This California State Summary educates policymakers and the public about EERE investments and their positive impacts in California.

California

The U.S. Department of Energy (DOE) is pursuing an all-of-the-above approach to developing every source of American energy. The Office of Energy Efficiency and Renewable Energy (EERE) leads DOE efforts to build a strong clean energy economy, a strategy that is aimed at reducing our reliance on foreign oil, saving families and businesses money, creating middle-class jobs, and reducing pollution.

This strategy will position the United States as the global leader in clean energy, increasing our nation's economic competitiveness. In 2012, \$268 billion was invested globally in clean energy, a 500% increase since 2004.¹ Trillions of dollars will be invested in the coming decades. Clean energy represents one of the most important economic development races of the 21st century. We face a stark choice—the clean energy technologies of tomorrow can be invented and manufactured in California and the rest of the United States for domestic use and export around the world, or we can cede global leadership and import those technologies from China, India, Germany, and elsewhere.





California's Clean Energy Resources and Economy

- Clean Economy Jobs (2010): 318,000+
- Average Annual Growth Rate of Clean Economy Jobs (2003–2010): 4.2%
- Average Annual Wage of Clean Economy Jobs (\$2009): \$46,400²

California is remarkably well positioned to compete in the global race for clean energy. It is second in the nation among states with renewable power capacity, contains multiple renewable energy resources from all types of renewable energy, and is the nation's leader in solar, biomass, and geothermal power generation.

For example, California has the most solar photovoltaic installations in the country and is a leader in wind energy. It added more new wind power than any other state in 2011, and wind now makes up 4% of the state's electricity generation. The state also takes advantage of abundant hydroelectric resources from California rivers.³

California is also a perennial leader in energy efficiency investment, leading the country with \$1.1 billion in utility investment for energy efficiency programs in 2010. Investment from 2010-2012 is expected to yield savings of nearly 7,000 gigawatt hours of electricity.4 The state has set unprecedented energy efficiency standards for appliances, equipment, and residential and commercial buildings. For example, the recently approved 2013 Building Energy Efficiency Standards will result in 25% and 30% more efficient residential and commercial construction standards respectively than those that they will be replacing, providing more savings for California energy users.





EERE and California

EERE helps create California's clean energy economy today, developing and delivering innovative, market-driven solutions for the following:

- Sustainable transportation making transportation cleaner and more efficient through solutions that put electric drive vehicles on the road and replace oil with clean domestic fuels
- Renewable electricity generation reducing the cost of renewable energy through solutions that squeeze more usable power from sustainable resources and improve the economics of manufacturing and installation
- Energy-saving homes, buildings, and manufacturing developing cost-effective energy-saving solutions that help make our country run better through increased efficiency—promoting better plants, manufacturing processes, and products; more efficient new homes and improved older homes; and other solutions to enhance the buildings in which we work, shop, and lead our everyday lives.

Working with public and private partners, including Lawrence Berkeley National Laboratory in Berkeley and Sandia National Laboratories in Livermore, EERE helps grow a competitive clean energy marketplace that creates and sustains American businesses, jobs, and economic leadership.

EERE Investments in California

EERE invests in California through a broad range of clean energy projects, from energy efficiency to solar, wind, geothermal, and biofuels. Through the research, demonstration, and deployment activities we conduct with California and its businesses, universities, national laboratories, nonprofits, and local governments, EERE supports cities, communities, and families to develop innovative, cost-effective energy solutions.

Sustainable Transportation



Advanced "Drop-In" Biofuels Power the Navy's Green Strike Group



San Francisco, California EERE investment: \$21.8M

Partnering with **Solazyme** of San Francisco, EERE enabled the company to increase its production of algal oil by a factor of 10. In December 2011, the U.S. Navy's Defense Logistics Agency announced that it would purchase 450,000 gallons of Solazyme's advanced "drop-in" jet fuel made from algal oil—the largest U.S. government purchase of biofuels to date. The Navy demonstrated the fuel in the Green Strike Group exercises in the Pacific in summer 2012, and by 2013, plans to deploy a Great Green Fleet powered entirely by alternative fuels.⁵

