

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

New Mexico

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 competitiveness. In 2012, \$268 billion was invested globally in clean energy, a 500% increase since 2004.⁸ 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 New Mexico 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.



 **New Mexico's Clean Energy Resources and Economy**

- Clean Economy Jobs (2010): 17,700+
- Average Annual Growth Rate of Clean Economy Jobs (2003–2010): 6.0%
- Average Annual Wage of Clean Economy Jobs (\$2009): \$39,327¹

New Mexico is poised to become a leader in clean energy production, thanks to its exceptional renewable resources—particularly the solar energy potential of its southern deserts. From 2010 to 2011, New Mexico's solar photovoltaic capacity nearly tripled from 43 megawatts (MW) to 116 MW, placing New Mexico fourth in the nation.² Concentrated solar thermal generation plants have the potential to further develop this resource. Geothermal activity in the northern Rocky Mountain areas has significant energy production potential; there are also pockets of strong wind resources across the state.³

New Mexico's state energy policies and utility incentive programs aim to take full advantage of these resources. In 2012, 4.4% of electricity in New Mexico was generated from renewable resources.⁴ New Mexico's Renewable Portfolio Standard requires that this rate increase to 20% by 2020 for investor-owned utilities and 10% for cooperatives.⁵ In addition to its Renewable Portfolio Standard, personal and corporate tax credits are available for alternative energy production and efficient building development.⁶ To encourage conservation, New Mexico has also adopted an energy efficiency standard. Its goal is to reduce energy consumption relative to 2005 levels—5% by 2014 and 10% by 2020. New Mexico also boasts several utility rebate programs for energy efficient appliance purchases.⁷

U.S. DEPARTMENT OF
ENERGY

Energy Efficiency &
Renewable Energy



A researcher at Sandia National Laboratories examines a prototype drill bit. High-performance drill bits can reduce the cost of extracting geothermal energy from hard rock formations.

Photo from Randy Montoya, PNNL

EERE and New Mexico

EERE helps create New Mexico’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.

EERE Investments in New Mexico

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

Sustainable Transportation



Sapphire Energy to Build an Integrated Algal Biorefinery



Columbus, New Mexico
EERE investment: \$50M

EERE’s partnership with **Sapphire Energy Inc.** is enabling the company to design construct a demonstration-scale integrated algal biorefinery near Columbus, New Mexico, that will use carbon dioxide (CO₂) to produce green crude oil from algae. The oil will be refined to produce jet fuel and diesel. The algae will metabolize approximately 56 metric tons of CO₂ per day (enough to offset the daily emissions from more than 4,000 passenger vehicles) and produce an average of 100 barrels of green crude oil per day, or approximately 1 million gallons per year of finished fuel product. At capacity, the biorefinery will employ 30 workers. The overall goal of the Sapphire biorefinery is to demonstrate that algal oil can be economically converted to biofuel on a large scale. As Sapphire proves this technology and achieves economies of scale, the company intends to commence design and construction of the first commercial biorefinery in 2018 and is expected to produce about 5,000 barrels of green crude oil per day (approximately 50 million gallons per year).⁹



An algae pond at Sapphire Energy’s demonstration biorefinery.

Photo from Sapphire Energy



Working with Los Alamos National Laboratory and Sandia National Laboratories



Los Alamos and Albuquerque, New Mexico

EERE works closely with New Mexico's Los Alamos National Laboratory (Los Alamos) and Sandia National Laboratories (Sandia) on a variety of cutting-edge clean energy technologies. Through their work with EERE these labs are helping provide practical clean energy solutions throughout the nation.

Sandia and Los Alamos Are Moving Vehicle Technologies Forward

EERE investment: \$11.5M at Sandia and \$1.1M at Los Alamos

New Mexico's **Sandia** and **Los Alamos** are working on several cutting-edge vehicle technologies. Los Alamos is modeling combustion engine processes and developing emission sensors with the goal of reducing the environmental and health impacts of gasoline and diesel vehicles. Sandia is developing new, inexpensive materials for power electronics components that translate electrical energy into mechanical power, which is essential to operate electric drive vehicles. Sandia is also working to improve the durability and resilience of batteries for electric drive vehicles, with the goal of lowering their overall cost. Electric drive vehicles can strengthen our economy, reduce our dependence on foreign oil, and minimize greenhouse gases and other harmful emissions. They also expand transportation choices available to drivers and have significantly lower operating costs than comparable conventional vehicles.

