

# New Hampshire

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

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.<sup>2</sup> 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 Hampshire 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 Hampshire's Clean Energy Resources and Economy

- Clean Economy Jobs (2010): 12,800+
- Average Annual Growth Rate of Clean Economy Jobs (2003–2010): 2.0%
- Average Annual Wage of Clean Economy Jobs (\$2009): \$40,773<sup>1</sup>

Given its wealth of clean energy resources, New Hampshire is poised to become a leader in clean energy production. Last year, 14% of New Hampshire's net electricity generation came from renewable sources. New Hampshire aims to increase this share to 24.8% in 2025—as required by its Renewable Portfolio Standard (RPS). New Hampshire has several waterways that provide it with hydroelectric power; the state also generates power from landfill gas, municipal solid waste, solar, and wind, and it is one of the few states whose RPS recognizes solar water heaters and other distributed solar thermal resources as eligible resources. New Hampshire's renewable resource potential is vast: in the North and West, the White Mountains hold promise for wind power; in the Southeast, solar power is a viable option; and throughout the state, wood residue gathered from dense forests through sustainable thinning practices can be used to generate biofuels and biopower.

Thanks in part to mild summers, New Hampshire is a modest energy user compared to other states; both total energy consumption and per capita energy consumption are among the nation's lowest. Since 2002, New Hampshire has funded energy-efficiency programs via a surcharge on electric bills. These programs have installed efficiency measures that will reduce consumption by more than 7 billion kilowatt hours (kWh), saving New Hampshire consumers nearly \$1 billion dollars, at a cost of only about \$125 million.

U.S. DEPARTMENT OF  
**ENERGY**

Energy Efficiency &  
Renewable Energy



## EERE and New Hampshire

EERE helps create New Hampshire’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 Hampshire

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

### Sustainable Transportation



#### Technical Information Exchange on Advanced Biofuels Workshop



Manchester, New Hampshire

In May 2012, DOE conducted a workshop in Manchester that focused on technical and economic challenges involved with developing, supplying, and using biomass-derived home heating oil. In 2009, approximately 7.2 million households in the United States were heated with petroleum-derived oil.<sup>3</sup> EERE is investigating technologies that can convert biomass

to a home heating oil substitute, thus displacing imported oil. The biomass-derived home heating oil would be produced from domestic, non-food-based biomass. Deployment of these technologies would help create U.S. jobs and provide other economic benefits. This workshop, which brought together more than 30 experts from DOE, state governments, industry, and academia, addressed the technical and economic challenges that must be overcome to make pyrolysis oil a viable substitute for conventional heating oil. The results of this workshop will inform EERE’s strategic planning for further pyrolysis oil research, development, and deployment.



Pyrolysis oil derived from biomass is a viable option to displace petroleum-derived oil. *Photo from Scott Butner, PNNL*

#### Clean Cities Coalitions Help Stakeholders Choose Smart Transportation Solutions



Statewide

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 **Granite State Clean Cities** coalition reduced fuel consumption by the equivalent of more than 1.2 million U.S. gallons of gasoline and reduced greenhouse gas emissions by 11,849 tons. The coalition supports more than 100 businesses, local governments, other organizations, and non-EERE grantees and works to promote the use of the 59 alternative fuel and charging stations in the state.



## Renewable Electricity Generation

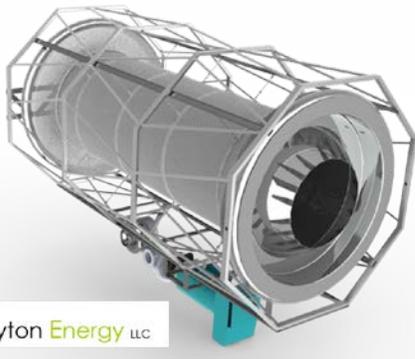


### Advancing State-of-the-Art Concentrated Solar Power Systems



Hampton, New Hampshire  
EERE investment: \$1.57M

Partnering with EERE, **Brayton Energy** is designing, building, and testing a new solar receiver for an advanced concentrating solar power (CSP) system. The receiver uses supercritical carbon dioxide as its working fluid rather than molten salt or steam, on which today's state-of-the-art CSP systems rely. The new solar receiver enables the use of low-cost materials and simplified manufacturing methods. Brayton Energy's advanced receiver withstands higher operating temperatures and pressures than existing technologies, leading to higher efficiency, increased durability of the CSP plant, and reduced cost compared with baseline receivers.



