and stops on funding legislation for the renewable power industry, such as the experience with renewable energy tax credits. The private sector has frequently hesitated to make major investments in cleantech because of the mixed signals sent by legislators and regulators. Stabilization of the policy environment will instill greater confidence in the business environment. For the time being, however, business owners and investors must pay constant attention to ensure they have sound intelligence regarding policy shifts.

Water, Air, Soil: A Problem of Alignment

At the state level, each of the relevant agencies (California Air Resources Board, State Water Resources Control Board, California Coastal Commission, etc.) is tasked with regulating and protecting its particular area, but they are doing very little to coordinate their standards. For instance, a hypothetical clean technology that provides electrical power with minimal emissions in the air or water may be prevented from implementation because of its failure to comply with the aesthetic requirements of the Coastal Commission. Technologies and policies are not reviewed holistically. The net impact is not weighted over the implications to any one resource. Solutions such as sequestration which may make a massive impact on global warming have the potential to be derailed by overlapping, but uncoordinated efforts by other regulatory agencies due to unforeseen impacts on soil quality. Numerous wind generation facilities have been permanently postponed as the result of negative environmental impact reports and concern for endangered species (migratory bats have had a tough time navigating through windmill farms).

⁴⁴ See <http://www.doe.gov/news/5172.htm>.

⁴⁵ See <http://www.energy.ca.gov/2006publications/CEC-600-2006-010/CEC-600-2006-010.PDF>.

⁴⁶ See http://www.energy.ca.gov/2005_energy/policy/index.html.

Companies looking to produce or invest in clean technologies need to expend considerable effort to map all of the potential regulatory agencies affecting their projects.

Green Construction

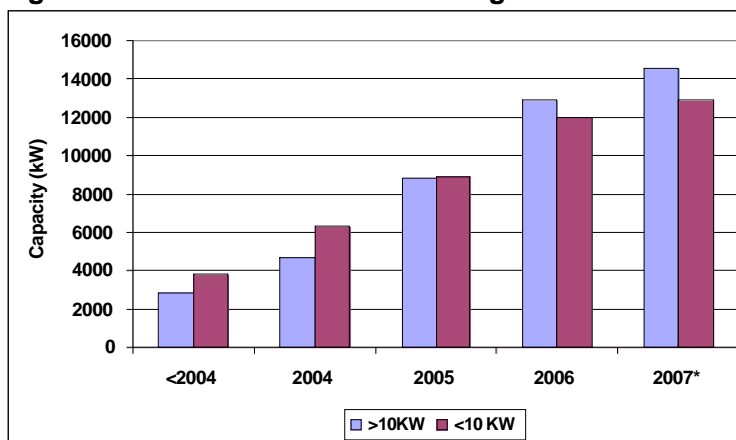
San Diego has a progressive track record in the implementation of green construction standards. This is true both for the production of new homes as well as the construction of city buildings. The Ridgehaven “Green Building” Project which houses the City of San Diego’s Environmental Services Department, is an example of this in its energy efficiency and environmentally friendly construction. The County of San Diego offers expedited processing times and a 7.5% reduction in fees for new construction featuring recycled content material, straw bale construction, graywater systems, or which exceed the CEC Title 24 standards by 15-20%. Additionally, the City of San Diego has put in place legislation that requires all new city construction and major renovations to comply with the US Green Building Council’s Leadership in Energy and Environmental Design (LEED) Silver Standards for sustainable building practices. On the private sector side, City Council Policy 900-14 created an expedited processing time for all manner of “green” construction including those policies delineated by the county, but also encompassing sustainable energy production and the LEED building standards. Furthermore, fifty percent of demolition and construction materials must be sent to recycling centers for processing per City of San Diego Ordinance #0-19420. This is scheduled to accelerate to 75% in the near future.

Power

San Diego has made headway in the development of sustainable electricity generation, due in part to overlapping rebate programs from local, state and federal governments. Under the County of San Diego Homeowners Relief Act, the installation of renewable energy systems in a residential setting does not require permits. The California Energy Commission has furthered this by offering rebates under the Emerging Renewables Program. In 2003, the Environmental Protection Agency gave the City of San Diego The Green Power Leadership Award in recognition of its commitment to generate 50 megawatts of renewable energy in the next decade. Additional renewable energy generation systems include those with installed photovoltaic systems, such as the Center for Sustainable Energy (, the Fleet Science Center, the Alvarado Waste Treatment Center, and many others. As the list of businesses in the Appendix makes clear, the City of San Diego has a burgeoning photovoltaic (PV) installation industry.

Federal and state governments have also incentivized the use of PV and other renewable energy sources through the Energy Policy Act of 2005 and the Tax Relief and Health Care Act of 2006 which permitted businesses to seek energy tax credits that purchased solar or geothermal energy. Changes to the tax code which provided for Modified Accelerated Cost Recovery System (MACRS) based depreciation of renewable energy cogeneration units has helped stimulate demand. Similarly, the

Figure 7: Cumulative PV in San Diego



Source: EPIC analysis using data provided by SDG&E
*Projected

State of California launched the California Solar Initiative to provide incentives and rebates for the purchase of solar power systems.

For distributed generation (DG) power systems (solar, micro-turbine, etc.), there are both incentives and barriers to adoption. Because utilities are responsible for providing sufficient electricity for all users, including peak demand, homeowners and businesses that install DG systems are subject to time-of-use (TOU) electricity tariffs. The reasoning behind this is that electricity producers must make power available to DG users in case of system failure or underperformance of the systems. The utilities essentially act like insurers for cogenerators. Unfortunately, it is often heard that these tariff charges are large enough to outweigh the economic benefits of having the DG system. Producers of DG systems are concerned about a drop off in demand as a result. Legislation is currently being negotiated in Sacramento to temporarily suspend the TOU regime while a more long-term solution can be worked out.

Example San Diego Gas & Electric Programs

San Diego Gas & Electric (SDG&E) offers customers the ability to take advantage of available governmental rebate programs as well as some provided by the utility itself. Most of their programs stress the importance of energy conservation through better building design and the replacement of energy-inefficient office machines. They will even offer to replace incandescent lighting with more efficient compact fluorescents at no charge to small and medium enterprises as well as residential customers. Larger organizations can take advantage of the Energy Savings Bid Program to save a minimum of 500,000 kilowatt hours annually. SDG&E will pay up to 100% of the cost of the retrofit, depending on the savings and the type of measure taken (lighting vs. refrigeration vs. natural gas). Non-residential customers can also avail themselves of interest free financing of the replacement of electrical equipment with natural gas equipment up to a total loan amount of \$50,000. SDG&E is also involved in the research arena with a current study comparing the efficiency of standard hybrid electric vehicles with converted plug-in hybrid electric vehicles.

Relevant Legislation and Tax Credits

It is beyond the scope of this report to provide a comprehensive inventory of all legislation which affects the development of a cleantech cluster, but those listed here are particularly significant. For enacted legislation, only select California laws are listed. USD's Energy Policy Initiatives Center (EPIC) provides a more detailed listing of energy-related legislation in California.⁴⁷

California legislation:

- The California Global Warming Solutions Act of 2006 (AB 32) – This bill was the first of its kind to mandate emissions caps through penalties for non-compliance, and utilizes a cap-and-trade emissions credit system. The market-based mechanism is expected to spur the creation of technologies which can offer to reduce emissions at a cost lower than the market price, thus producing a profit for greener manufacturers.
- The California Solar Initiative of 2006 (SB 1) – This is a comprehensive system of subsidies for consumers wishing to purchase photovoltaic energy systems for the home, office, or factory.
- The California Low Carbon Fuel Standard – Under a 2007 executive order from Governor Schwarzenegger, this Standard is designed to dramatically reduce emissions coming from California's 20 million drivers.⁴⁸ By mandating only an end result and not the method, this executive order allows fuel producers to determine the best means of

⁴⁷ See <http://www.sandiego.edu/epic/legislative/>.

⁴⁸ See <http://gov.ca.gov/index.php?/executive-order/5172/>.

reducing their carbon footprint whether it be from ethanol production or other biofuel technologies. The pending SB 210 (Kehoe) would enact a similar standard into law.

- Multi-State Emissions Trading System (2006) – As mentioned above, AB 32 authorizes the creation of a cap-and-trade system for emissions. Governor Schwarzenegger, along with the governors of Arizona, New Mexico, Oregon, and Washington, expanded the cap-and-trade program to the five-state region under the Western Regional Climate Action Initiative.
- California's Greenhouse Gases Emissions Performance Standard Act of 2006 (SB 1368) – This bill aims to “clean up” energy production in the state by establishing greenhouse emissions standards for energy producers. This standard will be the emissions of natural gas plants and will have the effect of preventing the state from purchasing fuel produced by coal fired power plants (unless they practice carbon sequestration or utilize similar clean technology).
- California Renewable Portfolio Standard – Based on the requirements of SB 1078 of 2002 and accelerated under SB 107 (2006), the California Energy Commission and the Public Utilities Commission jointly oversee the mandate that California increase the share of energy coming from renewable sources by 2% a year with a target of 20% by 2010. Pending legislation in the California Senate (SB 411) would set a further target of 33% by 2020.⁴⁹

Pending Federal and State cleantech legislation:

Federal:

- Creating Long-Term Energy Alternatives for the Nation (CLEAN) Act (HR 6) – This bill would increase automobile fuel efficiency standards, enact new rules against energy price gouging, and requires a large increase in ethanol production. Recently passed by the Senate with numerous amendments, this bill raises the standard for average fuel economy to 35 miles per gallon by 2020, as well as sets a production goal for ethanol at 36 billion gallons by 2022. The Senate bill must now be reviewed by the House.

State:

- California Clean Technology Services Unit (AB 1620) – Established with the Business, Transportation and Housing Agency, this Unit will promote the development of new clean technologies and products, facilitate the ability of businesses to bring clean technologies to California's market, and coordinate with specified state agencies to encourage clean technologies. This bill would also require the unit to report annually to the Legislature with regard to its activities promoting clean technology within the state.
- Clean Technology RD&D Program (SB 660) - This bill would establish the Strategic Clean Technology and Climate Change Research, Development, and Demonstration Program to coordinate the expenditure of state projects that focus on reducing greenhouse gas production and assessing and mitigating the effects of climate change. The bill would establish the Strategic Research Investment Council and require annual strategic plans to establish priorities and identify key expenditure categories for funds to be expended the following fiscal year.

⁴⁹ See http://info.sen.ca.gov/pub/07-08/bill/sen/sb_0401-0450/sb_411_bill_20070418_amended_sen_v98.html

There are numerous tax credit and incentive programs at the Federal and State levels. Listed below are a few examples.⁵⁰

Federal:

- Federal Energy Efficient Commercial Buildings Tax Deduction – Under the Energy Policy Act of 2005, the Federal government offers deductions for businesses that install efficiency-improving technologies up to a value of \$1.80 per square foot of commercial space.
- Federal Energy Efficient Home Credit - The Energy Policy Act of 2005 established tax credits of up to \$2,000 for builders of all new energy-efficient homes, including manufactured homes constructed in accordance with the Federal Manufactured Homes Construction and Safety Standards. Initially scheduled to expire at the end of 2007, the tax credit was extended through 2008 under the Tax Relief and Health Care Act of 2006 (H.R. 6111).
- Modified Accelerated Cost-Recovery System – It is worth noting again the value of this change to the IRS statutes in making the installation of large-scale clean technology initiatives financially feasible for industries by allowing companies to deduct a higher percentage of the value of such technologies in the near term, thus increasing their short term tax shield.
- Business Energy Tax Credit - The Tax Relief and Health Care Act of 2006 (H.R. 6111) extended the policies originally specified in the Energy Policy Act of 2005. This tax credit allows business to deduct 30% of the cost of solar power, solar hybrid lighting, and fuel cells, as well as 10% for microturbines and geothermal power units.
- Renewable Energy Production Tax Credit – The Renewable Electricity Production Credit (REPC) is a per kilowatt-hour tax credit for electricity generated by qualified energy resources. The REPC provides a tax credit of 1.5 cents/kWh, adjusted annually for inflation, for wind, closed-loop biomass and geothermal. Currently, the REPC for these technologies is 1.9 cents/kWh. Electricity from open-loop biomass, small irrigation hydroelectric, landfill gas, municipal solid waste resources, and hydropower receive half that rate -- currently 1.0 cent/kWh.

State:

- California Personal Deduction for Energy Efficiency – The State of California allows individuals to deduct the cost of interest from loans provided by publicly owned utilities to improve energy efficiency. If an individual purchases efficiency-improving heating, ventilation, cooling, lighting, or solar technology and finances it through their publicly owned utility, that individual can deduct the interest from that loan on their California Income Taxes.
- California Property Tax Exemption – Homeowners who install PV and solar heating systems can claim an exemption of up to 75% of the value of those systems from their property taxes. That is to say, if an owner improves the value of his or her home by installing such a system, then the full value of that system will not be assessed in his or her property value for tax purposes.

⁵⁰ The *Database of State Incentives for Renewables & Efficiency (DSIRE)* offers a more comprehensive listing. See <http://www.dsireusa.org/>.