Advancing Hydrogen Storage Technology at Los Alamos

From fuel cell electric vehicles to portable power, **Los Alamos** has been a pioneer in advancing offer alternatives that will reduce the nation's energy and petroleum requirements, as well as decrease U.S. greenhouse gas emissions. Los Alamos's technology has enabled the manufacture of polymer electrolyte membrane fuel cells with one-tenth the platinum content of earlier designs. This is a breakthrough that reduces the cost of fuel cells, as the prohibitive cost of platinum is one factor that has historically hindered the wide-spread adoption of fuel cells. Los Alamos now plays a leading role in developing an approach to completely

eliminate platinum from the fuel cell catalyst altogether. The laboratory has multiple projects that address issues that include fuel cell degradation, the effects of impurities on fuel cells, improving chemical hydrogen storage systems, and hydrogen fuel quality; Los Alamos is also working to streamline manufacturing processes. Last, as a member of the H2Educate program, members of the Los Alamos team are creating curricula and teaching materials for hydrogen and fuel cell education.

Clean Cities Coalitions Help Stakeholders Choose Smart Transportation Solutions



Albuquerque, New Mexico

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. In 2011, the **Land of Enchantment Coalition**, which covers New Mexico, reduced fuel consumption by the equivalent of 1.2 million U.S. gallons of gasoline, and prevented 3,700 tons of green-house gas emissions. The coalition, which includes almost 120 businesses, local governments, and other organizations, also works to promote the use of more than 110 alternative fuel and charging stations in the state.



Los Alamos' research is advancing clean energy technology in several areas; the laboratory is also reducing its own energy consumption by incorporating energy-efficient technologies into its own operations. *Photo from Los Alamos*



Renewable Electricity Generation



Working with Sandia National Laboratories



Albuquerque, New Mexico

Sandia Evaluates Emerging Technology for Geothermal Drilling Applications

EERE investment: \$1.3M

Sandia is partnering with EERE and the U.S. Navy to lower the cost of drilling for geothermal energy by improving the polycrystalline diamond compact (PDC) drill bit. The PDC drill bit was first developed for geothermal applications nearly 30 years ago. Tungsten carbide bits, which are made from an inorganic chemical compound much stiffer than steel, are sintered together with graphite powder and compressed at pressure of 1 million pounds per square inch, converting the drill tip to a 1-millimeter layer of synthetic diamond. The high-performance drill bits are optimally suited for geothermal reserves—where deeper, hotter resources are often buried in hard, basement rock formations. In testing, the diamond-tipped drill bits performed almost three times faster than standard drills. This technology has the potential to reduce drilling costs, which will enable more cost-effective production of clean geothermal energy.

New Mexico Resource Assessment Helps Characterize Geothermal Reservoirs



Socorro, New Mexico

EERE investment: \$760K

With the aid of an EERE investment, the State of New Mexico is realizing its potential to significantly expand geothermal development. New Mexico is leveraging shared data and resource characterization compiled in the National Geothermal Data System (NGDS)—an American Recovery and Reinvestment Act (ARRA) initiative underway that, once completed, will aggregate nationwide resource data from state and federal agencies, national labs, and universities. The **New Mexico Institute of Mining and Technology** is characterizing geothermal potential that has not been comprehensively assessed since the late 1970s. Researchers are using the new data generated by the NGDS to map key geothermal features and identify geothermal prospects across the state. The Institute used the data to complete four hydrothermal models to help locate and assess new and often hidden geothermal prospects in New Mexico. Such research will improve the potential for geothermal development in the state and, as additional research comes online, will make geothermal energy more cost effective.



The Incorporated County of Los Alamos Department of Public Utilities utilized EERE funds to enhance its efficiency by adding a new low-flow turbine generator, supporting 50 construction jobs in the process. *Photo from Los Alamos DPU*

Installation of a Low-Flow Unit at the Abiquiu Hydroelectric Facility: Making More Energy with Less Water



County of Los Alamos, New Mexico

EERE investment: \$4.5M

The **Incorporated County of Los Alamos Department of Public Utilities (DPU)**—owner and operator of the Rio Arriba County, New Mexico, Abiquiu Hydroelectric Plant—utilized EERE funds to enhance the plant’s efficiency through the addition of a new 3-megawatt low-flow turbine generator. The powerhouse addition increased the plant’s total power generation capacity from 13.8 megawatts to 16.8 megawatts. This low-flow generator allows for year-round power generation during the Rio Chama’s low-flow winter season, as well as increased power generation throughout the remainder of the year. In the first year of operation of the additional turbine generator, generation increased 1,700% during the traditional low-flow period, from November to February each year. In addition, this project supported 50 construction jobs. Rio Arriba County and other project participants contributed \$4.6 million to this project.