Agricultural Residues Produce Renewable Fuel



Visalia, California EERE investment: \$25M

Logos Technologies and EERE are partnering with Edeniq of Visalia to build a plant that will produce cellulosic ethanol from switchgrass, wood chips, and corn leaves, stalks, and husks—all plentiful, nonfood feedstock sources in California. This new facility will employ several new technologies, including advanced enzymes and high-yielding yeasts to more cost effectively produce this advanced biofuel. These new methods are expected to produce biofuel that reduces greenhouse gas emissions by 80% compared to fossil fuels and helps make California a leader in advanced biofuel production.⁶



The Logos and Edeniq pilot facility will test methods to convert non-food feedstocks into ethanol. Photo from Logos Technologies, Inc.



ChargePoint Expands Electric Vehicle Charging Infrastructure



San Jose, California (manufacturing); Sacramento, San Francisco / San Jose, and Los Angeles Metro areas (deployment)

EERE investment: \$15 million

Leveraging EERE support, ChargePoint has installed more than 4,500 Level 2 electric vehicle (EV) charging stations in residential and commercial locations nationwide, including three metropolitan areas in California. Deploying EV charging infrastructure is essential to bringing plug-in electric drive vehicles to the road, and this project will help DOE gather valuable data to improve future deployment efforts. This project has enabled ChargePoint to raise \$50 million in private-sector investments, which has helped to grow the company from 16 employees in June 2009 to 160 employees today. ChargePoint and their partners contributed over \$15 million to this project.

Clean Cities Coalitions Help Stakeholders Choose Smart Transportation Solutions



13 California Locations EERE investment: \$30K annually to each coalition

EERE coordinates a network of nearly 100 Clean Cities coalitions—self-organized groups of local community, government, and business stakeholders whose efforts to adopt smart transportation solutions have displaced more than 4.5 billion gallons of gasoline and diesel since 1993. California is home to 13 Clean Cities coalitions. In 2011, these coalitions reduced fuel consumption by the equivalent of nearly 150 million U.S. gallons of gasoline and prevented more than 700,000 tons of greenhouse gas emissions. Together, the coalitions include more than 1,700 businesses, local governments, and other organizations, and work to promote the use of the nearly 4,600 alternative fuel and charging stations in California. In 2011, the 13 coalitions leveraged DOE's support to raise nearly \$20 million from businesses, local governments, other organizations, and non-DOE grants.

Cutting-Edge Biofuels Research and Entrepreneurship Provide a Proving Ground



Emeryville, California EERE investment: \$20M

The Advanced Biofuels Process Demonstration Unit (ABPDU) at the DOE's Lawrence Berkeley National Laboratory provides state-of-the-art facilities for innovative biofuels production. Researchers from academia, the nonprofit sector, private industry, and government are taking advantage of ABPDU's bioreactors, centrifuges, purification systems, and other production and analytical equipment to test, develop, and perfect experimental technologies to produce biofuels from grasses, wood, and agricultural waste.



Berkeley Lab's ABPDU can convert biomass into advanced biofuels for engine testing. Photo from Roy Kaltschmidt, photographer, Lawrence Berkeley National Laboratory

Lithium-Ion Battery Technology Complements Previous Breakthroughs



Newark, California

EERE investment: \$5M and \$17M (through a combination of EERE and automobile manufacturer investments)

Building on advanced battery innovations enabled by EERE, Envia Systems of Newark has become a world leader in the race to commercialize high energy lithium-ion batteries that promise better performing electric vehicles that cost much less. Envia's innovative battery cells use a breakthrough mixed-metal cathode material invented at DOE's Argonne National Laboratory and developed through a decade of sustained EERE support. General Motors has found Envia's battery technology using the cathode so promising that it has invested \$7 million in the company. With the help of 2009 Advanced Research Projects Agency (ARPA-E) funds, the Newark startup is also developing and incorporating a silicon-based anode designed to further boost driving range, lower production costs, and improve safety. Through the U.S. Advanced Battery Consortium—a cooperative agreement between DOE and automakers—and an individual cost-share partnership with EERE, Envia continues to optimize this cathode technology. In February 2012, Envia announced it had achieved a breakthrough that would enable three times the battery energy density of current lithium-ion batteries and reduce their cost by more than half.8



