

GROWTH IN THE GREEN ECONOMY

PIER CONTRIBUTES TO JOB GROWTH
AND PRIVATE INVESTMENT



The California Energy Commission's Public Interest Energy Research (PIER) program attracts and grows businesses and creates jobs by investing in innovative, energy-related research development and demonstration projects.

Jobs from Active PIER Research

In the first quarter of 2011, 2,128 Californians were working in jobs directly related to active PIER-funded research. PIER staff used the IMPLAN model, a widely recognized economic impact assessment program, to estimate indirect and induced jobs. IMPLAN estimates these 2,128 PIER-funded jobs will lead to an additional 1,250 indirect jobs (firms doing the work purchase goods and services), and 2,180 induced jobs, (where firm owners and employees purchase goods and services). This totals more than 5,550 people employed at least part time over the course of these PIER contracts. The IMPLAN model also estimates \$2.3 million in state and local taxes are collected.

Jobs Created From Successful Research Projects

More significant job growth occurs when research results in advanced technologies that are sold in the marketplace. PIER staff interviewed representatives of 10 companies who attributed 1,300 new jobs, at least in part, to PIER funding. According to an IMPLAN estimate, these PIER jobs created an additional 3,900 jobs as these firms and employees purchased goods and services. See *PIER in Action* for specific examples.

Venture Capital Investment and Jobs Resulting From PIER Small Grants

The PIER Small Grants program has led to more than \$40 in private non-utility investment for every \$1 of PIER funding. Since 1999, awardees have garnered more than \$1.4 billion in following investment, including \$1.3 billion in private, non-utility investment. In other words, PIER research has contributed to developing products worth \$1.3 billion to the private sector. That is more than 40 times the \$30 million PIER invested. These new companies or new lines of business create private sector output and jobs and for successful companies, this output and jobs increase over the years.

■ Based on the statistical relationship between clean technology investment and creating clean technology jobs in California, PIER Small Grant program awardees are expected to generate more than 12,000 direct California jobs – for developers, manufacturers, marketers, distributors, and installers of their products. Awardees and their supply chain are expected to generate another 22,000 indirect jobs, as they and their employees purchase goods and services. (The jobs multiplier of 2.8 comes from applying green job classifications to National Bureau of Economic Research jobs multipliers published in the 2006 RIMS II.)

■ States that fund clean energy research as PIER does attract 4 times as much clean technology venture capital per capita as states that don't.

■ The Clean Energy States Alliance found that “on average, outside sources provided more than \$5 of additional capital for every \$1 provided by a state fund” for clean energy implementation projects.¹

Jobs From Clean Energy

PIER research also creates jobs by helping integrate renewable technologies into the market place by focusing on the near-term addition of renewable energy resources into the California local community energy infrastructure, as well as utility scale renewable research. Replacing fossil generation with renewable generation will increase generation employment 50 percent to 800 percent, depending on the type of renewable. Replacing fossil fuel generation with energy efficiency increases jobs 350 percent. California Berkeley researchers collected the following estimates of jobs per gigawatt hour of electricity consumed annually.²

1 http://www.cleanenergystates.org/Publications/CESA_Members_Report_2010-Final_LR.pdf

2 Wei, Max, Shana Patadia, and Daniel M. Kammen. 2010. *Putting renewables and energy efficiency to work: How many jobs can the clean energy industry generate in the US?* Energy Policy 38, no. 2 (February): 919-931. doi:10.1016/j.enpol.2009.10.044. <http://rael.berkeley.edu/sites/default/files/WeiPatadiaKammen-RE+EEjobs-EnergyPolicy2009.pdf>
Also at <http://rael.berkeley.edu/sites/default/files/old-site-files/CopenhagenClimateConcill-GreenJobs-TLS-04.pdf>,

PIER IN ACTION

CREATING JOBS IN CALIFORNIA

The public interest energy research supported by PIER has wide ranging benefits beyond technology innovations. In addition to attracting capital, PIER's investments have created jobs. PIER directly supported research jobs and successful research projects that have also led to new companies or new products for existing companies. Here are ten PIER success stories of companies that created 1,300 jobs in California and are leaders on the green economy path.