EERE Support Enables Improvements to Codes and Standards



Las Cruces, New Mexico

EERE investment: \$5.9M

EERE funding enabled the Southwest Technology Development Institute at **New Mexico State University** to implement and lead a working group dedicated to codes and standards—the Solar America Board for Codes and Standards (Solar ABCs). Solar ABCs plays a key role in coordinating and informing stakeholders of developments related to the codes and standards that affect PV systems. The working group is also a forum for stakeholders to



participate in or lead the development of standards and codes for installing safe, high-quality PV systems. The Solar ABCs website provides a centralized resource for regulations, technical resources, and “best practices” to educate and raise industry and public awareness of ongoing progress in these areas.¹⁰ Solar ABCs is also working to identify the most significant barriers to solar energy deployment by performing two “gap analysis” workshops and surveying U.S. PV stakeholders. Solar ABCs is helping the solar industry incorporate new technologies and remove barriers, which will enable the wider adoption of clean, renewable solar energy in residential, commercial, and municipal environments.

Energy-Saving Homes, Buildings, and Manufacturing



Working with Sandia and Los Alamos National Laboratories

Sandia: Building a Better Green LED



Albuquerque, New Mexico
EERE investment: \$1.6M

With funds from ARRA, EERE partnered with Sandia to address specific technical challenges related to solid state lighting, such as the so-called “green gap.” Currently, phosphor conversion is the most frequently used method to produce white light from light-emitting diodes (LEDs). This generally relies on the use of blue LEDs with a phosphor that converts the light to white. However, much energy is lost in the phosphor conversion process. To avoid these losses, white light can be made by mixing several individually colored LEDs (e.g., red, blue, and green). For complex reasons related to the chemistry of LEDs, green LEDs are less efficient than LEDs of other colors. The loss of efficiency suffered when using green LEDs is known as the “green gap.” Sandia’s goal is to develop green LED technologies that are twice as efficient as today’s state-of-the-art green LEDs. This project is one way EERE is addressing its goal of cutting the United States’ consumption of electricity for lighting by 50% by 2025.



Los Alamos, New Mexico

Los Alamos Deploys EERE Expertise, Realizes Significant Energy Savings

Los Alamos partnered with an energy service company to utilize a DOE Energy Savings Performance Contract

(ESPC). ESPCs are indefinite-delivery, indefinite-quantity contracts that allow federal agencies to accomplish energy savings projects without up-front capital costs. While ESPCs privately finance projects, EERE provides technical assistance and training for federal agencies implementing ESPCs. The Los Alamos ESPC project replaced light fixtures in 28 buildings and installed new HVAC systems in nine buildings. The ESPC project is expected to save the Los Alamos’s facility \$1.2 million per year in electrical, heating, ventilating, and air conditioning costs—a 3% savings on its annual energy bill. As a result of these upgrades, the project will save more than 62 billion British thermal units annually—equal to the total annual energy consumption of nearly 700 homes.¹¹

Saving New Mexico Money and Energy with Appliance Rebates



Statewide
EERE investment: \$1.9M

As part of EERE ARRA funding it received, the **State of New Mexico** implemented a residential appliance rebate program. The program aimed to save the greatest amount of energy possible, spur economic activity, and direct the appliance market toward energy-efficient options. Rebates of up to \$200 were offered for ENERGY STAR® qualified clothes washers, refrigerators, and furnaces. Projected program impacts will save consumers more than \$332,000 each year. Between April and December 2010, more than 8,500 rebates were provided to New Mexican residents, which represented total annual energy savings to the state of more than 7.1 billion British thermal units—enough energy to heat and cool more than 125 homes a year.¹²

Deploying Clean Energy Solutions in New Mexico Communities

EERE invests in the deployment of energy efficiency and renewable energy projects in communities across New Mexico, catalyzing economic development, create jobs, generate clean energy, and reduce utility bills. Of the nearly \$84 million in American Recovery and Reinvestment Act (ARRA) funds allocated to the State of New Mexico from EERE specifically for deployment projects, more than 97% has been spent as of January 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 42 communities have selected and overseen the completion of hundreds of projects that are delivering the benefits of clean energy to citizens throughout New Mexico. EERE allocated more than \$56 million in ARRA funds to support activities that

- Contributed to increased energy efficiency and cost savings for more than 2,000 buildings (more than 10 million square feet) through building retrofits
- Installed approximately 70 renewable energy systems, with nearly 2,200 kW of total generating capacity, including wind, solar, and geothermal energy systems
- Funded more than 130 workshops, teaching approximately 2,400 people to perform energy audits and install renewable energy systems
- Installed more than 200 energy-efficient streetlights.