World's First Tri-Generation Fuel Cell and Hydrogen Fueling Station



Fountain Valley, California EERE investment: \$2.2M

EERE supported the development of the world's first tri-generation station—a combined heat and power system that produces hydrogen in addition to heat and electricity—in Fountain Valley. The self-sustaining system runs on natural gas and biogas generated by the **Orange County Sanitation District's** wastewater treatment facility. Hydrogen produced by the fuel cell system is sent to a fueling station that is able to support support 25 to 50 fuel cell electric vehicles. The fuel cell system also produces 250 kilowatts of electricity to power the wastewater treatment facility. The project was developed as a partnership among DOE, California Air Resources Board, the Orange County Sanitation District, and including Air Products, FuelCell Energy, Inc. and the National Fuel Cell Research Center at the University of California, Irvine.⁹

Renewable Electricity Generation



Incubating Solar Technologies

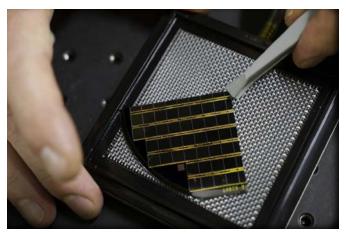
Since 2007, EERE's SunShot Incubator—a component of the Department of Energy's SunShot Initiative to reduce the installed cost of solar energy systems by about 75%—has invested \$60 million in 47 solar startups that have attracted more than \$1.6 billion in venture capital and private equity investments. The Incubator program provides early-stage assistance to help startup companies cross technological barriers to commercialization while encouraging private investment. More than 20 of those startups are located in California, including Alta Devices, Solar Junction, and Innovalight.

Alta Devices Develops World-Record Setting Thin Film Solar Cell



Santa Clara, California, and Sunnyvale, California EERE investment: \$3M

Partnering with **Alta Devices** of Santa Clara, EERE supported the development of the company's thin film Gallium Arsenide PV technology that set a world record for conversion efficiency. Alta Devices' pilot production line in Sunnyvale is expected to be completed in 2013. The company uses a pioneering technique that allows it to produce incredibly thin, flexible layers of Gallium Arsenide. Venture capital and private equity investment in Alta Devices now totals more than \$120 million.¹¹



Testing an array of solar cells produced by Solar Junction at NREL. *Photo by Dennis Schroeder, NREL 18579*

Solar Junction Develops World-Record Setting Concentrated Photovoltaic (PV) Solar Cell



San Jose, California EERE investment: \$3M

Partnering with **Solar Junction** of San Jose, EERE supported the development of the company's concentrated PV technology that also set a world record for conversion efficiency. The company's cell technology relies on inexpensive lenses to magnify the amount of sunlight striking each of Solar Junction's 5.5 x 5.5 mm cells by a factor of 400–1000 suns, making electricity from sunlight cheaper by reducing the need for exotic cell materials. The company plans to expand its manufacturing capacity to 40 megawatts by late 2012 or early 2013.¹²

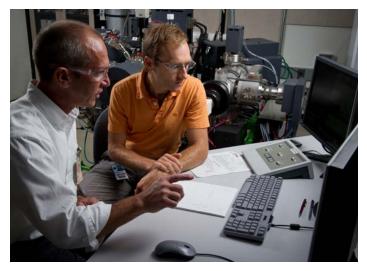
Silicon Ink Technology Offers Path to Higher Efficiency Solar Cells at Lower Cost



Sunnyvale, California EERE investment: \$6.4M

Partnering with **Innovalight** of Sunnyvale, acquired by DuPont in July 2011, EERE supported the development of the first liquid silicon on the market that offers a novel path to producing more efficient solar cells at lower cost. While Innovalight participated in the SunShot Incubator program, the company increased the conversion efficiency of its cells from 14% to 19% and increased their ability to produce its silicon ink to more than 250 megawatts of manufacturing capacity. During this time, Innovalight increased its full-time staff in Sunnyvale by 50% and originated more than 10 patents. Innovalight was also selected for a separate \$3.4 million award to support companies, developing technologies across the solar energy supply chain. ¹³