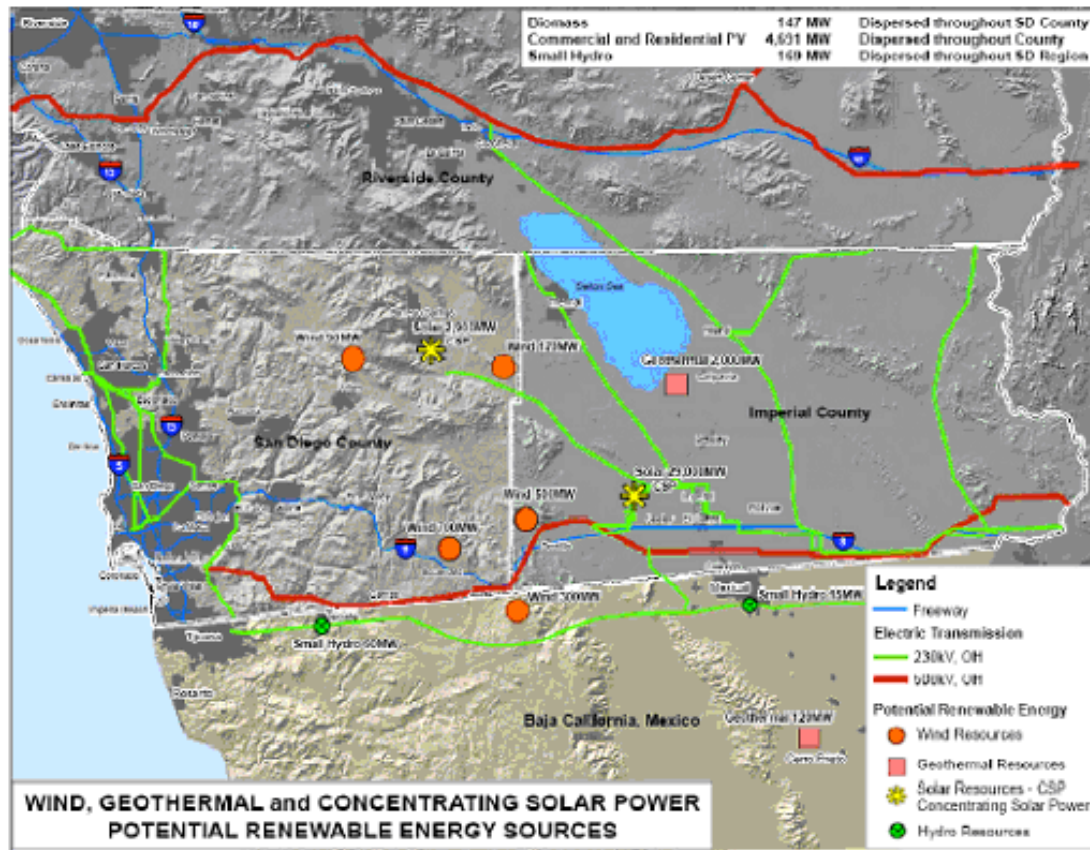
The Region's Natural Resources and Weather Trends

Overview of Renewable Energy Sources in the Region

An 18-month study conducted by the San Diego Regional Renewable Energy Study Group ending in 2005, yielded a collaborative report that combined the efforts of local energy interests wishing to develop an analysis of the technical feasibility of developing several clean tech renewable energy resources within the San Diego region. Major partners involved in the study included the San Diego State University Center for Energy Studies, ROHY Consulting Associates, SDG&E, the San Diego Regional Energy Office, RESLEY Consulting, the Universidad Autónoma de Baja California, and Tanaka Research and Consulting. The report concluded that pursuing and developing these renewable energy resources could be technically possible and that they could feasibly provide a basis for a regional renewable energy policy.

The figure below from the San Diego Regional Renewable Energy Study Group maps the distribution of renewable resources throughout the San Diego region.

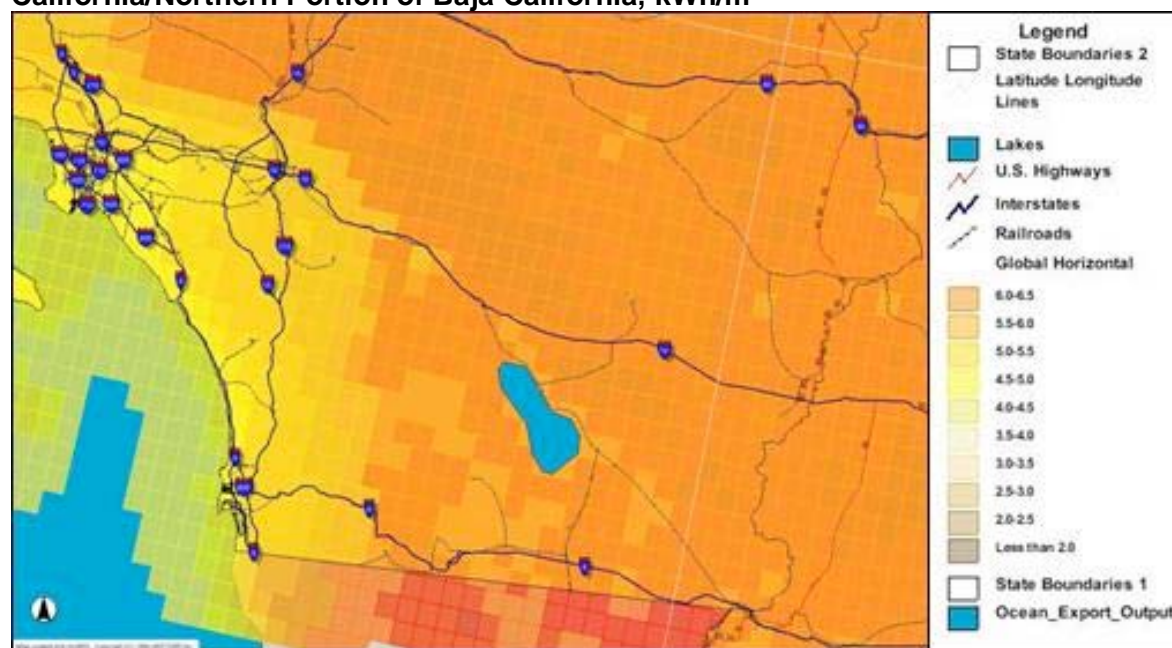
Figure 8: Approximate Location of Major Renewable Energy Resources in the Region



Source: Adapted from the San Diego Regional Renewable Energy Study Group

The natural and technical resources to develop renewable energy do exist in this region, as painstakingly and thoroughly analyzed in the report by the San Diego Regional Renewable Energy Study Group.

Figure 9: Average Annual Direct Normal Solar Radiation in the Southern Portion of California/Northern Portion of Baja California, kWh/m²



Source: United States Atlas of Renewable Resources, National Renewable Energy Laboratory

To assess the amount of solar radiation that San Diego receives, data were taken from the California Irrigation Management System and assessed for the technical feasibility of collection through solar resources. Additionally, by using residential data from the San Diego Association of Government's (SANDAG) and commercial data derived from Geographic Information System (GIS) estimates were made of the potential of developing solar energy as a viable renewable resource for the San Diego region. Estimated power that could possibly be harnessed from solar panels in San Diego County lies around 5,000 megawatts of electricity, enough to supply 3.3 million customers during peak usage. However, there is limited availability of land in the County that meets the criteria for siting concentrating solar power (CSP) systems.⁵¹ Adding in Imperial County and other regions may increase capacity to approximately 35,000 megawatts. Baja California and Northern Mexico are also cited by the report as having huge solar resource potential.

Table 4: Land Available for Concentrating Solar Power (CSP) Facilities, by Location⁵²

Location	Potential Available Area (km ²) for CSP	Approximate Solar Capacity (GW)
California	17,700	885
San Diego County	130	6
Imperial County	5,800	290

Source: Adapted from the San Diego Regional Renewable Energy Group

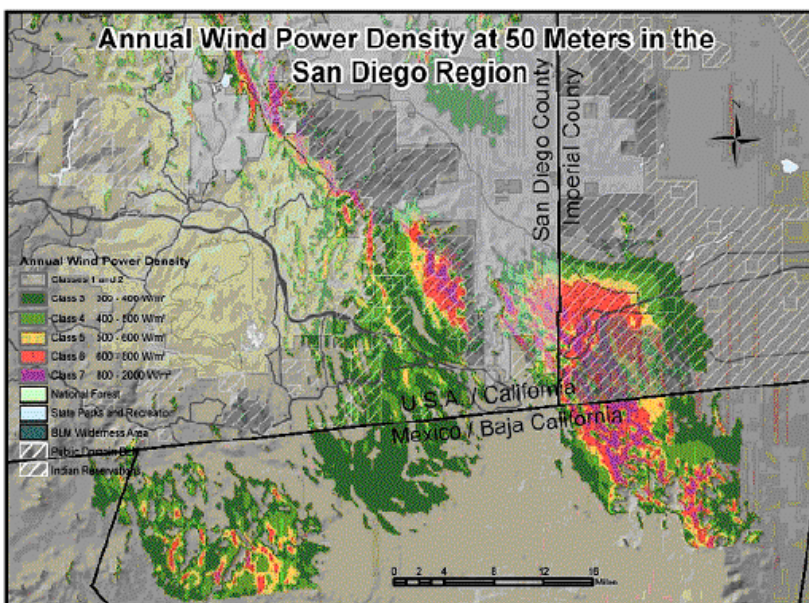
⁵¹ <http://advancement.sdsu.edu/marcomm/news/releases/fall2005/pr080205.html>

⁵² See: <http://www.renewablesg.org/docs/Web/AppendixE.pdf>

Renewable Energy Resources in the Region: Wind

In the San Diego region, east San Diego County and west Imperial County have the highest capacity for wind resources. In the San Diego region, east San Diego County and west Imperial County have the highest capacity for wind resources. In San Diego County, over 600 square miles have wind speeds at least between 6.4-7.0 m/s, placing these areas in the Class 3 category (the minimum required for grid-connected applications) and other areas that approach the Class 7 category with the possibility of minimally providing 300-400 W/m². The data map below shows wind resources and presents an overview of the distribution of wind resources within the San Diego region. Original data sets come from the National Renewable Energy Laboratory (NREL) and the California Energy Commission (CEC). The 2005 study by the San Diego Renewable Energy Study Group found no significant wind energy systems in the region.⁵³ However, since that time, a wind farm has been built on Campo Kumeyaay Nation land that supplies enough power to SDG&E for approximately 30,000 homes.⁵⁴

Figure 10: High Wind Resource Area in San Diego County, Imperial County, and Baja California



Source: San Diego Regional Renewable Energy Study Group

between 3,700 and 4,100 GWh. These results from the Bureau of Land Management (BLM) included privately owned lands and Indian reservations, whose owners may be unwilling to accept wind farms on their land; there has, however, been wind development on lands with such ownership in the past elsewhere, and, as noted above, a wind farm has recently been constructed on Kumeyaay Nation land in east San Diego County.

In order to clarify the status of the studied land and the potential use, the San Diego Regional Renewable Energy Study Group obtained topographic and ownership data from SANDAG, the California Spatial Information Library (CaSIL), the US Geological Services (USGS), and NREL.

The final results of the study are referred to in Table 5 below. The gross potential for wind power in the San Diego region lies between 21,000-24,000 GWh and the Technical Potential for wind power in the San Diego region lies

Table 5: Summary of Potential Wind Energy and Capacity in the San Diego Region⁵⁵

Gross Potential		Technical Potential	
Energy (GWh)	Maximum Capacity (MW)	Energy (GWh)	Maximum Capacity (MW)
21,000 to 24,000	6,500 to 6,900	3,700 – 4,100	1,380 – 1,530

⁵³ See the San Diego Regional Renewable Energy Group Report, <http://www.renewablesq.org/docs/Web/Wind.pdf>

⁵⁴ See <http://www.campo-nsn.gov/windfarm.html>.

⁵⁵ Table adapted from the San Diego Regional Renewable Energy Group Report.

Renewable Energy Resources in the Region: Geothermal, Biomass, and Hydropower

Geothermal resources are a potential form of renewable energy. Although there are no geothermal resources in San Diego County, there are significant resources close to the Salton Sea in neighboring Imperial County. Efforts have been underway to develop this resource for decades and there are now 15 geothermal plants south of the Sea.⁵⁶ These plants have the current potential to contribute 537 megawatts of electricity⁵⁷, tapping into brine and then converting super heated water to steam, which drives turbines and creates electricity, and experts believe that this geothermal energy resource may hold far more potential and commercial worth. CalEnergy is currently working on a project in the Salton Sea Known Geothermal Resource Area. When completed, this plant will be the largest geothermal plant in the U.S., will produce electricity solely from steam, and will be known as Salton Sea 6.

Biomass constitutes another important potential energy resource for the San Diego region. Potential fuel sources from which these resources may be drawn are from urban wood wastes (about four million tons annually), forest wood wastes, and landfill gas. Hydropower constitutes only a small renewable energy resource and does not have the potential to be developed any further. Hydropower therefore does not constitute a viable and consistent resource given the limited water sources with sufficient flow to generate electricity.

Renewable Energy Resources in the Region: Ocean and Tides

Two ocean-related renewable energy activities that could possibly be developed in the San Diego area are tidal energy and Ocean Thermal Energy Conversion (OTEC). The National Renewable Energy Laboratory states that OTEC can work if the seawater on the ocean surface differs from the cold deep water seawater by about 20°C (36°F) and is no more than about 1000 meters (3280 feet) below the surface. Current research at UC San Diego indicates that OTEC could feasibly be developed for the campus because one such area exists a mile off Scripps pier where the Scripps and La Jolla canyons connect. According to the study by UC San Diego sustainability researchers, the energy gained could possibly offset four megawatts of electrical equivalent load, reduce the amount of carbon dioxide UC San Diego releases by 12,700 metric tons, and reduce the overall ecological imprint of UC San Diego by 12%. Other ocean areas in the San Diego region may also contain similar potential, but environmental impact must be assessed for all areas in terms of warm water released from the plant and potential disruption to the Area of Special Biological Significance (ASBS). Tidal power, which includes tidal turbines, tidal fences, and ebb/flood generating systems have not yet been explored by UC San Diego researchers, but could possibly be developed on the San Diego coastline if tidal change and ecological impact are both assessed and prove to be minimal.

Weather Trends & Analysis of Extant Data/ Climate Change Modeling:

As substantiated by weather reports over almost half a century, San Diego has relatively consistent weather patterns. Being close to the Pacific Ocean, the climate is tempered and usually the summers are cool and the winters warmer than most regions at the same latitude.⁵⁸ Severe weather is relatively rare in the San Diego climate.⁵⁹ The only exception to these consistent general weather patterns occur during the El Niño and La Niña episodes. The more extreme fluctuations in weather patterns experienced during these episodes, however, can be partly disregarded as statistical outliers but this may change, as there has been some correlation linking these events to global warming and global climate change.