 Brayton Energy LLC

Brayton Energy is developing an advanced solar receiver, which will operate at lower costs and higher temperatures. *Photo from Brayton Energy*

### Improving the Safety of Ocean Energy Projects



Nashua, New Hampshire  
EERE investment: \$600K

EERE supported a joint effort by **Scientific Solutions (SSI)** of New Hampshire and **Ocean Renewable Power Company (ORPC)** of Maine to fully develop, integrate, test, and operate a full-scale, active acoustic-detection system for offshore renewable energy projects. The technology that SSI

developed is especially suited for marine and hydrokinetic energy applications. Through the use of active sonar, it provides real-time monitoring of the surrounding underwater environment and reduces operation risks that are associated with marine life and floating debris. ORPC is deploying and integrating this system in the nation's first commercial tidal energy project off the coast of Cobscook, Maine.

### Mitigating Potential Environmental Impacts of Energy Development



Bedford, New Hampshire  
EERE investment: \$294K

Partnering with EERE, **Normandeau Associates** of Bedford, New Hampshire, developed a tool that characterizes the risk for bird and bat species that may be susceptible to collisions with wind turbines. This tool will be used in environmental decision-making for the planning, siting, and assessments of wind projects, which will facilitate wind farm development while helping conserve bird and bat species.

## Energy-Saving Homes, Buildings, and Manufacturing



### Appliance Rebate Program Benefits Thousands of New Hampshire Residents



EERE investment: \$1.2M

In 2010, EERE provided the **State of New Hampshire** with American Recovery and Reinvestment Act (ARRA) funds to implement a residential appliance rebate program. New Hampshire residents obtained rebates ranging from \$100 to \$1,000 for the purchase and replacement of ENERGY STAR® qualified hot water heaters and heating systems, solar thermal products, and indoor boiler reset controls. In addition to federally funded rebates of up to \$750, New Hampshire offered an additional \$600 to \$900 in rebates for solar hot water heaters from its Renewable Energy Fund—resulting in a total potential rebate of \$1,650. Through these programs, consumers received a total of \$1.1 million in rebates through their purchases of more than 1,700 products. The annual energy savings are estimated to total 9.5 billion British thermal units. Consumers will benefit from approximately \$200,000 per year in cost savings.



## Better Buildings Program Supports the Beacon Communities Project in Berlin, Nashua, and Plymouth, New Hampshire

### Beacon Communities Project



Berlin, New Hampshire; Nashua, New Hampshire; and Plymouth, New Hampshire

EERE investment: \$10M

The **Beacon Communities Project**, New Hampshire’s first comprehensive energy-efficiency program, is upgrading 900 residential, commercial, and municipal buildings in communities across the state. EERE’s Better Buildings Neighborhood Program (part of the Better Buildings Program) provided \$10 million of ARRA funds for this initiative to reduce energy consumption by 30%. In 2012, through an existing contractor network, the Beacon Communities Project partnered with EERE’s Home Performance with ENERGY STAR® program—a collaboration that provides an integrated approach for residential energy-efficiency projects, combining on-bill financing with program implementation.<sup>4</sup> Additionally, the Beacon Communities Project offered job training through the Building Performance Institute at local community colleges in the form of classroom seminars and a mentoring program. As of September 2012, 43 workers were successfully trained through the Beacon Communities Project instruction and Lakes Region Community College mentorship program. Another series of trainings in the northern part of the state began in May 2012.<sup>5</sup>

## Deploying Clean Energy Solutions in New Hampshire Communities

EERE investments help deploy energy efficiency and renewable energy projects in communities across New Hampshire. 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 nearly \$69 million in EERE ARRA funds allocated to the New Hampshire 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 21 communities have selected and overseen the completion of hundreds of projects that are delivering the benefits of clean energy to citizens throughout New Hampshire. EERE allocated more than \$43 million in ARRA funds to support activities that

- Contributed to the increased energy efficiency of nearly 70 buildings (more than 5 million square feet) through building retrofits
- Installed approximately 85 renewable energy systems with a total capacity of more than 1,900 kW from wind, solar, and geothermal energy systems
- Funded more than 130 workshops, educating approximately 5,100 people on how to perform energy audits and upgrades, as well as help install renewable energy systems
- Installed more than 100 energy-efficient streetlights.