Bob Reedy, left, and Manuel Romero work with a secondary ion mass spectrometer, the same instrument used to analyze dopants and impurities in Silicon Ink for Innovalight. *Photo by Dennis Schroeder, NREL 19553*

Mineral Extraction Technologies Offer Potential to Ensure Plentiful Domestic Supply of Battery Materials



Pleasanton, California and Calipatria, California EERE investment: \$3M

Partnering with Simbol Materials of Pleasanton, EERE is pursuing the development of mineral extraction technologies that have the potential to ensure a plentiful domestic supply of battery materials, thus reducing our reliance on foreign imports. EERE support enabled the company to build the first demonstration facility to co-produce battery materials like lithium, manganese, and zinc from geothermal brines during the geothermal power production process. The company's efforts leverage mineral extraction technology initially developed more than 20 years ago at DOE national laboratories. Simbol estimates that one 50-megawatt geothermal power plant could produce enough lithium for hundreds of thousands of electric vehicle batteries annually. Construction on the demonstration facility in Calipatria, California, began in July 2010, and Simbol is now successfully extracting lithium from Salton Sea brine at this location. Commercial scale-up at the facility is underway but not yet on line.14

Distributed Energy Storage Advances for Residential PV Systems



Rancho Cordova, California EERE Investment: \$4.3M

Partnering with **Sacramento Municipal Utility District** (SMUD), EERE is pioneering residential PV systems with smart grid and energy storage capabilities in Rancho Cordova through the Anatolia SolarSmart Homes Community

Project. SMUD is analyzing the production characteristics of distributed PV systems with energy storage capabilities and developing two-way communication capabilities that allow the utility to interact with these systems. The Anatolia SolarSmart Homes Community Project has approximately 300 homes to date, all of which have PV systems. Eventually, the community will encompass 600 homes with approximately 1.2 megawatts of solar capacity. SMUD and its partners are investing an additional \$1.66 million in the project.

Energy-Saving Homes, Buildings, and Manufacturing



Largest Commercial Carpet Manufacturer in California Accepted as Superior Energy Performance Pilot Plant



Industry, California

EERE investment: Training provided in collaboration with Southern California Edison and SEMPRA utilities

Bentley Prince Street, the largest commercial carpet manufacturer in the state, was accepted as a Superior Energy Performance pilot plant within the EERE-supported California Energy Management Demonstration project. As a demonstration site, Bentley Prince Street is testing the elements of Superior Energy Performance—a forthcoming American National Standards Institute-accredited energy management certification program that the U.S. Council for Energy-Efficient Manufacturing is currently developing. Bentley Prince Street produces and ships more than 4 million yards of carpet each year at its 280,000-square-foot facility. Bentley Prince Street has already produced some impressive numbers regarding industrial sustainability: renewable sources provide 100% of electrical energy requirements, reducing waste sent to landfills by 97% since 1994, carbon pollution by 48% since 1996, and energy use per unit by 40% since 1994.15

High Efficiency Microturbine Leads to Increased Market Share



Chatsworth, California EERE investment: \$1.4M

Partnering with **Capstone Turbine Corporation** of Chatsworth, EERE supported microturbine research and development for a combined heat and power system that led to the commercialization of that product. Capstone increased electrical efficiency of the unit from about 17%–22% to 33%, and has seen more than \$83 million in revenue from these units through 2012. Microturbines offer an advantage over other distributed energy systems because of their increased energy efficiency and reduced capital cost.



Better Buildings Challenge Helps America's Commercial and Industrial Buildings Become At Least 20% More Efficient over the Next Decade

The United States spends about \$200 billion each year just to power commercial buildings, as well as another approximately \$200 billion to power manufacturing facilities. ¹⁶ The Better Buildings Challenge was launched to help America's commercial and industrial buildings become at least 20% more efficient over the next decade. To achieve this aggressive target, EERE is working with leading public and private sector partners to implement energy savings practices that reduce energy waste, save money, and create jobs. ¹⁷ California is home to many projects that showcase the work of these leading organizations and provide successful models and best practices that can be replicated across the country to help drive dramatic advancements in energy efficiency.