⁵⁶ See <http://saltonseaca.gov/econdev.htm>.

⁵⁷ <http://www.renewables.org/docs/Web/Geothermal.pdf>

⁵⁸ <http://www.wr.noaa.gov/sgx/climate/san-san.htm>

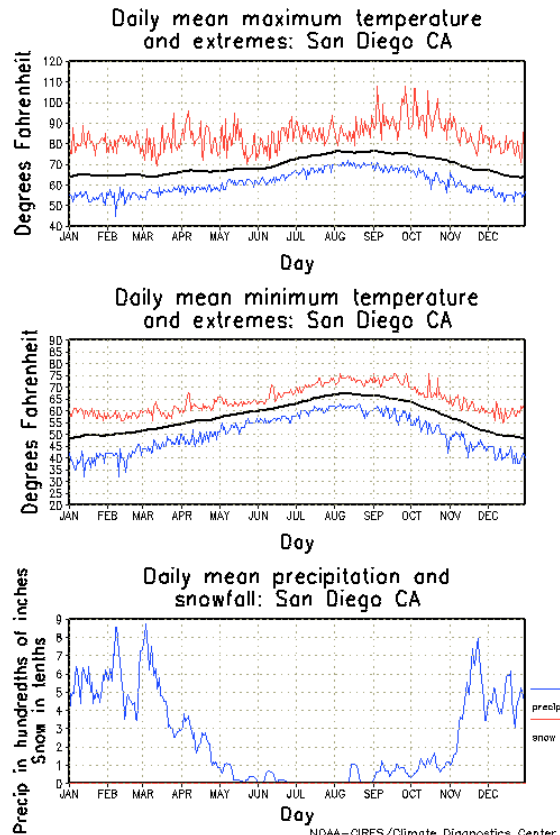
⁵⁹ For a history of significant weather events see: <http://www.wr.noaa.gov/sgx/document/weatherhistory.pdf>

Within the San Diego Region, there are four microclimates that vary in temperature and seasonal rainfall: the coast, the mountains, the inland valleys, and the desert. Generally, in the inland valleys the daytime summer temperatures are much higher and nighttime winter temperatures much cooler. The mountains receive a good deal more precipitation (20-40 inches) than the city (10 inches). The limited amount of rainfall in the County has for many years had implications for residential, industrial, and agricultural uses. This was a primary reason for the water transfer agreement with the Imperial Irrigation District in 2003.

The annual average temperature in San Diego hovers around sixty-four degrees Fahrenheit,⁶⁰ and on annual average there exist a 65- 70% possibility of daily sunshine.⁶¹ Similarly to the rest of the Pacific Coast, during the spring and summer early morning and nighttime there is a good deal of cloud cover near the city and in the inland valleys that burns off as midday nears. Cloud cover and the average possibility of sunshine are important factors when assessing the feasibility of solar technology (see section on Solar Radiation, above). From 1961 to 1990 the average daily maximum and minimum mean temperatures do not appear to significantly deviate from the grand mean.

The average daily mean precipitation for San Diego from the years 1961 to 1990 was highest from January to April and in November and December; snowfall did not occur at all over this time period. For the years 1914-2006, the average annual precipitation at the San Diego International Airport was 10.26 inches with a standard deviation of 4.16 inches, a maximum of 24.93 inches and a minimum of 3.41 inches, with a skew of 0.78.⁶²

Figure 11: Temperature and Precipitation Data



Source: Earth System Research Laboratory, NOAA

⁶⁰ <http://www.weather.com/weather/climatology/USCA0982>

⁶¹ <http://www.wrh.noaa.gov/sgx/climate/san-san-month.htm>

⁶² <http://www.wrcc.dri.edu/cgi-bin/cliMONtpre.pl?casand>

Agricultural Products

Many aspects of the cleantech industry are strongly related to agriculture. Biofuels, water-saving technologies, and natural pesticides are a few examples of cleantech applications that either rely on agriculture products as inputs or improve the growing process. While the San Diego region may not have sufficient land or water availability to produce biofuel crops such as corn or switchgrass at an industrial scale, its competencies in biotechnology and water quality technologies present opportunities for enhancing agriculture output and efficiency here and in other regions.

Agriculture in San Diego County relies on the excellent climate, allowing us to grow and produce just about anything grown anywhere in the world. Table 6 shows the value of the major crops produced in the County and the land area in use.

Table 6: Summary of Major Crops

Product Type	2005			2004		
	Acres	Hectares	Value (\$ millions)	Acres	Hectares	Value (\$ millions)
Nursery & Flower Crops	10,221	4,136	\$991	10,070	4,075	\$973
Fruit & Nut Crops	42,815	17,327	\$326	43,127	17,453	\$252
Vegetable Crops	7,044	2,851	\$138	6,736	2,726	\$141
Livestock & Poultry Products			\$48			\$65
Livestock & Poultry			\$19			\$21
Field Crops	213,096	86,239	\$6	206,149	83,427	\$6
Specialty Crops			\$1			
TOTALS	273,176	110,553	\$1,531	266,082	107,681	\$1,462

Source: University of California Cooperative Extension, Farm and Home Advisor's Office

San Diego agriculture is diverse but concentrated on higher value crops such as nursery, flowers, citrus, avocado and vegetables. Field crops such as grains, hay, pasture, rangeland and silage account for only 4% of the total value of agriculture in the County. In general, land availability and the high cost and limited amount of water severely restrict the production of these types of crops in San Diego County.

Other factors besides climate, however, are a challenge. High water prices, high land prices, competition with development for growing areas, water quality issues and intense international competition force agriculture in the county to hone its competitiveness, its technology and its partnerships with other industries.

Biotech/Agriculture Partnerships

The relationship between the biotechnology sector and agriculture in San Diego is indicative of both the challenges and opportunities in local agriculture supporting the development of a regional cleantech cluster. The experience of this potential but largely unexploited relationship between biotechnology and agriculture may have implications for inter-sector communications as cleantech develops. The possibility for cooperative efforts between San Diego County agriculture and the local biotechnology industry is great. The local biotechnology industry needs field facilities whether it is for the research and development of agriculturally related products, or for other types of projects (pharmaceuticals, for example) that are produced in agricultural crops

for later extraction or consumption. The local agricultural industry could benefit from tapping into the biotechnology industry's understanding of plant biology, genetics, and pathology.

A 2005 study⁶³ indicated that a number of factors must be in place for such partnerships to be successful. The study found that a number of biotechnology companies were conducting field work at remote locations, sometimes thousands of miles away. The reasons for this were many: sometimes the biotechnology companies had relocated their laboratory facilities to San Diego and had left the field research locations at the original Midwest location. There were several biotechnology firms that had been bought out by larger firms, and the field work was consolidated. This is costly, requires more travel and minimizes the opportunities for scientists to view their field plots. One common factor among a number of biotechnology firms was the lack of knowledge that any agriculture existed in San Diego County, and would possibly be able to have some level of involvement in their product development.

Corresponding to the biotechnology industry's lack of knowledge of San Diego agriculture was the lack of knowledge by agricultural producers of opportunities that could be available by working with biotechnology. Few producers have ties to biotechnology. In addition, agricultural producers were not aware of the level of security required for participation in biotechnology-related research and development; most were surprised to find that the level of security and containment was relatively low. One interesting and surprising piece of information that was determined through the study was that the agricultural producers had a difficult time in determining what their time, experience and facilities were worth. All agricultural producers placed a value for their participation of approximately 10% what the biotechnology industry was willing and expecting to pay.

Disease Detection Mechanisms

There may also be opportunities to develop methods that allow growers to rely less on pesticides or fertilizers to produce their crop. Detection of plant diseases, particularly viruses, is a very important factor for growers. Selling and shipping of diseased plants can quickly decimate an industry, forcing quarantines and other difficult measures. The use of disease detection methods on site is becoming routine, using testing kits that have been developed by the biotechnology industry. These test kits utilize laboratory-based colorimetric indicators when the disease-causing agent is present. Growers often need employees with some laboratory experience to maintain their disease screening processes.

Plant Propagation

Tissue culture is a micro-propagation method of producing clonal plant starts that are disease free or contain specific genetic traits. This requires manipulation of plant hormones under sterile laboratory conditions that allows undifferentiated plant tissue to produce the specific plant starts required for the process. Numerous growers in San Diego County, as well as in other parts of the state and country use tissue-culture propagated starts for planting materials.

In addition the micro-propagation methods of tissue culture, the growing of plant starts from seed or cuttings are also a lucrative industry in the county. The companies producing plant starts have a very short turnaround time, and often custom grow specific varieties of plants needed by the customer. Plant starts are grown in flats that are designed to effectively utilize all available bench space, available water, labor and other resources. The plant starts are grown for approximately four weeks before they are transported to the finishing grower. Starts can be

⁶³ Mellano, Valerie J., 2005. Potential for Partnerships Between San Diego County Agriculture and the Local Biotechnology Industry. CORF News, 7(3), September, 2005.

grown for common varieties, unusual or heirloom varieties and under conditions that meet the certified organic requirements.

Irrigation Technologies

Water is a scarce resource in Southern California and it is possible that the combined effects of climate change-induced drought and growing populations will place tremendous strain on the region's water supply in the coming years. According to the San Diego County Water Authority's Agricultural Water Management Plan, over 250,000 acre-feet of water was devoted to agriculture production in 2000. This represented 16% of total demand.⁶⁴ The Valley Center Metropolitan Water District (MWD) reported the highest water usage that year, drawing nearly 40,000 acre-feet to support its citrus and avocado crops. The Rainbow MWD used just over 21,000 acre-feet for agriculture.

Growers in San Diego County have been on the cutting edge of irrigation technology for many years due to the tremendously high price of water in the area, nearly twice as much as farmers in Imperial County.⁶⁵ Efficient methods of water use have been utilized in San Diego County for many years, and all growers are aware that water is a very limiting factor to plant production in the area. Use of micro irrigation systems is routine, and computerized irrigation systems that deliver water to plants at appropriate times based on evapotranspiration/weather data is becoming more commonplace. Weather stations are established in several locations within the county and provide a number of data points in the county that allow the growers to match their location to the closest data point with similar temperature, humidity and other factors.

Quality of water is also a factor. Most growers use district or purchased water that is quite salty from the perspective of growing plants. Others have been fortunate to have some ground water, but generally speaking, the quality of the groundwater is even higher in salt than that of the district water, forcing the growers to mix or blend the water to provide their plants with water of appropriate salinity. Other growers have installed systems to remove the salts through reverse osmosis and increase the usability of the water, and this is becoming more commonplace when growing plant starts, specialty plants and certain ornamentals that will not be marketable if they have any sign of damage to their flowers or foliage.

Nutrient Management

Laboratory analysis of plant, soil and water to determine the nutritional needs of the crop are very commonplace, and highly encouraged. Proper delivery of nutrients will ensure maximum uptake by the plants and will minimize other problems, such as water quality degradation, when nutrients are not fully utilized.

Nutrient delivery is also more technical than was traditionally portrayed-most growers use nutrient delivery systems associated with their irrigation, and the amount, timing and seasonal variations can be carefully controlled. Custom mixes of fertilizer based on the laboratory analysis are often delivered to the growers by agricultural services in large tanks, minimizing the potential for over-fertilization and error.

⁶⁴ Residential usage represented 57% of demand, followed by Commercial/Industrial at 21%. See San Diego County Water Authority, *Agricultural Water Management Plan* - <http://www.sdcwa.org/manage/awmp.phtml>.

⁶⁵ On average, San Diego growers pay \$650 per acre-foot versus \$379 per acre-foot in Imperial. San Diego County Water Authority, *Agricultural Water Management Plan*.

Expansion of Crops Selection

Because of high levels of competition from other agricultural countries, many growers in San Diego County have gravitated toward more specialty crops. These are varieties or plants and animals selected to be unique and are not grown in large quantities, but often provide a relatively high return. Research into new varieties, new crops and other specialty crops, both plant and animal, is continuous, and is highly important in the viability of agriculture in San Diego.

Summary and Key Findings

Based on this analysis, San Diego is well positioned to develop into a leading region for cleantech. In addition to the companies currently in the region, San Diego possesses many of the important elements for the development of a robust cleantech cluster. These elements include a technically trained workforce, comparatively ready access to risk capital, some of the top research universities and institutions in the United States, and weather trends and natural resources that are very favorable to some clean technologies.

- **San Diego has a cleantech industry.**
The region already has 147 companies involved with clean technologies, indicating a strong foundation upon which this emerging cluster can be built. Some of these companies have been present in the region for years and others are newly minted startups. The majority are involved in energy generation technologies and there is a core group involved with water and wastewater. There are also several companies involved in the intersection between biotechnology, wireless communications, and cleantech.
- **San Diego has a well-trained, technical workforce.**
San Diego has a strong talent pool of science and engineering capabilities due to its existing technology industries such as biotechnology, wireless telecommunications, and defense. Firms like General Atomics, SAIC, and others have been conducting cutting-edge technology development in the region for decades and turning their attention to cleantech. These companies and others in the region could respond rapidly in creating new products and services as market demand shifts.
- **The region's support mechanisms for high technology companies can help cleantech succeed here.**
San Diego has developed into a hotbed of entrepreneurial activity in high technology, bolstered by support programs like CleanTECH San Diego, CONNECT, CCAT, other technology trade associations, and a well-developed business services sector. These organizations provide hands on assistance to entrepreneurs and link them to investors, clients, and other business services. Such support is crucial to growing a vibrant cleantech cluster.
- **San Diego has world-class research institutions with the capabilities to lead the development of new clean technologies.**
The infrastructure for cutting edge research is well-developed due to the rapid rise of the region's academic institutions. Both UC San Diego and San Diego State University have been nationally and internationally recognized for their work in climate change, the life sciences, engineering, and connections with local high technology companies, yet the amount of activity explicitly focused on cleantech applications is only beginning to emerge. As greater emphasis is placed on clean technologies by the funding agencies, San Diego's academic researchers will quickly be able to seize the opportunity.
- **Cleantech companies are drawing investors from the large pool of risk capital in the region, but not yet at the level of other technology industries.**
San Diego cleantech companies are attracting capital, but not yet in large numbers or dollar amounts compared with other technology industries, as shown by the six deals in cleantech last year. Overall, the challenge is in accelerating deal flow and not the accessibility of capital. More efforts, such as those being organized by CONNECT, the City, the Regional

EDC, and trade associations, will increase the visibility of good business ideas. This will in turn attract more capital.