New Hampshire has significant potential for clean, renewable wind power development. *Photo from iStock 8390201*



## Weatherizing Homes for Lower Income Families

New Hampshire has spent more than 98% of the more than \$25 million in ARRA funds it received to weatherize more than 4,000 homes—surpassing its goal. To date, this effort has resulted in total annual energy savings of nearly 113 billion British thermal units and averted more than 10,300 metric tons of carbon pollution—the equivalent of taking more than 2,000 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.<sup>6</sup>

## Deployment Project Examples

### Small Businesses and Entrepreneurs Supported by the Green Launching Pad



Durham, New Hampshire  
EERE investment: \$1.5M

Leveraging an EERE ARRA investment, the **University of New Hampshire's** Green Launching Pad (GLP) program has jump-started a number of innovative companies that are engaged in the clean energy sector throughout the state. By providing financial support and technical expertise from the University of New Hampshire and associated partners, venture capitalists, business, legal, and marketing professionals, GLP has made a permanent impact on the state. Since its inception in early 2010, 14 companies have received GLP funding, and more than 450 people have attended seminars and events that are aimed at teaching companies to commercialize their green products and services. GLP's efforts allow small businesses to conduct market research, execute competitive research, significantly increase renewable energy production at the local level, and create and sustain clean energy jobs.

### References

<sup>1</sup>"Sizing the Clean Economy: A National and Regional Green Jobs Assessment." The Brookings Institution and Battelle, July 2011. <http://www.brookings.edu/research/reports/2011/07/13-clean-economy>.

<sup>2</sup>"New Investment in Clean Energy Fell 11% in 2012." Bloomberg New Energy Finance, 2013. <http://about.bnef.com/2013/01/14/new-investment-in-clean-energy-fell-11-in-2012-2/>.

<sup>3</sup>"Potential Impacts of Reductions in Refinery Activity on Northeast Petroleum Product Markets." U.S. Energy Information Administration, February 2012, updated May 11, 2012. <http://www.eia.gov/analysis/petroleum/nerefining/update/pdf/neprodmts.pdf>

<sup>4</sup>"New Hampshire Elects Three Towns to Serve as Beacons for Energy Efficiency." EERE, 2012. [http://www1.eere.energy.gov/buildings/betterbuildings/neighborhoods/new\\_hampshire\\_profile.html](http://www1.eere.energy.gov/buildings/betterbuildings/neighborhoods/new_hampshire_profile.html); "Home Performance With Energy Star." Energy Star, 2012. [http://www.energystar.gov/index.cfm?fuseaction=hpwes\\_profiles.showsplash](http://www.energystar.gov/index.cfm?fuseaction=hpwes_profiles.showsplash); "NH Home Performance With Energy Star." NH Saves, 2012. <http://nhsaves.com/residential/retrofit.html>.

<sup>5</sup>"Better Buildings: A NH Beacon Communities Project." Better Buildings NH, 2012. [www.betterbuildingsnh.com/](http://www.betterbuildingsnh.com/).

<sup>6</sup>"Residential Energy Consumption Survey." U.S. Energy Information Administration, 2009. <http://www.eia.gov/consumption/residential/>.

<sup>7</sup>"Fewer Lights, Brighter Shine in New Hampshire County." DOE, 2010. <http://energy.gov/articles/fewer-lights-brighter-shine-new-hampshire-county>.

<sup>8</sup>"Retrospective Benefit-Cost Evaluation of U.S. DOE Vehicle Combustion Engine R&D Investments: Impacts of a Cluster of Energy Technologies." DOE, May 2010. [http://www1.eere.energy.gov/analysis/pdfs/advanced\\_combustion\\_report.pdf](http://www1.eere.energy.gov/analysis/pdfs/advanced_combustion_report.pdf).

## Reducing Energy Bills for Low-Income Families across New Hampshire



Manchester, New Hampshire  
EERE investment: \$600K

Using EERE-leveraged funds, **Southern New Hampshire Services**, located in the City of Manchester, issued EERE funds to Community Action Agencies to weatherize 425 mobile homes in co-op owned parks throughout the state. EERE funds have been completely expended on this effort, but weatherization services are moving forward with a \$2 million investment of Regional Greenhouse Gas Initiative funds. With an additional \$2 million grant from the New Hampshire Public Utilities Commission, New Hampshire's Community Loan Fund is working through community action programs to weatherize manufactured homes state-wide. In addition to weatherization efforts, energy auditors are conducting carbon monoxide readings on homes and checking for other safety issues, such as gas leaks.