CBRELos Angeles, California

The **CRBE** Group has made the Better Buildings Corporate Challenge commitment for its 25-million-square-foot portfolio. CBRE is a Fortune 500 and S&P 500 company headquartered in Los Angeles and is the world's largest commercial real estate services firm.



PrologisSan Francisco, California

Prologis, the leading global provider of industrial real estate, has committed to reduce energy consumption in 100 million square feet of its building stock in markets across the Americas, Europe, and Asia, as a Better Buildings partner. Prologis has already demonstrated its commitment to green design at its Pier 1 corporate head-quarters in San Francisco with an innovative bay-water-source radiant heating and cooling system to condition the building, among other energy efficiency features.



SUPERVALU Carpinteria, California

SUPERVALU, one of the largest U.S. grocery companies, has made the Challenge commitment to improve the energy efficiency of 89 million square feet of its network of approximately 2,500 retail stores and 1,900 independent stores. A remodeled Albertson's grocery store in Carpinteria, California, showcases SUPERVALU's commitment to incorporate a low-carbon ammonia

refrigeration system that is both more energy efficient and uses a refrigerant better for the environment. Ammonia has a near zero global warming potential as opposed to hydrofluorocarbons or hydrochlorofluorocarbons, which both have a higher global warming potential.



Assistant Secretary Danielson recently visits SUPERVALU, which has committed to improving the energy efficiency of 89 million square feet of its network of approximately 2,500 retail stores and 1,900 independent stores. *Photo from SUPERVALU*

Energy-Efficient Glass Saves Energy Costs, Increases Personal Comfort



Milpitas, California EERE investment: \$3.46M

From 2010 to 2011, EERE invested in Soladigm, Inc., an energy-efficient buildings materials company, as one of 14 selections for projects focused on advancing windows and envelope component technologies to enhance energy savings and performance. Now known as View, Inc., the company is deploying its patented View Dynamic Glass. Currently used in windows at the W Hotel in San Francisco, this smart glass material constantly adjusts its tint, lightening and darkening with the sunlight. This technology is similar to transition eyeglasses in that it changes with outside lighting; however, it is demonstrated on a much larger scale and is promising for the future of building design. View's window designs are decreasing energy costs and improving quality of life by decreasing glares and helping to control internal temperatures. View is also creating green jobs—employing 100 people at its headquarters in Milpitas, California, and another 150 at its Olive Branch, Mississippi, plant. 18 As of June 2012, View has secured \$125 million to date in venture capital for the project.¹⁹



Projects to Watch

EERE has recently provided funds for these projects as it continually invests in new, promising energy efficiency and renewable energy technologies.

Producing Cheaper Biofuels from Algae



San Diego, California EERE Investment: \$2M

General Atomics of San Diego is working to reduce the cost of fermentation processes used to produce algal oils that can be further refined into advanced biofuels.

Converting Biomass to Critical Industrial Chemicals



San Diego, California EERE Investment: \$5M

Genomatica of San Diego has developed a process to produce butanediol from cellulosic sugars. Butanediol, which is used in the manufacture of many plastics, has until now been produced mostly from petrochemicals and displacing this production could result in significant carbon pollution reduction.

Building Better Condensers for Geothermal Energy Extraction



Torrance, California EERE Investment: \$200K

Physical Optics Corporation of Torrance is investigating the potential of an innovative condenser for use in geothermal wells. This new condenser could convert hot geothermal vapor into cool liquid more efficiently than existing condensers, thus capturing more energy.

Investigating Innovative Methods for Hydrogen Storage



Malibu, California EERE Investment: \$1.2M

New research has shown that when specially engineered liquids are confined in porous structures, the resulting composite material can store up to 50 times more hydrogen than in a purely liquid storage medium. **HRL Laboratories** of Malibu plans to use this composite concept to develop a high-density, compact storage option for vehicles and other hydrogen-powered technologies.

Developing Advanced Geothermal Well Designs



Monrovia, California EERE Investment: \$541K

Terralog Technologies of Monrovia is exploring geothermal well designs that combine horizontal and vertical wells to maximize extraction of geothermal energy.