- **Progressive polices that support cleantech are in place at the State and local level, but concerns remain about how the patchwork of polices could be streamlined and improved.**

With its solar initiative and bills like AB 32, California is taking the lead in developing policies that support the adoption of clean technologies. However, clean technologies are still expensive compared with their traditional counterparts, and incentives are likely needed for the foreseeable future to promote greater adoption. At the local level, the City has a progressive track record for fast-track permitting and green building codes. SDG&E and the Center for Sustainable Energy provide incentive programs for solar power systems and energy efficiency improvement. However, there are concerns about some policy issues, such as the time-of-use tariffs that affect the economics of distributed generation systems and the “marble cake” mix of environmental regulations that complicate the adoption of cleantech.

- **Strengths in certain natural resource areas present advantages for clean technology development.**

In terms of natural resources relevant to cleantech, San Diego is rich in some and poor in others. Solar, wind, and geothermal energy sources are viable here, although more so in the eastern portions of San Diego County, and to a greater extent in neighboring Imperial County and Baja California. Using the ocean as a source of energy is also possible, but the technology requires further development. The availability of water for residential, commercial, and agricultural use may become increasingly more limited due to possible impacts from climate change and a growing population here and in other regions that draw from the same sources.

- **With its strengths in biotechnology and water purification technologies, San Diego can become a leader in applying clean technologies to agriculture.**

Due to the limited amount of land under cultivation in San Diego County, it is not likely to become a major source of crops for biofuel production. However, there are distinct opportunities for cleantech applications that support the current agricultural industry through natural pesticide development, plant propagation, and more efficient irrigation technologies. As a home for innovative biotechnology research and development, San Diego has the potential to become a leader in creating the clean technologies that can be applied in agricultural areas elsewhere.

- **Other industries in San Diego become more competitive by having a strong cleantech cluster**

Lastly, cleantech companies in San Diego are already adding value to the existing technology clusters through supplier relationships. For instance, cleantech firms support the biotechnology industry with filtration systems that produce ultra pure water needed for research and development. By reducing costs, improving quality, and enhancing overall efficiency, cleantech companies improve the competitiveness of all industries located in San Diego.

Recommended Next Steps

The primary goal of this study is to assess the cleantech industry in the San Diego region and determine the critical issues that affect the overall business environment. Having found that the industry is fairly robust in terms of the number of companies and products and services offered, the logical next step in creating a comprehensive economic development strategy is to see how San Diego compares with other regions with emerging cleantech clusters. More specifically, we recommend the following series of follow-on actions:

1. Identify other potential competing cleantech regions for review

Based upon the cities and regions mentioned in media reports and market analyses related to cleantech, we suggest examining the industries in the San Francisco Bay Area; the Boston/Cambridge region of Massachusetts; Seattle, Washington; Portland, Oregon; Austin, Texas; and Sacramento, California. We would also include Vancouver, British Columbia because of its emerging competencies in alternative energy technologies. Lastly, we would also recommend the broad region of southern England, due to the presence of several research universities, the policy positions of the British government on environment and sustainability issues, and the role of the Carbon Trust, a government-backed company that supports clean technology development. By including two international locations, the review would draw out some of the dynamics of what is becoming a highly competitive global industry.

2. Examine each region's cleantech industry characteristics

To see how San Diego's cluster compares, the number of cleantech companies, the types of segments they are involved in, and the number of people employed in each region should be determined. The analysis should also look at the presence of entrepreneur support programs (e.g. "CONNECT-like" entities), any cleantech trade associations, the amount of venture capital invested in the region (overall, and for cleantech companies if possible), and the contributions made by research institutions in terms of technology and workforce training.

3. Conduct a comparative analysis of national, state, and local government policies relevant to cleantech cluster development

Government policies at the national, state, and local levels act as a driver of demand for cleantech products or services. A comparative review of policies in different regions will draw out potential best practices. We suggest examining regulations on air pollution emissions such as those that affect vehicle emissions, greenhouse gasses, and cap-and-trade regimes for emission credits; local permitting processes and requirements that may impact the adoption of renewable energy sources and/or energy efficient buildings; government-backed technology development funds; business attraction incentive programs; and cleantech-specific incentives such as rebates and tax credits.

4. Conduct a comparative analysis of regional utility policies relevant to cleantech

As with local government regulations, policies and procedures adopted by regional utilities can support or inhibit clean technology adoption, particularly for renewable energy. Best practices could be determined from reviewing tariff rates charged for distributed or co-generation power systems, incentive programs such as rebates or energy efficiency improvement efforts, the adoption of net metering and smart grid technologies, and goals and progress towards meeting renewable energy portfolio standards.

This is but a short list of possible next steps. At a minimum, action taken on the steps listed above will further elucidate what San Diego's competitive strengths are, how it can differentiate itself to attract and retain cleantech businesses, and what areas may be improved upon.

Conclusion

Based upon this initial assessment, San Diego possesses a solid foundation for developing a leading cleantech cluster. Many of the elements required for a successful industry, including a significant number of companies in certain cleantech segments, a workforce skilled in science and engineering, the high quality educational institutions, an entrepreneurial and innovative culture, and readily accessible risk capital. In addition, the presence of other high technology clusters has created an ecosystem that supports new company creation and a better quality of life. While other regions also have many of these elements, what perhaps sets San Diego apart is its strong culture of collaboration. Facilitated by regional organizations that link the various pieces of the ecosystem, this engrained collaborative spirit increases the visibility of opportunities, reduces transaction costs, and accelerates the growth of companies.

As many regions throughout California, the United States, and other parts of the world begin to position themselves as cleantech hubs, it is critical that a coordinated approach to nurturing this cluster in San Diego be developed. Some challenges and areas of improvement remain, but the overall outlook is very positive.

Appendix

Directory of Cleantech Companies

The following directory lists cleantech companies in the San Diego region by category. Six companies have products and services that span more than one category and are therefore listed multiple times. Company descriptions are based on information available on websites or provided by the companies themselves. Claims made by the companies have not been independently verified.

Agriculture

Innovative Solution Growing
7922-B Miramar Rd.
San Diego, CA 92126
Tel: 858 578 4477
Website: www.igshydro.com

Innovative Growing Solutions is a San Diego based supplier of hydroponics, horticulture, organic and indoor growing environments. We specialize in the design, consultation, construction, and implementation of controlled green house environments.

Protected Harvest
12260 Brassica St.
San Diego, CA 92120
Tel: 8587801822
Website: www.protectedharvest.org

Protected Harvest is an independent non-profit certification organization, with the principal mission of advancing and certifying the use of sustainable agriculture practices through the development of stringent, transparent, and quantifiable standards.

Xtermite
6328 Riverdale St., Suite A
San Diego, CA 92120
Tel: 619-542-8582
Website: www.xtermite.com

Xtermite, Inc. was founded to provide termite control services to Southern California while minimizing the impact on human health and the environment. Xtermite controls termites without the dangers, inconveniences, and added costs associated with other methods that necessitate packing food and pets and costly move-outs.

Air & Environment

Alliance Air Products
1392 E. Palomar St., #403-222
Chula Vista, CA 91913
Tel: 619-428-9688
Website: www.allianceairproducts.com

Alliance Air Products has brought together an engineering team focused on practical solutions to all aspects of air handling unit design. Our engineers are leaders in the industry with extensive experience in research and product development. The payoff to our customers is a streamlined design and manufacturing process resulting in efficient, cost effective, custom units.

Envitech
2924 Emerson Street
San Diego, CA 92106
Tel: 619-223-9925
Website: www.envitechinc.com

Envitech is a leading supplier of air pollution control systems for the treatment of medical, pathological, chemical, and industrial wastes. Our systems include high efficiency wet scrubbers, NOx scrubbers, packed tower scrubbers, and electrostatic precipitators for particulate and gaseous emission collection.

George T. Hall Company
4289 Taylor Street
San Diego, CA 92110
Tel: 619-297-4671
Website: www.georgethall.com

George T. Hall Company is a premium distributor of industrial process, burner boiler, and HVAC controls.

Heating & Cooling Supply LLC
1669 Brandywine Ave., Suite A
Chula Vista, CA 91911
Tel: 619-262-8885
Website: www.heatingandcooling.com

Heating and Cooling Supply is a wholesale distributor, serving contractors in California, Arizona, and Nevada since 1960. We stock a wide selection of heating, ventilating, and air conditioning parts and equipment.

Hi-Q Environmental Products
7386 Trade Street
San Diego, CA 92121
Website: www.hi-q.net

Hi-Q Environmental Products Company is a leading manufacturer of air sampling equipment, remote monitoring systems & air monitoring accessories since 1973. We are an ISO-9001 Certified manufacturer of continuous duty high & low volume air samplers, air flow calibrators, radioiodine sampling cartridges, collection filter paper, combination filter holders, emergency response sampling kits and complete stack & fume hood sampling systems designed per the requirements of ANSI N13.1 1999.

Seacoast Sciences, Inc.
2151 Las Palmas Drive, Suite C
Carlsbad, CA 92011
Tel: 760-268-0083
Website: www.seacoastscience.com

Focused on the next generation of chemical sensor and chemical detection devices, Seacoast Science emphasis is on the development of gas sensors for a variety of markets including leak detection, military, homeland security, air quality monitoring, and emission gas detection.

Cleantech Solutions Providers

Environmental Business International, Inc.
4452 Park Blvd., #306
San Diego, CA 92116
Tel: 619-295-7685
Website: www.ebiusa.com

EBI is a business research and publishing company focused on the environmental and climate change industries. EBI offers clients a subscription-based information service, produce market research reports, and conduct business research projects for companies and government.

MotivEarth
16308 Pinto Ridge Court
San Diego, CA 92127
Tel: 877-374-2934
Website: www.motivearth.com

MotivEarth is a Global Warming Solutions provider. We work with companies to address activities that contribute to climate change then develop and deliver dynamic solutions. We offer options which include renewable energy, energy efficiency, carbon trading and clean fuel technologies that will reduce impacts. We solve global warming problems and get results.

Teotl Energy Partners LLC
3667 Berryfield Ct
San Diego, CA 92130
Tel: 858-353-3830
Website: www.teotlenergy.com

Teotl Energy Partners LLC (TEP) provides comprehensive business & industry expertise for start-ups and established firms launching new or building on existing cleantech ventures. TEP specializes in accelerates commercialization of technological discoveries.

Energy Efficiency

Alternative Energy Systems Consulting, Inc.
8555 Aero Dr., Suite 200
San Diego, CA 92123
Tel: 858-560-7182
Website: www.aesc-inc.com

Alternative Energy Systems Consulting, Inc. (AESC) provides high quality technical and management consulting services to the energy market; facilitating the deployment of efficient, cost effective, reliable and environmentally friendly energy systems. AESC accomplishes this by developing and delivering innovative and specifically tailored engineering services and solutions to utilities, corporations and government agencies devoted to improving energy conversion, delivery and end-use efficiency.

Biomatrica
5627 Oberline Dr. #120
San Diego, CA 92121
Tel: 858-550-0308
Website: www.biomatrica.com

Biomatrica is a biostability company that has developed a revolutionary, room temperature sample storage technology, eliminating the need for cold storage and transport of biological samples. This revolutionary product allows research labs to turn off their energy guzzling freezers and tread lighter on the earth.

Brummitt Energy Associates inc.
2171 India Street, Suite B
San Diego, CA 92101
Tel: 619-531-1126
Website: www.brummitt.com

Brummitt Energy Associates, Inc. helps clients achieve highly energy efficient, cost-effective projects by integrating the building design with daylighting, electric lighting, and mechanical systems. Consulting from early design through construction documentation, we specialize in energy modeling, increasing financial incentives, and Title 24, LEED™

and CHPS documentation. 20 years experience includes thousands of buildings, and over 35 LEED™ projects from Certified to Platinum.

ClearDome Solar Thermal
3368 Governor Dr., # 153-F
San Diego, CA 92122
Tel: 619-990-7977
Website: www.cleardomesolar.com

ClearDome Solar Thermal offers BISFA heating panels, solar air heaters, thermal barrier fabrics, parabolic solar cookers & heat generators.

Energy Eye, Inc.
9833 Pacific Heights Blvd., #H
San Diego, CA 92121
Tel: 858-202-0001
Website: www.energy-eye.com

Energy Eye™ designs and manufactures proprietary WIRELESS technology products for Energy Savings. Our Products and Services are used in collaboration to help reduce the environmental impact of Heating and Cooling elements in Apartments, Classrooms, Offices and Hotel or Motel Guestrooms. This translates into a profound Economic advantage created for the users of our products.

Environmental Power Products
P.O. Box 951
Cardiff-by-the-Sea, CA 92007
Tel: 858-243-3774
Website: www.envpower.com

Home monitoring from Environmental Power Products will give homeowners the ability to see how their power is being used. Power consumption and actual power costs can be displayed in real time on a room-by-room or even on an appliance-by-appliance basis.

Leviton Manufacturing
860 Harold Place
Chula Vista, CA 91914
Tel: 619-205-8600
Website: www.leviton.com

Leviton was founded in 1906 to manufacture a single product: tip mantles for gas lights. Since then, the Company has become a leading North American producer of electrical and electronic products, including energy management systems, lighting controls, and information, entertainment and control systems for residential and commercial use.