## Supporting Energy Efficiency Projects in Strafford County



Strafford County, New Hampshire  
EERE investment: \$35K

Leveraging an EERE ARRA investment, **Strafford County** successfully replaced 15 high-pressure mercury vapor lights at its Justice Center parking lot with energy-efficient, high-pressure sodium lamps.<sup>7</sup> Thanks to the efficiency gains the new lights provided, the county was able to remove seven sidewalk lamps and seven parking lot lamps and poles. With new lights and 14 fewer poles, the county is saving \$6,000 on energy bills annually.

Front page photo from iStock/1781389; page 2: iStock/17393871; page 3: Dennis Schroeder, NREL 19156; Jim Tetro, U.S. Department of Energy Solar Decathlon

<sup>9</sup>"Retrospective Benefit-Cost Evaluation of DOE Investment in Photovoltaic Energy Systems." DOE, August 2010. [http://www1.eere.energy.gov/analysis/pdfs/solar\\_pv.pdf](http://www1.eere.energy.gov/analysis/pdfs/solar_pv.pdf).

<sup>10</sup>"Retrospective Benefit-Cost Evaluation of U.S. DOE Wind Energy R&D Program," U.S. DOE, June 2010. [http://www1.eere.energy.gov/analysis/pdfs/wind\\_bc\\_report10-14-10.pdf](http://www1.eere.energy.gov/analysis/pdfs/wind_bc_report10-14-10.pdf).

<sup>11</sup>National Research Council. *Energy Research at DOE: Was It Worth It? Energy Efficiency and Fossil Energy Research 1978 to 2000*. Washington, DC: National Academies Press, 2001.

<sup>12</sup>"DOE Hydrogen and Fuel Cells Program Record #12020," DOE, September 27, 2012.

<sup>13</sup>[http://hydrogen.energy.gov/pdfs/12020\\_fuel\\_cell\\_system\\_cost\\_2012.pdf](http://hydrogen.energy.gov/pdfs/12020_fuel_cell_system_cost_2012.pdf). Based on projections to high-volume manufacturing.

<sup>14</sup>"Retrospective Benefit -Cost Evaluation of DOE Investment in Photovoltaic Energy Systems." DOE, August 2010. [http://www1.eere.energy.gov/analysis/pdfs/solar\\_pv.pdf](http://www1.eere.energy.gov/analysis/pdfs/solar_pv.pdf).

<sup>15</sup>"Retrospective Benefit-Cost Evaluation of U.S. DOE Wind Energy R&D Program," DOE, June 2010. [http://www1.eere.energy.gov/analysis/pdfs/wind\\_bc\\_report10-14-10.pdf](http://www1.eere.energy.gov/analysis/pdfs/wind_bc_report10-14-10.pdf).

<sup>16</sup>"Weatherization Assistance Program." EERE, May 2009. [http://www1.eere.energy.gov/wip/pdfs/wap\\_factsheet.pdf](http://www1.eere.energy.gov/wip/pdfs/wap_factsheet.pdf).

<sup>17</sup>"Building Technologies Program: History and Impacts." EERE, 2013. [http://www1.eere.energy.gov/buildings/appliance\\_standards/history\\_and\\_impact.html](http://www1.eere.energy.gov/buildings/appliance_standards/history_and_impact.html).

<sup>18</sup>"Energy Technology Solutions: Public-Private Partnerships Transforming Industry." EERE, December 2010. [http://www1.eere.energy.gov/manufacturing/pdfs/itp\\_successes.pdf](http://www1.eere.energy.gov/manufacturing/pdfs/itp_successes.pdf).

<sup>19</sup>"Facilitating Cost-Effective Federal Energy Management." EERE, December 2012. [http://www1.eere.energy.gov/femp/pdfs/femp\\_fs.pdf](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.<sup>8</sup>
- 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.<sup>9</sup>
- 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.<sup>10</sup>
- 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).<sup>11</sup>

## 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.<sup>12</sup>

## 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.<sup>13</sup>
- 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.<sup>14</sup>

## 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.<sup>15</sup>
- 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.)<sup>16</sup>
- 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.<sup>17</sup>
- 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.<sup>18</sup>

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](http://eere.energy.gov). If you have questions or comments about the information in this document, please contact us at [EE.Communications@ee.doe.gov](mailto:EE.Communications@ee.doe.gov).