Deploying Clean Energy Solutions in California Communities

EERE invests in the deployment of energy efficiency and renewable energy projects in communities across California. These investments catalyze economic development, create jobs, generate clean energy, and reduce utility bills. Many of these investments are a result of the American Recovery and Reinvestment Act (ARRA). Of the more than \$771 million in ARRA funds allocated to the state of California from EERE for deployment projects, more than 96% has been spent as of March 2013 through the Energy Efficiency and Conservation Block Grant Program, State Energy Program, and Weatherization Assistance Program.

Building Clean Energy Infrastructure

With financial and technical support from EERE, energy officials at the state level and in 306 communities have selected and overseen completion of hundreds of projects that are delivering the benefits of clean energy to citizens throughout California. EERE allocated more than \$585 million in ARRA funds to support activities that

- Increased energy efficiency and cost savings for more than 25,000 buildings (approximately 1.8 billion square feet) through building retrofits
- Installed approximately 7,400 renewable energy systems, with a total capacity of nearly 49,000 kilowatts of solar energy systems
- Funded nearly 30,000 workshops teaching more than 100,000 people to perform energy audits and install renewable energy systems
- Installed more than 51,000 energy efficient streetlights and more than 12,000 energy efficient traffic signals.²⁰



Weatherizing Homes for Lower Income Families

California has spent 100% of the more than \$185 million in ARRA funds it received to weatherize homes. The state has weatherized or reweatherized approximately 60,000 homes since 2009, exceeding its goal. This effort has resulted in total annual energy savings of more than 1.7 trillion British thermal units and 160,000 metric tons of carbon pollution averted to date, the equivalent of taking more than 31,000 passenger vehicles off the road for a year. The projects have enabled income-eligible families to save hundreds of dollars per year on heating and cooling bills by improving their homes' energy efficiency, as well as the health and safety of home environments. 22

Deployment Project Examples

Solar Powers Water Treatment Facility



Bakersfield, California EERE Investment: \$3.4M

The **City of Bakersfield** is building a solar array installation adjacent to the city's wastewater treatment facility. The solar array is expected to generate 40% of the expanded facility's energy costs, which will help keep energy costs down.



Solar photovoltaic systems offset electricity costs and reduce carbon dioxide emissions, saving users money, while reducing their carbon footprints. *Photo from Utah Office of Energy Services, NREL 09306*

PV Systems Lower the City's Energy Costs



Palm Springs, California EERE Investment: \$2M

The **City of Palm Desert** purchased and installed two 40-kilowatt solar PV systems, a solar integrated carport system at a building within the Civic Center, and a roof-mounted solar system at the city's Corporation Yard Complex. The Civic Center array is estimated to provide more than 80% of the total power needed by the building on an annual basis. The Corporation Yard array is anticipated to offset 30% of the annual energy costs and reduce emissions by 1,250 tons of carbon dioxide over 25 years.

Los Angeles Improves Energy Efficiency in Existing Buildings and New Construction



Los Angeles, California EERE Investment: \$37M

The City of Los Angeles undertook several projects to improve energy efficiency and reduce its carbon emissions. One project was launching a self-sustaining community-scale building retrofit program with a principal goal of engaging the maximum number of city buildings possible to reduce energy use, water use, and carbon emissions. The county of Los Angeles also retrofitted several municipal buildings and implemented a Green Building Ordinance for new construction of residential and commercial buildings to facilitate aggressive energy and carbon emission reduction goals set by the state.

San Jose Improves Municipal Energy Efficiency and Solar Deployment



San Jose, California EERE Investment: \$8.8M

The **City of San Jose** undertook three specific activities to create jobs, improve energy efficiency, and expand the use of renewable energy in San Jose. The city devoted \$4.5 million to the installation of energy cost-effective measures, such as heating, ventilation, and air conditioning upgrades; cool roofs; water heater replacements; and lighting improvements at city facilities with high energy costs. The city also devoted \$2.3 million to expand solar energy deployment and \$2 million to replace approximately 1,500 sodium vapor streetlights with energy efficient programmable LED bulbs.



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- ³³ "Facilitating Cost-Effective Federal Energy Management." EERE, December 2012. http://www1.eere.energy.gov/femp/pdfs/femp_fs.pdf.