McParlane Building Optimization
4619 Viewridge Ave., Suite C
San Diego, CA 92123
Tel: 858-751-5702
Website: www.mbo1.com

MBO Inc. commissions projects for functional and operational performance and HVAC optimization, from the design, to the construction documents, to the measurement and verification and trend logs.

Onsite Energy
2701 Loker Ave. West, #107
Carlsbad, CA 92008
Tel: 760-931-2400
Website: www.onsitenergy.com

Onsite Energy provides large industrial energy consumers with effective energy cost management services aimed at improving the bottom line.

Optimum Energy
Office in San Diego opening soon
Tel: 619-417-9984
Website: www.optimumenergyco.com

Optimum Energy develops networked information control applications and products to reduce energy consumption in commercial buildings. Our state-of-the-art integrated solutions reduce energy consumption while increasing operating efficiencies in HVAC plants with no effect on occupant comfort.

P&E Automation, Inc.
1357 7th Ave., Suite C
San Diego, CA 92101
Tel: 619-696-6906
Website: www.power-and-energy.com

The company's initial offering, EnergyXTRLs, will be the first end-to-end hosted energy management system (EMS) to provide intelligent building automation and optimization, energy accounting, and equipment diagnostics in one low-cost service for commercial, industrial, and government facilities.

Pentech Energy Solutions Inc
6885 Flanders Drive
San Diego, CA 92121
Tel: 619.450.8227

Created with the vision of energy efficiency, Pentech Energy Solutions provides energy products and service to both commercial and non-commercial sectors. Pentech's operations include the manufacturing and marketing of energy efficient products and utility improvements.

Talon Communications
7795 Arjons Drive, Suite 201
San Diego, CA 92126
Tel: 858-679-7550

Talon Communications, a full service electrical engineering firm, designs and manufactures products for both the commercial and military markets, focusing in the communications arena. Working with Southern California Edison, Talon has demonstrated a pilot wireless

Website: www.taloncom.com

Title24 Energy Consultants
1010 Second Ave., Suite 100-B
San Diego, CA 92101
Tel: 619-595-7891
Website: www.title24consultants.com

Xnergy
2721 Loker Ave.
Carlsbad, CA 92010
Tel: 760-438-7676
Website: www.xnergy.net

Energy Generation

Bull Moose Energy
Tel: 619-284-1714
Website: www.bullmoosesenergy.com

Chaienergy
12220 El Camino Real, Suite 418
San Diego, CA 92130
Tel: 858-480-2818
Website: www.chaienergy.org

Coast Intelligen
2460 Ash St.
Vista, CA 92081
Tel: 760-597-9090
Website: www.coastintelligen.com

Diversified Power Systems & Engineering
9748 Los Coches Rd., Suite 13
Lakeside, CA 92040
Tel: 619-562-8869
Website: www.divpower.com

Enpex
1329 Stratford Court
Del Mar, CA 92014
Tel: 858-792-5505
Website: www.enpex.com

system to help the utility cut costs by eliminating the need to read meters manually. A small ZigBee-based, thin magnetic card affixed to an appliance such as a refrigerator or washer allows utility customers to monitor electricity usage in their area and adjust their consumption accordingly to save energy.

Title 24 Energy Consultants provide architects, engineers, contractors, and home builders with a quick, simple method to demonstrate compliance with California's strict Title-24 standards. Using our sophisticated state-of-the-art computer energy analysis software we can provide our clients Title 24 energy compliance options necessary to save thousands of dollars in construction costs, increase design flexibility, increase allowable glass area, and speed up the plan-check process.

Xnergy's cast of skilled and experienced leaders are poised to serve our specialized clients in the biotech, pharmaceutical and high technology industries. We have a core group of highly skilled tradesmen providing services and installation for General Construction, HVAC, plumbing, process piping and insulation. Our focus is on energy management, cogeneration, biomedical laboratories, manufacturing operations, cGMP construction, validation and facility services.

Bull Moose Energy, a Woman Business Enterprise (WBE), is developing a 23 MW power plant (20 MW net to the grid) in Otay Mesa, in southeast San Diego County. The facility will use biomass waste products to produce electrical power to be sold to San Diego Gas & Electric (SDG&E) and produce enough electricity to serve 20,000 homes. Currently in the desing phase, the facility is expected to begin operating in 2008.

Chai Energy's mission is to confront challenges by applying our energy and creativity with science to fuel a better world. The company is currently developing nano-scale fusion technology and fuel cell systems.

Coast Intelligen is the leader in cogeneration systems for small and medium sized facilities, manufactures power systems that are a proven, cost effective, reliable and efficient way to help manage your energy needs.

Diversified Power Systems & Engineering is a renewable energy company that designs and manufactures complete solar power systems and products for distribution worldwide.

Over the past 23 years ENPEX has been the lead developer in a number of energy resource projects deploying advanced technology including enhanced oil recovery techniques, fluidized bed coal combustion.

Float, Inc.
4903 Morena Blvd., Suite 1213
San Diego, CA 92117
Tel: 858-866-0816
Website: www.floatinc.com

Float, Inc. develops pneumatically stabilized platforms (PSP) for oil and gas production facilities, floating Islands, mobile offshore military bases, additional real estate for coastal cities, floating harbors, floating breakwaters. PSPs can extract energy generated by waves to make electricity.

Functional Design & Engineering, Inc.
4250 1/2 Fairmount Ave.
San Diego, CA 92105
Tel: 619-528-4510

Functional Design & Engineering is producing point absorber buoy machines for converting the power available in a passing ocean wave to a useful form. These buoys may be free floating and do not require a rigid mooring for operation. Output from the buoys can be potable water for use in remote coastal locations, DC electricity for storage or immediate use via submarine cable, grid connectable AC power, pumped gasses or hydraulic fluids.

General Atomics
3550 General Atomics Court
San Diego, CA 92121
Tel: 858-455-3000
Website: www.ga.com

General Atomics is a San Diego based company specializing in energy-related research and product development. Products and services include nuclear fission and fusion reactor technologies, environmentally friendly de-icing technology, micromachining technology, high voltage capacitors, and hazardous waste minimization & destruction.

Green Star Products, Inc.
858 Third Ave., #455
Chula Vista, CA 91911
Tel: 619-864-4010
Website: www.greenstarusa.com

Green Star Products, Inc. is an environmentally friendly company dedicated to creating innovative cost-effective products to improve the quality of life and clean up the environment. Green Star Products and its Consortium are involved in the production of renewable clean-burning biodiesel and other products, including lubricants, additives and devices that reduce emissions and improve fuel economy in vehicles, machinery and power plants.

Hi-Z Technology Inc.
7606 Miramar Rd.
San Diego, CA 92126
Tel: 858-695-6660
Website: www.hi-z.com

Hi-Z Technology is a manufacturer of thermoelectric materials, devices, and systems for waste heat recovery from autos, trucks and industrial plants.

Innergy Power Corporation
9375 Customhouse Plaza, Bldg. 1, Ste. J
San Diego, CA 92154
Tel: 619-710-0758
Website: www.innergypower.com

Innergy Power Corporation™ is a leader in the design and manufacture of thin sealed lead batteries and high-quality flat-panel multicrystalline PV solar modules.

Kyocera Solar
10300 Campus Point Dr.
San Diego, CA 92121
Tel: 858-829-1708
Website: www.kyocerasolar.com

Kyocera is one of the world's largest vertically-integrated producers and suppliers of solar energy products. Kyocera Solar, Inc. is staffed by the most experienced and talented engineers, technical support, and sales personnel within the solar electric industry. The Company's expertise is based upon designing, manufacturing, and installing the most technologically advanced solar electric power systems available today.

New Leaf Biofuel
1504 Reed Ave/
San Diego, CA 92109
Tel: 858-384-3373
Website: www.newleafbiofuel.com

New Leaf Biofuel is a San Diego biodiesel company focused on transforming the way companies fuel their vehicle fleets. New Leaf currently has over 140 resetaurants and organizations participating in our waste vegetable oil collection program.

Pure Source Energy Research, Inc.
2383 Mountain View Dr.
Escondido, CA 92027
Tel: 760-644-0364

Pure Source Energy Research has developed a device that produces energy from waste sources or sunlight. This device costs one-fifth of the cost of competing systems, is solid state and has almost zero maintenance. This device is more efficient at producing energy than its nearest competitor (photovoltaic cells).

Pyron Solar
4060 Morena Blvd., Suite J
San Diego, CA 92117
Tel: 858-270-0330
Website: www.pyronsolar.com

Pyron Solar, Inc. is an engineering and manufacturing concern whose founders have developed a revolutionary design electricity generator employing a low-profile floating system with short-focal-length lenses concentrating direct sunlight by 8000 times at a focal point on the surface of a proprietary secondary optic, which then spreads the light uniformly over the photovoltaic cell; resulting in a high-efficiency conversion of sunlight into electricity; the generator being intended for scalable utility-owned, merchant, and industrial applications.

SAIC
10260 Campus Point Dr.
San Diego, CA 92121
Tel: 858-826-6000
Website: www.saic.com

SAIC is a leading provider of scientific, engineering, systems integration and technical services. With more than 44,000 employees in over 150 cities worldwide, SAIC engineers and scientists solve complex technical challenges requiring innovative solutions for customers' mission-critical functions, to include research and development, testing and evaluation, and systems engineering and integration. Specific areas include energy (oil and gas, solar, fuel cells), EH&S systems, remediation, weather forecasting, as well as water and air quality.

San Diego Gas & Electric (SDG&E)
8306 Century Park Ct.
San Diego, CA 92123
Tel: 619-696-2000
Website: www.sdge.com

San Diego Gas & Electric (SDG&E) is a regulated public utility that has been supplying safe and reliable natural gas and electric service to the San Diego region since 1881. SDG&E currently serves 3.4 million consumers through 1.4 million electric meters and 830,000 natural gas meters. SDG&E has an outstanding track record on implementing energy efficiency programs. They are the energy experts and have an outstanding record of helping its customers. SDG&E is a regulated subsidiary of San Diego-based Sempra Energy (NYSE:SRE), a Fortune 500 energy services holding company.

Sky Windpower Corporation
35 Aruba Bend
Coronado, CA 92118
Website: www.skywindpower.com

Sky Windpower Corporation develops high altitude wind power electricity generators.

Solar Hydrogen Company
10303 Centinella Dr.
La Mesa, CA 91941
Tel: 619-670-6555
Website: www.solarhydrogenco.com

Solar Hydrogen Company has created the Solar Hydro-gen (H2) Generator, a unique self-contained system that accepts solar radiation and creates an electrical reaction that splits water into its components; hydrogen and oxygen. The traditional utility electricity-to-electrolyzer is not used in this system. The hydrogen is processed and stored for use twenty-four hours a day, seven days a week energy supply. The H2 Generator is made in modules offering opportunity for large or small hydrogen generating facilities.

Solar Turbines
2200 Pacific Highway
San Diego, CA 92186
Tel: 858-694-6586
Website: mysolar.cat.com

Solar Turbines is a world leading producer of mid-range industrial gas turbines for use in power generation, natural gas compression, and pumping systems. It provides full product support, equipment supply, financing, plus installation and operation and maintenance capability.

Solarflex Technologies Inc.
7940 Silverton Ave., Suite 112
San Diego, CA 92126
Tel: 858-693-1256

Solarflex Technologies is a developer of photovoltaic cells, PV cell materials, and flexible and lightweight plastic substrate solar cells.

Synthetic Genomics
11149 N.Torrey Pines Rd., Suite 200
La Jolla, CA 92037
Tel: 858-754-2906
Website: www.syntheticgenomics.com

After designing and producing a synthetic chromosome, Synthetic Genomics plans a proof of concept in either of two bio-energy applications—hydrogen or ethanol. We believe that the synthetic chromosome, and eventually a synthetic cell, will become an integral tool for the energy industry.

United Solar Ovonic
8920 Kenamar Dr., Suite 205
San Diego, CA 92121
Tel: 858-530-8586
Website: www.uni-solar.com

As the world's leader in thin film solar technologies and the manufacture of thin film solar electric modules and laminates, Uni-Solar offer the most cost-effective and reliable solution to our customers to supplement their energy needs from solar electricity.

Verenium Corporation
4955 Directors Place
San Diego, CA 92121
Tel: 858-526-5000
Website: www.verenium.com

Verenium Corporation's San Diego-based R&D unit, formerly known as the Diversa Corporation, has pioneered the development of high-performance specialty enzymes. Verenium customizes enzymes for manufacturers within the alternative fuel, industrial, and health and nutrition markets to enable higher throughput, lower costs, and improved environmental outcomes.

YBR Solar
2223 Avenida de la Playa, Suite 212
La Jolla, CA 92037
Tel: 858-754-3205
Website: www.ybrsolar.com

Using breakthrough LED technology, YBR believes it has applied its proven material science and production process expertise to propose a step function change in the potential efficiency and cost for solar energy conversion. YBR believes that its novel and patent pending technology and know how will yield a solar energy conversion that should exceed 50%, enabling solar power generation systems with a lower cost per watt than most current systems and technology.

Energy Generation – Energy System Design, Integration, Sales, & Installation

Advanced Solar Technologies
8895 Town Centre Dr., #105
San Diego, CA 92122
Tel: 619-507-2102
Website:
www.advancedsolartechologies.com

Advanced Solar Technologies specializes in the design and installation of the latest in renewable solar energy solutions. As a full service company our services include design, project management, installation and maintenance of residential and commercial electrical systems, solar pool heating, domestic hot water heating systems, and solar window film.

AES SeaWest Windpower Inc.
4542 Ruffner St., Suite 200
San Diego, CA 92111
Tel: 858-268-7909
Website: www.seawestwindpower.com

AES SeaWest offers a range of expertise in operations and maintenance-related services for wind power plants, including turnkey development, turbine installation, and asset management. AES Seawest is a subsidiary of AES, a leading global power company, with 2004 sales of \$9.5 billion. AES operates in 27 countries, generating 44,000 megawatts of electricity through 124 power facilities and delivers electricity through 15 distribution companies.