JOBS PER GIGAWATT HOUR BY TECHNOLOGY

Renewables

Biomass	.21
Geothermal	.25
Photovoltaic (PV)	.87
Solar Thermal	.23
Wind	.17

Energy Efficiency	.38
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Fossil Fuel Generation

Coal	.11
Natural Gas	.11
Nuclear	.14

DEVELOP ENERGY STORAGE

PRIMUS POWER

Primus Power, located in Hayward, California, received a \$95,000 Small Grant from PIER to build a prototype of a grid-scale electricity storage technology. This prototype exceeded industry performance benchmarks. Based on this, Primus Power received venture capital funding and, in 2009, PIER awarded \$1 million in leveraged funding. Primus Power was then awarded \$14 million as part of a \$47 million U.S. Department of Energy project that intends to deploy a 25 megawatt (75 megawatt hour) "EnergyFarm" for the Modesto Irrigation District in California's Central Valley. This operation will displace a \$78 million 50 MW fossil fuel plant that is no longer needed to compensate for the intermittent nature of wind energy. In 2010, Primus received \$2 million in ARPA-E funding for advanced electrode development that led to developing an engineering prototype that achieved 10 times its original performance targets. Primus Power received \$11 million in additional venture capital funding in 2011, just as the company was advancing to a full-scale energy storage demonstration system with a staff of 32 skilled "greentech personnel." In 2012, for the first time, Primus Power will field test its modular EnergyPod™ electricity storage product at the PG&E Modular Generation Substation. Also in 2012, Primus will begin installing an assembly of EnergyPods™ in Modesto to form the 25 MW EnergyFarm.

"Funding from the California Energy Commission launched Primus Power as an exciting home-grown technology company that has attracted significant co-funding and led to the creation of a skilled workforce that will create manufacturing jobs in the green economy."

—Rick Winter, founder and CTO, Primus Power

INCREASE ENERGY EFFICIENCY IN BUILDINGS

ADURA® TECHNOLOGIES

ADURA® Technologies, located in San Francisco, California, develops wireless lighting controls and energy management solutions to reduce energy use in buildings. In 2004, ADURA received a \$75,000 PIER Small Grant to test a personal control system for open office plans that promised to achieve a 40 percent reduction in energy use. The company eventually received about \$5 million in follow-on funding from a private equity firm and now has a commercially available and very successful product.

In 2006, ADURA received a PIER “Lighting California Futures” subcontract to develop cost-effective means of integrating photo and motion sensors in building lighting retrofit applications, that has become the core component of the company’s product line.

ADURA is running a California-wide training initiative designed to ensure quality installation, commissioning, and maintenance of lighting systems. The California Advanced Lighting Controls Training Program (CALCTP) has trained employees and representatives of 28 electrical firms that have been certified in the use of ADURA equipment. For every \$1 of ADURA equipment sold, \$3 in wages become available for California electrical workers.

“ADURA has 35 employees at the San Francisco HQ. We are on a hiring spree with 9 open job requisitions to be filled. These are R&D jobs. Part of the California Advanced Lighting Control Training Program (CALCTP), these are R&D jobs that are repurposing the IT talent pool into developing energy efficiency technology. ... This program retrains electrical workers to be able to be re-qualified to install retrofit lighting technologies. ... ADURA’s growth has been initiated by receiving this PIER grant.”

—Elizabeth Savell, Adura Technologies

FINELITE® TECHNOLOGIES

Located in Union City, California, FINELITE developed an integrated classroom lighting system (ICLS) to provide a series of effective lighting modes and switches for use by teachers to optimize the classrooms for students and teachers. The PIER-funded ICLS provides an “Audiovisual Mode” to improve image contrast on A/V screens, while providing the right amount of light for note taking and to support eye-to-eye contact in the classroom. The ICLS “General Mode” provides light for lectures, discussion, and study, and the focus mode uses a whiteboard luminary to concentrate attention on board work.

The FINELITE ICLS saves energy and the company claims energy savings as high as 50 percent. The ICLS helps meet the requirements of LEED, CHPS, and ASHRAE best practice guidelines; the improved lighting creates jobs in California to support and install classroom lighting systems.

“The popularity of FINELIGHT has led to 10 new jobs in California, alone.”

— Terry Clark, President FINELITE

VIGILENT™

Vigilent is working to increase building energy efficiency, and the company recently created 50 green tech jobs as a result of PIER funding. An additional 12 jobs were created in California-based manufacturing companies and suppliers. Located in El Cerrito, California, Vigilent provides intelligent, energy-efficient heating, ventilation, and air conditioning control systems. Leveraging PIER-funded projects, Vigilent refined and expanded its energy management system offerings to multiple data centers and buildings, securing a federal American Recovery and Reinvestment Act (ARRA) grant.