A Proven Track Record

Snapshot of National Outcomes from EERE Investments

EERE's Return on Investment for Clean Energy Technologies

- EERE's \$931 million investment in vehicles combustion engine R&D from 1986 to 2007 achieved a net benefit of \$69 billion (2008 dollars) in fuel savings for users of heavy-duty diesel trucks.²³
- EERE's \$3.7 billion investment in solar photovoltaic R&D from 1975 to 2008 resulted in a net economic benefit of \$15 billion (2008 dollars) due to module efficiency and reliability improvements.²⁴
- EERE's \$1.7 billion investment in wind energy R&D from 1976 to 2008 resulted in a net economic benefit of \$8.7 billion (2008 dollars) due to wind turbine efficiency, energy capture, and reliability improvements.²⁵
- A 2001 National Academy of Sciences analysis found that investments of \$1.6 billion in energy efficiency R&D in the first two
 decades of DOE's existence from 1978 to 2000 realized a net economic benefit of approximately \$30 billion (1999 dollars).²⁶

Sustainable Transportation

- EERE research has helped reduce production costs of automotive lithium-ion batteries by more than 50% since 2008 and is on track to reach its goal of enabling cost-competitive market entry of plug-in hybrid electric vehicles within the next 10 years.
- EERE's activities to achieve cost-competitiveness for biofuels have resulted in the recent achievement of reaching a modeled cellulosic ethanol production cost of \$2.15 per gallon of ethanol (or \$3.27 per gallon of gasoline equivalent).
- EERE's efforts have reduced the projected costs of automotive fuel cells (assuming high-volume manufacturing) by more than 35% since 2008 and 80% since 2002—doubling the durability of fuel cells from 950 hours of demonstrated operation in 2006 to more than 2,500 hours of operation on the road.²⁷

Renewable Electricity Generation

- Without EERE involvement, the average solar photovoltaic (PV) module production cost per watt would have been \$5.27 in 2008, rather than \$1.92. EERE has accelerated solar industry progress by an estimated 12 years.²⁸
- Without EERE involvement, cumulative wind power deployment through 2008 would have been less than a third of actual 2008 levels. EERE has accelerated the overall progress of the wind industry by an estimated 6 years.²⁹

Energy-Saving Homes, Buildings, and Manufacturing

- More than 6,200,000 homes have been weatherized with EERE funding provided to states or leveraged from other sources with EERE support since 1976—creating an average energy savings of \$350 or more per year and avoiding \$1.6 billion in energy costs during winter 2005 alone for all households weatherized.³⁰
- Due to EERE appliance standards implemented through 2012, a typical household today already saves about \$180 per year off its utility bills. Households can expect to save more than \$300 per year by 2030, as they replace their existing appliances with newer models that use less energy—a cumulative savings to consumers of more than \$900 billion by 2020, and more than \$1.6 trillion through 2030. The cumulative energy savings of these standards phased in through 2012 will be about 70 quadrillion British thermal units (quads) of energy through 2020, and will amount to 120 quads through 2030. (The United States consumes a total of about 100 quads of energy per year.)³¹
- EERE and its partners in the manufacturing sector have successfully launched 220 new, energy-efficient technologies, received 78 R&D 100 Awards, and delivered technical assistance to more than 33,000 industrial plants.³²
- Since 2005, EERE has facilitated \$3.1 billion of efficiency investments in federal government facilities from performance-based contracts, which will result in energy cost savings of approximately \$8.5 billion over the life of the energy-saving measures. The savings on utility bills and operation and maintenance created through the facility upgrades will be used to pay for the project over the term of the contract, and the agencies will continue to save money and energy after the contract term has ended.³³

The Office of Energy Efficiency and Renewable Energy is at the center of creating the clean energy economy today. We lead U.S. Department of Energy efforts to develop and deliver market-driven solutions for renewable electricity generation; sustainable transportation; and energy-saving homes, buildings, and manufacturing. To learn more about the activities of the Office of Energy Efficiency and Renewable Energy, visit eere.energy.gov. If you have questions or comments about the information in this document, please contact us at EE.Communications@ee.doe.gov.