Allied Sun Technologies
6881 Alvarado Rd., Suite 4
San Diego, CA 92120
Tel: 888-765-2740
Website: www.alliedsun.com

Allied Sun Technologies offers full-service residential and commercial solar PV solutions and installation. We have the largest affordable-housing solar generating system in California.

ASAP Power!
3208 Morningside Dr.
Oceanside, CA 92056
Tel: 760-724-3777
Website: www.asappower.com

At ASAP POWER! our goal is to deliver quality services and proven products from within the renewable energy industry in the most efficient manner possible. We are here to revolutionize and mainstream the solar electric industry by assisting all home and business owners in integrating solar power for existing energy needs and a clean energy future. Like the power systems we sell, we have designed our services to be as efficient as possible.

Borrego Solar
1365 N. Johnson Ave., Suite 102
El Cajon, CA 92020
Tel: 619-562-7183
Website: www.borregosolar.com

Borrego Solar designs and installs solar power systems. We help home and business owners save money, save resources, and become energy independent.

BreezElectric, LLC
13240 Evening Creek Dr., Suite 313
San Diego, CA 92128
Tel: 858-513-1204
Website: www.breezelectric.com

BreezElectric LLC is a Delaware Limited Liability Company located in San Diego, California. Formed in 2000, BreezElectric has developed a superior business model for supplying electricity for small grids on remote islands.

Buck Electric
PO Box 664
Poway, CA 92074
Tel: 858-748-8061
Website: www.buckelectric.com

We at Buck Electric, Inc. strive to meet our customers' needs by being one of the most diversified companies in our field. We have worked hard to become your "one-call" source for all of your electrical needs: Solar Electrical sales, installation and service of solar PV, underground electric utility locating, conventional power, and custom lighting.

Butler Sun Solutions
PO Box 1666
Solana Beach, CA 92075
Tel: 858-259-8895
Website: www.butlersunsolutions.com

Butler Sun Solutions provides the design, manufacturing, and installation of solar assisted water systems and components.

Captain Voltage Electric
1033 Derby St.
San Diego, CA 92114
Tel: 619-264-4099
Website: www.captainvoltage.com

Captain Voltage Electric is based in San Diego, California and has been helping commercial, industrial, and residential customers move to the future with solar power.

Clean Power Resources, Inc.
14440 Golden Sunset Lane
Poway, CA 92064
Tel: 858-486-9733
Website: www.cleanpowerusa.com

Clean Power Resources, Inc., a new subsidiary of Buck Electric, Inc., was formed to facilitate the exclusive sale, project management and installation of solar electric (photovoltaic) power systems. Buck Electric, Inc. has been serving San Diego County for over 30 years, and has provided residential and commercial customers with expert leadership in promoting and installing solar electricity over the past six years.

Clean Power Systems
13230 Evening Creek Dr. South, Suite 203
San Diego, CA 92128
Tel: 858-748-3636
Website: www.noelectricbill.com

Clean Power Systems, Inc. (CPS) is a full service solar electric firm saving its clients thousands of dollars each year through the design, engineering, sales, installation, and service of solar electric systems through-out Southern California. CPS provides turnkey solutions that are recognized for setting the standard in the market place for high-quality, fair-priced solar electric (photovoltaic or PV) systems.

Debenham Energy
11317 Valle Vista Rd.
Lakeside, CA 92040
Tel: 619-334-9541
Website: www.debenhamenergy.com

Debenham Energy provides a complete range of wind energy services including site evaluation, equipment selection, procurement, turbine installation and extended equipment operations, maintenance and repair.

DG Energy
1660 Union St., Suite 200
San Diego, CA 92101
Tel: 619-232-6564
Website: www.dg-energy.com

DG Energy is one of the nation's leading integrated energy companies specializing in the ownership and operation of commercial and industrial cogeneration, biomass, and district energy systems.

Discover Power
5555 Santa Fe St., Suite D
San Diego, CA 92109
Tel: 858-581-0051
Website: www.discoverpower.com

A multinational company with offices California, Canada, and Spain, Discovery Power offers high quality solar products from all the top manufacturers. We buy, sell and trade solar products for boat and RV power, camping, emergency and disaster preparedness, and home power for a greener planet while helping people from all over the world discover the benefits of free power from the sun.

Envirepel Energy Inc
1390 Engineer St.
Vista, CA 92801
Tel: 760-598-9194
Website: www.envirepel.com

Envirepel Energy Inc. is an environmentally-aware engineering company that seeks to find sustainable solutions in agriculture, recycling, and clean energy supplies from an integrated system perspective.

Envision Solar
4225 Executive Square, Suite 480
La Jolla, CA 92037
Tel: 858-799-4583
Website: www.envisionsolar.com

Officially formed in 2006, Envision Solar is a natural evolution of a highly successful collaboration between Tucker Sadler Architects, Midwest General Construction, Inc. and Kyoceral Solar, Inc. Envision Solar offers design, feasibility studies, construction, and operation of integrated photovoltaic systems. Together, the Envision Solar partners designed and built an attractive and unique photovoltaic carport system called a Solar Grove™, which has won several design, innovation, and environmental awards.

Eurus Energy America Corporation
4660 La Jolla Village Dr., # 800
San Diego, CA 92122
Tel: 858-638-7115
Website: www.eurus-energy.com

Eurus Energy Holdings Corporation operates from its headquarters in Japan. Its development activities are managed through its worldwide locations in Japan (Eurus Energy Japan), the United States (Eurus Energy America) and Europe (Eurus Energy Europe). Eurus Energy Holdings recognized the potential of wind energy ahead of many other players. It is the largest wind power developer in Japan, and is one of the world leaders in the field.

Garrard Hassan
11770 Bernardo Plaza Ct.
San Diego, CA 92128
Tel: 858-451-7013
Website: www.garradhassan.com

Headquartered in the UK, Garrard Hassan and Partners Limited was established in 1984 to answer a growing need for independent expert advice on wind energy. GH now employs over 200 full time staff working in the wind energy and marine renewables industries around the world and is recognized as the leading independent authority.

Harbaugh Electric, Inc.
PO Box 1701
La Jolla, CA 92038
Tel: 858-456-8434
Website: www.harbaughelectric.com

Harbaugh Electric specializes in electric service for residential new construction and remodels, as well as commercial new construction and office remodeling. Harbaugh Electric, Inc. also installs solar electrical systems, photovoltaic (PV) panels to convert sunlight directly into electricity. PV technology is the ultimate source of electric power for the 21st century, utilizing a clean renewable source.

Hardy Solar
15749 Lyons Valley Rd.
Jamul, CA 91935
Tel: 619-669-1995
Website: www.hardysolar.com

Hardy Solar is your online alternative energy super store, with award winning customer service and technical expertise. Hardy Solar is a pioneer in these technologies and has installed many local systems. Some customers have completely eliminated their electric bills all together with Hardy Solar renewable Grid Tie systems.

HelioPower
550 Industrial Way, Unit C
Fallbrook, CA 92028
Tel: 866-SOLAR-55
Website: www.heliopower.com

HelioPower is professional solar system integrator. We combine our technical expertise, project management experience, exceptional client communication skills, exacting workmanship, and engineering discipline to give you a fully integrated solar package at a fair and competitive price. HelioPower specializes in helping you manage your energy consumption, as well as helping you reduce or eliminate your energy bills - whether gas, propane, or electricity.

Heritage Solar
5035 Surfside Dr.
San Diego, CA 92154
Tel: 619-200-9073
Website: www.heritagesolar.com

Heritage Solar is a full service supplier of photovoltaic solar electric systems. We provide you with real world system sizing, competitive pricing and the highest output solar power modules.

Home Energy Systems, Inc
6996 Convoy Ct.
San Diego, CA 92111
Tel: 858-278-2300
Website: www.homeenergysystemsinc.com

Home Energy Systems specializes in the design, fabrication, installation and maintenance of solar powered electricity generating systems for commercial, residential, industrial and governmental institutions.

Horizon Solar Systems
120 N. Pacific St.
San Marcos, CA 92069
Tel: 760-744-1001
Website: www.horizonsolar.com

Horizon Solar Systems is one of the largest and most experienced solar contractors in San Diego County. Since 1984, we have been installing and servicing solar domestic hot water, solar pool heating, and solar electric systems for both residential and commercial customers.

Independent Energy Solutions
421 S. Las Posas Rd.
San Marcos, CA 92078
Tel: 760-752-9706
Website: www.indenergysolutions.com

Independent Energy Solutions offers turnkey systems that are appropriate for both commercial and residential customers who want solar electricity.

Mark Naylor Solar Specialists
7930 Arjons Dr., Suite C
San Diego, CA 92126
Tel: 858-695-9465
Website: www.naylorsolar.com

Mark Naylor Solar Specialists is San Diego's oldest licensed solar heating contractor. We specialize in energy saving solar domestic hot water and pool heating systems.

Natural Energy Systems
147 South Vinewood St.
Escondido, CA 92029
Tel: 760-743-6400
Website: www.naturalenergyusa.com

Natural Energy provides custom design of solar pool heating systems based upon your location and pool specifics. We also offer complete installations and service existing systems throughout the Southwest USA.

Open Energy Corporation
514 Via de la Valle, Suite 200
Solana Beach, CA 92075
Tel: 858-794-8800
Website: www.openenergycorp.com

Open Energy Corporation is a renewable energy (RE) company focused on the development and commercialization of a portfolio of technologies capable of delivering low-risk, cost-competitive electricity, fresh water, and related commodities on a global basis. Open Energy offers building-integrated photovoltaic (PV) roofing materials for commercial, industrial, and residential markets.

Padoma Windpower
7777 Fay Ave., Suite 200
La Jolla, CA 92037
Tel: 858-731-5002
Website: www.padoma.com

Padoma Wind Power, LLC is a wind energy development company that utilizes a broad scope of capabilities to take a project from inception to commercial operation.

REC Solar
1195 West Spruce St.
San Diego, CA 92103
Tel: 888-657-6527
Website: www.recsolar.com

REC Solar specializes in grid-tied solar electric designs and installations. We make solar an accessible, turnkey solution for our customers in California, Colorado, and New Jersey. REC Solar has installed over 6.5 megawatts of solar electricity in 1300 homes and businesses since 1997, making us the nation's leading local solar integrator. We have built more residential and small commercial solar electric systems in California, and the US, over the past two years than any other solar company in the market.

San Diego Solar, Inc
2785 Kurtz St., #5
San Diego, CA 92110
Tel: 619-497-1195
Website: www.dshsolar.com

San Diego Solar, Inc. is one of Southern California's leading designers, manufacturers, and installers of energy solutions for both residential and commercial customers. Founded in 1995, DSH's energy solutions incorporate innovative Demand-Side Management (DSM) products with the latest in PV solar electric technologies to help greatly reduce the need for grid-supplied power while providing an excellent return on investment and protection against future rate hikes or electric power shortages.

Silverwood Energy
6716 Bestwood Ct.
San Diego, CA 92119
Tel: 619-501-2713
Website: www.silverwoodenergy.com

Silverwood Energy, Inc. designs and installs solar electric and hydrogen fuel cell systems to power residential and commercial energy applications. With electric rates on the rise, there has never been a better time to invest in an environmentally friendly, cost-effective energy solution.

Solar Summit
1765 Garnet Ave., #55
San Diego, CA 92109
Tel: 866 827 6527
Website: www.solarsummit.com

Solar Summit is a full service systems integrator of renewable and distributed energy generation and distribution equipment. Solar Summit works on the front-line, paving the way to a new century of cleaner and less political energy.

Son Energy Solar Systems Inc.
550 West 6th Ave.
Escondido, CA 92025
Tel: 760-738-4066
Website: www.sonenergy.com

Son Energy Inc. is family owned and operated and has been serving San Diego county since 1987. Karl Holmberg, the CEO, has over 25 years experience in all types of solar applications, resulting in over 4,000 installations countywide. Son Energy Inc. is the exclusive distributor in San Diego for two major solar collector manufacturers for heating pools; Heliocol and Sealed Air.

SPG Solar
3230 Production Ave., Suite A
Oceanside, CA 92054
Tel: 760-435-0767
Website: www.spgsolar.com

SPG Solar, Inc. (SPG) is the industry's most experienced developer, designer and installer of solar photovoltaic (PV) systems for homes, small businesses, and large-scale commercial and government facilities.

Stellar Solar
2115 Mission Ave.
San Diego, CA 92116
Tel: 800-632-1111
Website: www.stellarsolar.net

Stellar Solar is a licensed contractor that provides installation services of BP Solar photovoltaic solar systems to homeowners.

Sullivan Electric
7933 Silverton Ave., #713
San Diego, CA 92126
Tel: 858-271-7758
Website: www.sullivan-electric.net

Sullivan Electric has proven itself to be the premier solar power contractor in San Diego. We design, provide and install photovoltaic systems while placing an emphasis on quality and optimal power production.

Sundance Technology
12463 Rancho Bernardo Rd., #250
San Diego, CA 92128
Tel: 858-967-2204
Website: www.sundancepowerinc.com

Sundance Technology provides residential and commercial customers with site evaluation, system selection, site engineering, installation, testing, and utility interconnection services for renewable energy systems.

SunTechnics
5631 Palmer Way, Suite L
Carlsbad, CA 92010
Tel: 760-602-9720
Website: www.suntechnics.com

SunTechnics is one of the worldwide leading suppliers of turnkey systems for the utilization of renewable energy and is dynamically pushing ahead with its international growth, showing more than 600 employees and sales offices in 14 countries worldwide. The basis for the success of SunTechnics in markets with different needs and demands is found in the company's many years of experience. Whether dealing with photovoltaics, solar thermal energy conversion, bio-energy, wind power or hybrid systems, extensive engineering know-how has been acquired over more than 11 years through the construction of thousands of facilities.

Suntrek Industries
120 N. Pacific, Unit E-6
San Marcos, CA 92069
Tel: 760-891-9092
Website: www.suntreksolar.com

Established in 1991, Suntrek Industries, Inc. is a leading provider of solar electricity, hot water, and pool heating systems. A manufacturer, equipment integrator, and licensed solar contractor, we are a one-stop resource for all the solar needs of residential, commercial, and agricultural markets.