“We built a company as a result (of PIER funding), and our workforce is up to 50 people. All of our manufacturing is done inside California.”

— Mark Housley, Vigilent

REDUCE PEAK ENERGY DEMANDS

UTILITY INTEGRATION SOLUTIONS, INC. (UISOL)

UISOL of Santa Clara, California, develops and commercializes DRBizNet™ demand response software and provides integration services for utility systems. The software was developed with a 2004-2006 \$1 million grant from PIER. In 2011, UISOL was acquired by Alstom, a power generation, power transmission and rail infrastructure provider. DRBizNet received the “Project of the Year Award” in the Energy Efficiency and Demand Response category at “DistribuTech 2010,” for implementing this software at PJM Interconnection, a regional transmission operator, and today, 1,100 DRBizNet users in 250-plus companies in 27 states are producing more than 10,000 megawatts of demand response. DRBiznet created 40 jobs in Silicon Valley.

“UISOL was a two-person start-up in 2003 when we applied for the PIER funding. DRBizNet boosted us to become one of the most successful companies in the utility industry... in 2009, UISOL was listed in the ‘INC500’ list of the fastest growing companies in the U.S. and ranked 15th in the energy category. ... Given that DR is significantly cheaper than central generation, is clean, and does not depend on foreign oil, DRBiznet is helping cost savings, protecting our environment, and increasing our energy independence. ... I am grateful for the funding we received from PIER, and hope that the funding of PIER will continue so that future startup companies in California are able to introduce their innovations.”

—Ali Vojdani, Ph.D., Founder and CEO, UISOL

AKUACOM CORPORATION

Located in San Rafael, California, Akuacom worked with the PIER-funded Demand Response Research Center at Lawrence Berkeley National Lab to develop open source Demand Response Automation Server software and to create the OpenADR protocol. This server/client application allows electricity customers to tell their electricity using equipment how to respond in real time to price, reliability and event signals posted on the utility server. This saves customers money and preserves customer choice, while allowing utilities to use price signals or contractual arrangements to manage periods of peak load and ensure grid reliability. Through domestic and international growth, the Akuacom team has experienced a five-fold increase in its San Rafael, California, staff since its acquisition by Honeywell in May 2010. In support of U.S. Department of Energy and California Auto DR Smart Grid Investment Grants (SGIG), Honeywell has hired an additional 22 Californians to deploy controls at customer sites.

“Electrical unions benefit from these jobs and technology employers benefit from these jobs. AUTO DR is a highly leveraged generator of jobs. Go PIER.”

— Clay Collier, co-founder and CEO Akuacom

BUILD LOCAL ENERGY GENERATION

POWERLIGHT (SUNPOWER SYSTEMS, A SUBSIDIARY OF SUNPOWER)

SunPower, located in Santa Clara, California is an integrator and installer of large photovoltaic (PV) solar electric projects, including tracking systems. Powerlight/SunPowerSystems received three multiyear grants from PIER and has experienced growth in jobs, adding more than 200 full-time employees in 2007. Currently Sunpower Systems employs more than 500 full-time employees, in addition to hundreds of part-time employees carrying out construction jobs. PIER helped Powerlight develop and improve its innovated building integrated solar PV products, including the successful sleek black SunTile product. These reduce air conditioning loads and extend roof life while providing electricity. PIER also funded solar tracker system improvements that reduced life cycle cost, shortened design-to-installation time, and cut the materials waste stream.

“The PIER grants, covering multiple years, were highly beneficial.” “The PIER program was instrumental in Powerlight’s success. Having the PIER funding – the backing of PIER and other organizations – allowed us to get ‘what we consider getting across the Valley of Death’ – which is commercialization.”

— Melissa Zucker, Vice President of Powerlight

CHA CORPORATION

CHA Corporation, recently relocated to Sacramento, California received a \$95,000 Small Grant from PIER for laboratory study and engineering design of microwave technology to improve biogas use for electricity production by removing contaminants from biogas and resulting exhaust. The research led to CHA Corporation receiving funding from the Sacramento Municipal Utility District to demonstrate using microwave technology to remove oxides of nitrogen (NOx) and sulfur dioxide from biogas engine exhaust.

CHA Corporation moved its operation from Laramie, Wyoming, to Sacramento, California. The company plans to hire more engineers and scientists to develop and commercialize microwave technologies for biogas upgrades and electric power generation.