Weatherizing Homes for Lower Income Families

New Mexico has spent more than 97% of the more than \$26 million in EERE ARRA funds it received to weatherize approximately 4,500 homes, surpassing its goal. Statewide, this has resulted in annual energy savings of approximately 130 billion British thermal units and has averted nearly 12,000 metric tons of carbon pollution to date, the equivalent of taking more than 2,500 passenger vehicles off the road for a year. These 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.¹³

Deployment Project Examples in New Mexico Communities

Solar for Schools



Statewide
EERE investment: \$4.5M

The **New Mexico Public Education Department** purchased and installed a 50-kilowatt rooftop and ground-mounted photovoltaic (PV) solar arrays at 15 public schools throughout the state. These PV systems provide clean energy and cost savings to schools, as well as the opportunity to educate students on renewable energy technologies. The Solar for Schools program, which is part of the state's \$7.4 million renewable energy project portfolio, will further educate by demonstrating the benefits of commercial-scale PV systems to parents, teachers, and communities throughout New Mexico. Most of the PV panels and mounting systems

used in this program were manufactured in New Mexico—boosting both the economy and manufacturing industry. This program boasts 1.4 million kilowatt hours of electricity generated annually; 907 metric tons of carbon dioxide emissions avoided annually, which is enough to offset the annual greenhouse gas emissions of more than 180 passenger vehicles; and 25 jobs created directly created and/or retained by the installations (not including manufacturing jobs).

LED Streetlights Light Up New Mexico



Statewide
EERE investment: \$2M

The **New Mexico Department of Transportation** replaced incandescent traffic signal lamps with LEDs in 33 communities statewide. New Mexico has realized an 80% energy savings in the cities and counties where the incandescent bulbs were removed and LED traffic signals were installed. This project will repay its initial investment in a year, with energy savings continuing into the future. The state has reported an annual savings of 4 million kilowatt hours, and 25 direct installation jobs have been created and/or retained.

New Mexico Weatherizes Its First Multifamily Dwelling



Albuquerque, New Mexico
EERE investment: \$200K

The **New Mexico Mortgage Finance Authority** weatherized Solar Villa Apartments, a four-story apartment complex, the first multi-family energy-efficiency upgrade project in the state. Weatherization services included air sealing the building envelope, replacing two gas-powered boilers, insulating hot water pipes, and installing storm windows. Residents received low-flow showerheads, faucet aerators, compact florescent light bulbs, and state-of-the-art thermostats from the electricity provider in Albuquerque. This state-of-the-art weatherization project will reduce energy bills for 100 residents, all of whom are seniors or individuals with disabilities.

Incentives for Recycling Programs and Waste Reduction



Santa Fe, New Mexico
EERE investment: \$2.8M

The **New Mexico Recycling Coalition (NMRC)** built a statewide rural recycling coalition that is giving all municipalities in the state access to regional processing hubs for solid waste—affording them with the opportunity to process solid waste for end market value, incentivize waste diversion from landfills, and reduce transportation costs and emissions. NMRC educates residents on the importance of recycling through workshops and training to ensure sustainability and increase participation. NMRC has hosted more



than 40 in-state trainings, serving more than 500 recycling professionals. The trainings range from large, multi-day professional conferences to on-site transfer station trainings in which operators are provided with the basics of recycling. From October 2011 through June 2012, sub-recipients reported recycling 7,087 tons of material—the equivalent of saving more than 24 billion British thermal units. Over the same time period, local government entities avoided 8,140 transportation miles thanks to new recycling opportunities.

Senior Center Solar Project



Grady, New Mexico
EERE investment: \$432K

The **Village of Grady**, population 98, installed a 16-kilowatt solar system for its senior center—the largest electricity user in the village. Installing this renewable energy system reduced the senior center's monthly utility bill by 75%. The village also installed a 65-kilowatt wind turbine to provide electricity for the Village Office and Municipal Water Pumping, which alone accounts for 9% of the village's budget. Additionally, the savings obtained from the reduction in energy consumption will help retain one full-time and one part-time job.¹⁴

Geothermal Heating and Cooling System



Española, New Mexico
EERE investment: \$452K

The **City of Española** installed a geothermal heating and cooling system, computer-controlled thermostats, and an air handling system in its City Hall in 2010. These actions reduced the city's heating and cooling bills by 50%. The upgrade also had an unexpected benefit in February 2011, when New Mexico experienced the coldest recorded temperatures in 40 years, which resulted in a failure of the state's natural gas distribution system. At the peak of the crisis, more than 30,000 homes, businesses, and government buildings were without heat for up to a week; Española City Hall was the only government building in the area that had heat during the crisis.¹⁵ Additionally, 22 jobs were created during construction of the project, and the city is saving an estimated \$42,000 per year in energy costs. The city contributed \$145,990 to this project.

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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.¹⁶
- 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.¹⁷
- 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.¹⁸
- 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).¹⁹

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.²⁰

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.²¹
- 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.²²

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.²³
- 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.)²⁴
- 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.²⁵
- 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.²⁶

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.