Watts New Under the Sun
P. O. Box 204
Warner Springs, CA 92086
Tel: 760-782-9200
Website: www.wattsnewunderthesun.com

Watts New Under The Sun, Inc Renewable Energy Systems specializes in electrical generating systems that are code compliant, technologically efficient and both reliable and cost effective, dealing in all major brands at a very competitive price.

Western Solar
14211 Garden Rd.
Poway, CA 92064
Tel: 858-668-1701
Website: www.western-solar.com

Western Solar provides design, sales, installation and service of photovoltaic system components to high-end homes and business complexes in San Diego County.

Energy Infrastructure

Alta Solutions, Inc.
11305 Rancho Bernardo Rd., Suite 104
San Diego, CA 92127
Tel: 858-350-1009
Website: www.altasol.com

Alta Solutions Incorporated develops and markets innovative data acquisition solutions for a variety of manufactured products and processes. Our company offers a complete family of signal processing products to test, measure, and analyze everything from large rotating machinery to simple roller bearings, eg machinery that lower NOX gas emissions.

Ambient Control Systems
1810 Gillespie Way, Suite 210
El Cajon, CA 92020
Tel: 619-562-5411
Website: www.ambientalert.com

Ambient Control System's goal is to apply alternative, uninterruptible, battery free, solutions to existing and new generations of self-powered equipment, with the aim of eliminating concerns about battery maintenance and dependability, while providing power reliability of the highest order. The company's Light Energized Instrumentation Technology is used to power wireless sensors and the wireless detection/management systems for irrigation, fire management, intruder alerts, and water flow.

CEYX Technologies
3645 Ruffin Rd., Suite 101
San Diego, CA 92123
Tel: 858-270-2399
Website: www.ceyx.com

CEYX Technologies is a leading provider of software-enabled control systems for light emitting devices. CEYX designs, develops and markets embedded firmware for use in optical transceivers for communications networks, liquid crystal display backlights and specialized optical devices such as optical sensors.

General Atomics
3550 General Atomics Ct.
San Diego, CA 92121
Tel: 858-455-3000
Website: www.ga.com

General Atomics is a San Diego based company specializing in energy-related research and product development. Products and services include nuclear fission and fusion reactor technologies, environmentally friendly de-icing technology, micromachining technology, high voltage capacitors, and hazardous waste minimization & destruction.

P&E Automation, Inc.
1357 7th Ave., Suite C
San Diego, CA 92101
Tel: 619-696-6906
Website: www.power-and-energy.com

P&E Automation was founded in 2002 to exploit the market opportunity for integrating low-cost Internet technologies and open system philosophies into energy management applications. With strong competencies in industrial automation and web technologies and a team-wide passion for energy conservation, P&E engineers have designed industry-changing tools for automating energy efficiency in commercial and industrial facilities.

SAIC
10260 Campus Point Dr.
San Diego, CA 92121
Tel: 858-826-6000
Website: www.saic.com

SAIC is a leading provider of scientific, engineering, systems integration and technical services. With more than 44,000 employees in over 150 cities worldwide, SAIC engineers and scientists solve complex technical challenges requiring innovative solutions for customers' mission-critical functions, to include research and development, testing and evaluation, and systems engineering and integration. Specific areas include energy (oil and gas, solar, fuel cells), EH&S systems, remediation, weather forecasting, as well as water and air quality.

SDG&E
8306 Century Park Ct.
San Diego, CA 92123
Tel: 619-696-2000

San Diego Gas & Electric (SDG&E) is a regulated public utility that has been supplying safe and reliable natural gas and electric service to the San Diego region since 1881. SDG&E currently serves 3.4 million consumers through 1.4 million electric meters and 830,000 natural gas

Website: www.sdge.com

meters. SDG&E has an outstanding track record on implementing energy efficiency programs. They are the energy experts and have an outstanding record of helping its customers. SDG&E is a regulated subsidiary of San Diego-based Sempra Energy (NYSE:SRE), a Fortune 500 energy services holding company.

Energy Storage

Gold Peak Industries
11235 W Bernardo Ct.
San Diego, CA 92127
Tel: 858-674-5620
Website: www.gpbatteries.com

Gold Peak Industries is a manufacturer of both primary and rechargeable batteries with one of the most complete product lines of any major battery manufacturer.

Innergy Power Corporation
9375 Customhouse Plaza. Bldg. 1, Ste. J
San Diego, CA 92154
Tel: 619-710-0758
Website: www.innergypower.com

Innergy Power Corporation™ is a leader in the design and manufacture of thin sealed lead batteries and high-quality flat-panel multicrystalline PV solar modules.

L3 Communications, Pulse Sciences
4855 Ruffner Ave., Suite A
San Diego, CA 92111
Tel: 858-499-0284
Website: www.titan-psd.com

L-3 PS provides pulsed power products and services, as well as ultra capacitors for energy storage, to both government and commercial institutions.

Maxwell Technologies
9244 Balboa Ave.
San Diego, CA 92123
Tel: 858-503-3300
Website: www.maxwell.com

Maxwell is a leading developer and manufacturer of innovative, cost-effective energy storage and power delivery solutions such as ultracapacitors and power systems for applications in consumer and industrial electronics, transportation, telecommunications, and electricity generation industries.

Morenz Development Corporation
2790 Loker Ave. West, #105
Carlsbad, CA 92010
Tel: 760-431-8077

Utilizing the latest DSP technology combined with proprietary software developed in high power applications in audio amplifiers, Morenz Development Corp. has developed an innovative product that supports storing and delivering energy with a total conversion efficiency of 95% or better.

PowerGenix
10109 Carroll Canyon Rd.
San Diego, CA 92131
Tel: 858-547-7300
Website: www.powergenix.com

PowerGenix is a developer and manufacturer of patented, next-generation nickel-zinc (NiZn) batteries. Our high density, high cycle-life and low-cost rechargeable batteries are specifically designed for DC-powered products that demand high discharge rate performance. The PowerGenix technology offers a range of exclusive benefits over traditional nickel-cadmium (NiCd), nickel-metal hydride (NiMH) and lead-acid battery technologies.

Sanyo Energy
2055 Sanyo Ave.
San Diego, CA 92154
Tel: 619-661-6620
Website: www.us.sanyo.com/batteries

SANYO's vast research and development resources help create and improve battery technology for today's power-hungry products and include Nickel-Cadmium (Ni-Cd), Lithium Ion (Li-ion), Nickel-Metal Hydride (Ni-MH), Lithium batteries, fast charge control chips and modules and amorphous solar cells. Sanyo Energy is also the world's largest manufacturer of rechargeable batteries.

Manufacturing/Industrial

3E Company
1905 Aston Ave.
Carlsbad, CA 92008
Tel: 760-602-8700
Website: www.3ecompany.com

3E Company is the trusted global provider of chemical, regulatory and compliance information services. 3E's services offer a cost effective program for regulatory compliance management by alleviating the burdensome aspects of compliance and allowing environmental, health and safety (EH&S) professionals to focus on more strategic functions related to providing a safe place to work and live.

Enviance
2386 Faraday Ave., Suite 220
Carlsbad, CA 92008
Tel: 760-496-0200
Website: www.enviance.com

Enviance delivers software that automates and improves the management of environmental, health and safety compliance activities. Many leading organizations trust Enviance to help them reduce the time and cost of managing compliance activities, retain institutional knowledge, and confidently certify compliance.

Filmetrics, Inc.
9335 Chesapeake Dr.
San Diego, CA 92123
Tel: 858-573-9300
Website: www.filmetrics.com

Filmetrics is the leader in affordable and easy-to-use instruments for measuring film thickness (30Å to 450µm), index of refraction, and deposition rates.

Genomatica, Inc.
5405 Morehouse Dr., Suite 210
San Diego, CA 92121
Tel: 858-824-1771
Website: www.genomatica.com

Genomatica is an innovative biotechnology company that possesses proprietary technologies to transform the design, engineering, and manipulation of living cells for the production of valuable biological and chemical products. Genomatica is dedicated to developing and commercializing these high throughput research technologies to address metabolism-driven product opportunities in the chemical, material, energy, pharmaceutical, and other industries.

International Thermal Instrument Company
4511 Sun Valley Rd.
Del Mar, CA 92014
Tel: 858-755-4436
Website: www.iticompany.com

International Thermal Instrument Company was established in 1969 to explore the application of thermoelectric sensing to calorimetry, thermal conductivity, heat flux, radiometry, geothermal and velometry. ITI Co.'s product line has been developed largely as a result of industrial requirements. Industries such as Heating and Air Conditioning, Petroleum, Chemical, Nuclear and Power Generation have all contributed to the continued growth of the company.

KAIROS Scientific Inc.
10225 Barnes Canyon Rd., #A110
San Diego, CA 92121
Tel: 858-626-8170
Website: www.kairos-scientific.com

KAIROS Scientific Inc. develops instrumentation, computer algorithms, and molecular biology methods to create solutions to challenging problems in the biopharmaceutical and chemical industries. Product application areas include: high-throughput screening of evolved proteins (including biopharmaceuticals and bioindustrial enzymes), biodiversity and natural products screening to identify biocatalysts used in bioremediation or biomass conversion, and microbial identification.

Materials

OnMaterials, LLC
1425 Russ Blvd. Suite T-107E
San Diego, CA 92101

OnMaterials offers innovative materials solutions for the environmental remediation marketplace. OnMaterials' Z-Loy™ products are engineered zero valent metal powder suspensions (zero-valent iron [aka zvi, nZVI], copper, magnesium, zinc, and others). In situ remediation with Z-Loy™ injected into the subsurface, facilitates the elimination of toxic substances.

Trex Enterprises
10455 Pacific Center Ct.
San Diego, CA 92121
Tel: 858-646-5300
Website: www.trexenterprises.com

Trex Enterprises is a high-tech incubator conducting research and development leading to state-of-the-art commercial and government solutions. Product areas include advanced materials for semiconductor manufacturing, advanced mirrors and optics, communications, and sensors.

Wildcat Discovery Technologies
6985 Flanders Dr.
San Diego, CA 92121

Wildcat Discovery Technologies is a startup stage company focused on the discovery of energy-related, solid-state materials. Wildcat utilizes high throughput synthesis and characterization technologies, and is initially targeting materials for hydrogen storage.

Yulex
1945 Camino Vida Roble, Suite C
Carlsbad, CA 92008
Tel: 760-476-0320
Website: www.yulex.com

Yulex Corporation is a biomaterials innovator for medical and specialty materials available internationally as the world's first premium quality natural latex safe for people with latex allergy. Yulex and its network of growers are cultivating proprietary, high-yield lines of Guayule, a native plant grown extensively in the southwestern United States.

Recycling & Waste

3E Company
1905 Aston Ave.
Carlsbad, CA 92008
Tel: 760-602-8700
Website: www.3ecompany.com

3E Company is the trusted global provider of chemical, regulatory and compliance information services. 3E's services offer a cost effective program for regulatory compliance management by alleviating the burdensome aspects of compliance and allowing environmental, health and safety (EH&S) professionals to focus on more strategic functions related to providing a safe place to work and live.

Advanced Chemical Safety
7563 Convoy Ct.
San Diego, CA 92111
Tel: 858-874-5577
Website: www.chemical-safety.com

Advanced Chemical Safety, Inc. (ACSafety) is an international health, safety, and environmental protection consulting firm. ACSafety is committed to the prevention of accidents, injuries, illnesses, and environmental contamination by assisting our clients with safe and effective handling of hazardous materials and in compliance assistance for Federal, State and local Safety, Health, and Environmental regulations.

Balboa Pacific Corporation
13155 Portofino Dr.
Del Mar, CA 92014
Tel: 858-259-7621
Website: www.balboa-pacific.com

Balboa Pacific Corporation is focused on the development of environmentally sound waste processing systems and mineral resource technologies, particularly in the area of pyrolytic gasification for waste treatment systems. The company has also developed water treatment, soil remediation, thermal conversion, and heat recovery/co-generation systems.

CP Manufacturing
1300 Wilson Ave.
National City, CA 91950
Tel: 619-477-3175
Website: www.cpmfg.com

CP Manufacturing is the leader in the waste management and recycling equipment industry - providing what the industry needs now, and anticipating and developing solutions for the future. CP Manufacturing provides materials recycling facilities, single stream processing systems, recycling equipment.

Enviance
2386 Faraday Ave., Suite 220
Carlsbad, CA 92008
Tel: 760-496-0200
Website: www.enviance.com

Enviance delivers software that automates and improves the management of environmental, health and safety compliance activities. Many leading organizations trust Enviance to help them reduce the time and cost of managing compliance activities, retain institutional knowledge, and confidently certify compliance.

E-World Recyclers
2480 Ash St.
Vista, CA 92081
Tel: 760-224-8680
Website: www.eworldrecyclers.com

E-World Recyclers is dedicated to maintaining the highest level of standards throughout all phases of the Electronic Waste Recycling Industry. We strive to provide convenient recycling services while creating cleaner, more sustainable raw materials for reuse in other markets. Our skilled, experienced workforce uses separation and size reduction equipment for a complete recycling process.

General Atomics
3550 General Atomics Ct.
San Diego, CA 92121
Tel: 858-455-3000
Website: www.ga.com

General Atomics is a San Diego based company specializing in energy-related research and product development. Products and services include nuclear fission and fusion reactor technologies, environmentally friendly de-icing technology, micromachining

technology, high voltage capacitors, and hazardous waste minimization & destruction.

KAIROS Scientific Inc.
10225 Barnes Canyon Rd., #A110
San Diego, CA 92121
Tel: 858-626-8170
Website: www.kairos-scientific.com

KAIROS Scientific Inc. develops instrumentation, computer algorithms, and molecular biology methods to create solutions to challenging problems in the biopharmaceutical and chemical industries. Product application areas include: high-throughput screening of evolved proteins (including biopharmaceuticals and bioindustrial enzymes), biodiversity and natural products screening to identify biocatalysts used in bioremediation or biomass conversion, and microbial identification.