ALTEX TECHNOLOGIES CORPORATION

A developer of combined heat and power (CHP) technologies for fuel cells and boiler burners, Altex Technologies Corporation, located in Sunnyvale, California, anticipates employing 3,700 people to install and maintain the technologies under development in two PIER-funded projects over the next 10 years.

The estimate includes 750 jobs within five years to deploy the PIER-funded Altex Technologies fuel cell project. That number is based on 10 percent market penetration of a fuel cell that will operate on waste vegetable oil produced in California fast food restaurants

“We already see a strong pull from the market for the Power Burner because the power it produces pays for the investment in two years. This is why we have already launched Leva Energy to commercialize the Power Burner and to realize the projected job creations once the development and test work are completed.”

—Dr. John Kelly, President Altex Technologies

“The EISG R&D funding has provided the CHA Corporation with an opportunity to work with SMUD in conducting the field demonstration of microwave technology to remove NOx and sulfur dioxide from the exhaust of an engine running on biogas. The results obtained from the EISG R&D-funded project CHA Corporation received were crucial to earning the opportunity to work with the SMUD on the field demonstration of the microwave technology to remove NOx and SO2 from the exhaust of a biogas fueled engine. Without this opportunity, CHA Corporation would not have decided to move to Sacramento, California.”

—Chang Yul Cha, CHA President

BUILD LOCAL ENERGY GENERATION (CONTINUED)

NANOSOLAR

With its headquarters and production factory for flexible solar foil cells located in San Jose, California, Nanosolar targets utility, commercial, and residential solar markets throughout the state. An innovator in cost-competitive printable solar cells with low lifetime emissions footprints, the company received \$400 million in private equity and \$97 million from governmental agencies including PIER, U.S. Department of Energy, U.S. Department of Defense, Defense Advanced Project Research Agency (DARPA), U.S. Army, and the National Science Foundation (NSF). Nanosolar estimates California installations to total 1 megawatt (MW) (2011), 50 MW (2012), 100 MW (2013) corresponding to 10, then 500, and at least 1,000 jobs over the next three years. California installations will continue to quickly grow if Nanosolar's success in Europe is any indicator; Nanosolar has signed long-term agreements to supply 1,000 MW of utility panels.

"The first grant that we ever received at Nanosolar was a PIER grant from the Energy Commission, about eight years ago, so that has been the start for our external fundraising efforts. So, it all began in this building. So, thank you." "We have some very high throughput roll-to-roll enabled production processes that have been the fruit of about 400 people's work."

— Brian Sager, Vice President of Corporate Development, Nanosolar, Inc

GREENVOLTS, INC.

In 2005, PIER awarded a \$95,000 research grant to GreenVolts based in Fremont, California. With this funding, GreenVolts proved the feasibility of a low-cost, two-axis tracker for a concentrated solar power system and conducted testing that led to a product redesign. A 2009 PIER award for \$250,000 to develop the "Low Cost Installation of Concentrating Photovoltaic (CPV) led to further funding. By fall of 2011, GreenVolts will have installed more than 4 megawatts. Since 2009 its workforce has grown from 30 employees to more than 100 and additionally GreenVolts has created 100 local jobs along the supply and installation chain.

GreenVolts can deliver and install fully integrated concentrating photovoltaic systems, designed for rapid deployment and simple assembly. In addition to reduced installation costs and low-cost manufacturability, the system boasts reliable, high-accuracy tracking and efficient energy production. The system's reduced ground footprint allows for minimal disturbance of soil and ecosystem. Because of its scalable nature, it can be used for distributed near-load locations, and can be scaled up to multi megawatt utility-scale power plants. The GreenVolts product is optimal for sunny climates like California's and requires about half the cleaning water of typical PV systems due to its unique stowing position at night that reduces dust and dew, and tailored monitoring features. Its combined hardware and software allow for a smoother delivery of solar electricity than other approaches, an important factor in integrating renewables.

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ABOUT PIER

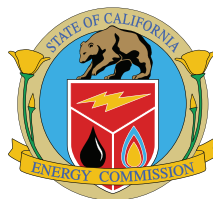
Since 1996, PIER has invested more than \$700 million in energy research, development and demonstration projects with millions in tangible ratepayer benefits. PIER has also attracted more than \$510 million in federal and private funding to California over the last decade (not including funds from the American Recovery and Reinvestment Act). PIER funds complement and support private research and development – they are not a substitute for private research.

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