Liquid Environmental Solutions
12626 High Bluff Dr., Suite 240
San Diego, CA 92130
Tel: 858-481-8106
Website: www.liquidenviro.com

In business for more than ten years, Liquid Environmental Solutions has become one of the largest companies in the nation specializing exclusively in the collection, treatment and disposal of non-hazardous liquid waste streams from food service, automotive, and industrial companies.

Riverside Technologies, Inc.
10650 Treena St., Suite 111
San Diego, CA 92131
Tel: 858-271-4552
Website: www.rti-ww.com

Riverside Technologies, Inc. (RTI) has developed a new clean technology that manufactures four commodity products: SynBlack -- the world's first "green" carbon black, oil, gas and steel. RTI's proprietary process recycles scrap tires (without burning them), uses them as the primary raw material to produce these valuable products, and as an energy source for each manufacturing facility.

SAIC
10260 Campus Point Dr.
San Diego, CA 92121
Tel: 858-826-6000
Website: www.saic.com

SAIC is a leading provider of scientific, engineering, systems integration and technical services. With more than 44,000 employees in over 150 cities worldwide, SAIC engineers and scientists solve complex technical challenges requiring innovative solutions for customers' mission-critical functions, to include research and development, testing and evaluation, and systems engineering and integration. Specific areas include energy (oil and gas, solar, fuel cells), EH&S systems, remediation, weather forecasting, as well as water and air quality.

US Microbics
6451 El Camino Real, Suite C
Carlsbad, CA 92009
Tel: 760-918-1860
Website: www.bugsatwork.com

U.S. Microbics Inc. is a business development and holding company that acquires, develops, and deploys innovative environmental technologies for soil, groundwater, and carbon remediation; air pollution reduction; modular drinking-water system development and deployment; and agricultural enhancement.

World Waste Technologies Inc
13500 Evening Creek Dr., Suite 440
San Diego, CA 92128
Tel: 858-391-3400
Website: www.worldwasteintl.com

World Waste Technologies, Inc. is a development stage company that is developing technologies to profitably transform Municipal Solid Waste (MSW) into usable commodity products such as ethanol, electricity and paper pulp. We plan to design, build, own and operate such facilities.

Transportation

Clean Air Power Inc.
5131 Santa Fe St.
San Diego, CA 92109
Tel: 858-332-4812
Website: www.cleanairpower.com

Clean Air Power has pioneered the move towards using natural gas to power vehicles by developing Dual-Fuel™ technologies that guarantee diesel engine performance, with significant cost savings and low carbon emissions. An immediate solution to reducing carbon emissions produced by HGVs and CVs, Clean Air Power's patented Dual-Fuel™ system enables heavy duty diesel engines to operate primarily on natural gas, with diesel fuel acting as a "liquid spark plug".

High Regard Software, Inc.
1452 Ranch Rd.
Encinitas, CA 92024
Tel: 619-573-4077
Website: www.highregardsoftware.com

High Regard Software offers RideGrid, a service that uses mobile internet and location technology to enable individuals to obtain rides to and from any location, spontaneously. Using the service, rider and driver can evaluate the safety, convenience and value of riding together before they meet. They both save on the cost of transportation relative to driving alone, and in areas with HOV lanes may get to their destinations faster. RideGrid customers reduce dependence on foreign oil, consume less energy and produce fewer greenhouse gases.

ISE Corporation
12302 Kennan St.
Poway, CA 92064
Tel: 858-413-1736
Website: www.isecorp.com

ISE offers integrated hybrid-electric drive systems, which can be installed into buses by bus and truck manufacturers. ISE also provides individual subsystems and components, including integrated battery and ultracapacitor packs, motive drive subsystems (as well as individual motors and inverters), auxiliary power units, electrically-driven accessories, and hybrid vehicle control systems.

L3 Research
6161 El Cajon Blvd., Suite 434
San Diego, CA 92115
Tel: 619-933-6058
Website: www.l3research.com

L3 Research provides structural design and engineering, as well as systems analysis and engineering, for electric and hybrid drives and controls for manned and unmanned vehicles.

Omnitek
1945 South Santa Fe Rd.
San Marcos, CA 92069
Tel: 760-815-9768
Website: www.omnitekcorp.com

Omnitek Engineering, Corp. is a leader in the development of advanced engine management systems and exhaust emissions control technologies. Omnitek is working in a cooperating effort with other leading companies and research centers around the world to develop advanced engine technologies and emissions control systems for IC engines.

Phyre Technologies
11803 Sorrento Valley Rd., Suite A
San Diego, CA 92121
Tel: 858-792-8378
Website: www.phyre.net

Phyre Technologies has developed a catalyst based inert gas generating system as well as a catalyst based de-oxygenation system that is applicable to most liquids. Phyre works with industry leading companies and organizations to address critical system needs including fire suppression, thermal property improvement, reduction in coking and deposition as well as other specific applications.

Reaction Design
6440 Lusk Blvd., Suite D-205
San Diego, CA 92121
Tel: 858-550-1920
Website: www.reactiondesign.com

Reaction Design is leading the way towards development of Clean Technology combustion systems and fuels for the transportation and energy sectors through the application of detailed chemistry. The company is creating a comprehensive and easy-to-use set of software simulation tools, chemical models and expert consulting services to provide solutions to specific chemical-process problems, empowering our customers to develop environmentally conscious products faster. As the exclusive commercial developer and distributor of CHEMKIN, the de facto standard for modeling gas and surface-phase chemistry, Reaction Design is uniquely qualified to lead the Clean Technology approach to design and improvement of combustors, engines, and chemical reactors.

Tour Engine, Inc.
6340 Raydel Ct.
San Diego, CA 92120
Tel: 619-920-1623
Website: www.tourengrine.com

Tour Engine has developed an innovative engine that incorporates simple design and temperature differential energy harvesting which has application in the world's largest manufacturing activity – the motor industry. We have developed the world's first split-cycle engine that integrates temperature differential as a secondary source of energy capture. Highly skilled and knowledgeable professors and engineers estimate that our engine will be up to eighty percent more efficient than current internal combustion engines.

Water & Wastewater

Applied Membranes Inc.
2325 Cousteau Ct.
Vista, CA 92081
Tel: 760-727-3711
Website: www.appliedmembranes.com

Applied Membranes, Inc. is a manufacturer and distributor of Reverse Osmosis Membranes, RO Systems and Components, both commercial and residential. We have been manufacturing Reverse Osmosis Systems, RO Membranes and Water Filtration Components under the AMI label for over 25 years. AMI Products have earned an industry-wide reputation for their high quality and superior performance.

Aqua Clear Water Treatment Specialists, Inc.
4809 Clairemont Dr., #294
San Diego, CA 92117
Tel: 858-270-7655
Website: www.aquaclearllc.com

Aqua-Clear is a full service water treatment company. We specialize in custom designed water treatment programs for commercial, institutional and industrial clients. Our services and products have been proven to reduce downtime and repairs as well as increasing equipment life and efficiency.

Aquaverde Inc.
5595 Magnatron Blvd., Suite F
San Diego, CA 92111
Tel: 714-875-5386
Website: www.aquaverdeinc.com

Aquaverde has patented and developed a residential graywater recycling system (the Cycle) that separates, collects and filters reusable water for on-site residential irrigation. The Cycle is the only Graywater System that can easily and affordably attach to existing plumbing, thus offering all homeowners the luxury of a beautiful green outdoor living environment. The Cycle reduces water demand on municipal water systems which would otherwise need to provide potable water for these purposes. With the Aquaverde Cycle operating in two million homes in Southern California, each of the individual homes saving approximately 28,000 gallons per year, which results in a total savings of in an excess of 56 billion gallons of potable water (or 171,000 acre feet) per year.

Assure Controls, Inc.
5900 La Place Ct., #107
Carlsbad, CA 92008
Tel: 760-505-3000
Website: www.assurecontrols.com

Assure Controls uses a patented technology that allows rapid onsite detection of contaminants at toxic levels in water and soils. Our QwikLite™ Testing System uses sensitive bioluminescent plankton in small cartridges to assess both inorganic and organic substances. When exposed to substances, as toxicity increases, bioluminescence decreases.

Challenger Water International
133 Newport Dr., Suite 1
San Marcos, CA 92069
Tel: 760-471-2282
Website: www.waterdrop.com/chalnger.htm

Challenger Water International manufactures reverse osmosis (RO) replacement filters and RO membranes for water purification.

Cross Technologies
1220 Caminito Septimo
Cardiff, CA 92007
Tel: 760-944-9778
Website: www.crosstechnologies.net

Cross Technologies seeks to unleash the true power of micro- and nano-sized structures for catalysis, sorption, surface/structure functionalization, and other applications for the benefit of mankind. To facilitate the safe and effective use of the new genre of highly effective nano- and micro-structures, including micro- and nano-particle catalysts and sorbents, in the laboratory and in large scale practical applications, for the remediation of CHC-polluted groundwaters as well as other applications across the nation and the globe.

Filtercon Technologies
2801 Camino Del Rio S., #300C
San Diego, CA 92108
Tel: 619-688-1810
Website: www.filtercon.com

Filtercon Technologies develops water purification systems for home and commercial use. Unlike "water softeners" the Filtercon system uses absolutely no chemicals, and does not require a reverse osmosis system. The advanced technology of a Filtercon is environmentally friendly, maintenance free and is used and recommended by doctors and health professionals worldwide.

GE Osmonics
760 Shadowridge Dr.
Vista, CA 92083
Tel: 760-598-1800
Website: www.osmonics.com

Headquartered in Minnesota, GE Osmonics is one of the world's largest integrated manufacturers of water treatment machines, components, and equipment for the industrial, commercial and institutional markets. The facility in Vista is a primary manufacturer of spiral-wound membrane elements used for reverse osmosis, nanofiltration and microfiltration, plus thin-film composite membrane elements for home reverse osmosis.

Hadronex
381 Engel St.
Escondido, CA 92029
Tel: 760-291-1980
Website: www.mysmartcover.com

Hadronex, an employee-owned company, was formed in 2005 to solve problems in the water and wastewater industry through contemporary technical solutions. Hadronex is dedicated to providing solutions that the industry desires, using state-of-the-art and proven technologies for effective, low cost, robust products and services. Hadronex actively seeks partners in the industry for the maximum benefit of our customers.

Hydranautics
401 Jones Rd.
Oceanside, CA 92054
Tel: 760-901-2500
Website: www.membranes.com

Hydranautics manufactures reverse osmosis, nanofiltration, ultrafiltration and microfiltration membrane products for water treatment applications around the world.

JMAR
10905 Technology Place
San Diego, CA 92127
Tel: 858-946-6800
Website: www.jmar.com

JMAR's flagship product, BioSentry™, is a contamination warning system for waterborne microorganisms. BioSentry™ uses laser-based, multi-angle light scattering technology to provide continuous, on-line, real-time monitoring for harmful microorganisms.

Myron L. Company
2450 Impala Dr.
Carlsbad, CA 92010
Tel: 760-738-2021
Website: www.myronl.com

Since the 1960's, the Myron L. Company has established itself as the leading manufacturer of high quality, simple to operate, yet low cost, conductivity and pH instrumentation for municipal, commercial and industrial water quality control, chemical concentration testing and process control.

Poseidon Resources Corporation
501 W Broadway, #840
San Diego, CA 92101
Tel: 619-595-7802
Website: www.poseidonresources.com

Poseidon Resources is a company that develops, invests in, and manages water supply projects with a focus on seawater desalination, water treatment, and reuse.

Pure-O-Tech
520 S Andreasen Dr.
Escondido, CA 92029
Tel: 760-480-4488
Website: www.pureotech.com

Pure-O-Tech, Inc. is an engineering and manufacturing company that provides water purification technologies. Pure-O-Tech systems incorporate the latest technologies in ozone, UV radiation, Nano-, Ultra, and Microfilters, Reverse Osmosis and specialty filters to solve your water treatment requirements by computer controlled modular systems.

RO Ultra Tech
541 Industrial Way, Suite # 1
Fallbrook, CA 92028
Tel: 760-723-5417
Website: www.roultratec.com

R.O. UltraTec USA, Inc. is a premier manufacturer of residential and commercial reverse osmosis membranes, housings, systems, and a distributor of many other water treatment products.

Teledyne RD Instruments
14020 Stowe Dr.
Poway, CA 92064
Tel: 858-842-2600
Website: www.rdinstruments.com

Teledyne RD Instruments, Inc. specializes in the design and manufacture of underwater acoustic Doppler products for a wide array of current profiling and precision navigation applications, as well as discharge and flow-measurement products for inland environments.

Toray Membrane USA, Inc.
12140 Community Rd., Suite B
Poway, CA 92064
Tel: 858-523-0476
Website: www.torayro.com

Ultraviolet Sciences
9189 Chesapeake Dr.
San Diego, CA 92123
Tel: 858-571-6590
Website: www.uvsciences.com

Waterlink Systems, Inc.
215 South Highway 101, Suite 115
Solana Beach, CA 92075
Tel: 858-792-9760
Website: www.water2save.com

Toray Membrane USA, Inc. manufactures a wide assortment of reverse osmosis elements for the US, Canada, Central America and South American markets.

Ultraviolet Sciences has developed a series of compact and highly efficient ultraviolet water treatment systems (UV Reactors) for purifying water. The innovative design of these new UV systems greatly increases the overall effectiveness of low-pressure ultraviolet lamps for producing Purified and Ultrapure water. There is a wide-range of water purification applications, for which the HRC Series of UV reactors is well suited, such as microelectronics fabrication, pharmaceutical manufacturing, food and beverage production, aquaculture, and power generation.

Waterlink Systems offers a recurring subscription service to install and remotely operate its field-proven wireless technology to optimize water used on landscapes. This results in substantial utility bills savings for its customers while conserving billions of gallons of water each year.