

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

Alaska

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 2004.⁹ 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 Alaska 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.



Alaska's Clean Energy Resources and Economy

- Clean Economy Jobs (2010): 16,600+
- Average Annual Growth Rate of Clean Economy Jobs (2003–2010): 10.2%
- Average Annual Wage of Clean Economy Jobs (\$2009): \$48,778¹

Alaska is a state of rich and diverse energy resources. Currently, 23.6% of its electricity is generated from hydropower, and it is one of only eight states generating electricity from geothermal energy sources.² In addition to hydroelectric and geothermal power, Alaska has significant wind resources along its vast coastlines.³ Alaska is also home to many fuel cell and battery storage systems, which—along with other distributed generation technologies—are well suited to serving the state's rural population.

In 2010, Alaska's leadership set ambitious goals: achieving 50% renewable electricity generation and an increase of 15% in energy efficiency per capita by 2025.⁴ To further promote renewable energy and energy efficiency development, the Alaskan Renewable Energy Grant Program intends to provide \$50 million annually for renewable energy installations and research through 2023.⁵ Municipalities may exempt residential renewable energy systems from taxation.⁶ An energy-efficiency revolving loan supports energy-efficiency upgrades by public entities,⁷ while utility incentives provide rebates for residential efficiency upgrades.⁸

U.S. DEPARTMENT OF
ENERGY

Energy Efficiency &
Renewable Energy



EERE and Alaska

EERE helps create Alaska’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 Alaska

EERE invests in Alaska through a range of clean energy projects, from energy efficiency to hydropower, fuel cells, wind, biofuels and biopower, 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 Alaska and its businesses, universities, nonprofits, and local governments.

Sustainable Transportation



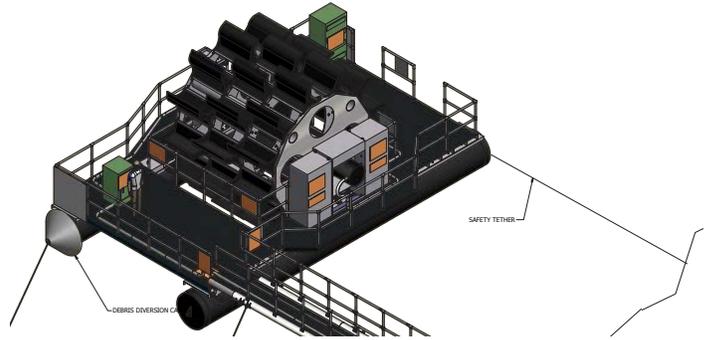
Low-Cost Production of Hydrogen and Electricity



Anchorage, Alaska
EERE investment: \$2.4M

At an airport in Anchorage, Alaska, EERE provided funds to **Bloom Energy** in completing a one-year demonstration of two 25-kilowatt fuel cells—providing valuable, real-world data in one of the harshest environments on earth. Each fuel cell showed an impressive peak electrical efficiency of more than 50%. The high operating temperature of these specific fuel cells allows for a higher electrical efficiency than lower temperature fuel cells, which have a peak electrical efficiency closer to 40% when operating on natural gas. In addition, a small-scale electrochemical hydrogen pump was connected to an identical 25-kilowatt fuel cell system in Bloom’s laboratory to demonstrate the coproduction of hydrogen and electricity. The gas that is emitted by the fuel cell where the electricity is

generated is sent to the hydrogen pump, where the hydrogen is then separated from the other gases, resulting in a pure hydrogen stream. Data collected during the fuel cell demonstration and hydrogen pump validation testing, along with subsequent analysis based on high-volume manufacturing, shows the potential to produce low-cost hydrogen from natural gas by simultaneously producing hydrogen and electricity.



The RISEC device can bring hydroelectric power to rural communities without the need for a dam. *Photo from AK Energy Authority*

Renewable Electricity Generation



Tapping the Power of Alaska’s Rivers



Delta Junction, Alaska
EERE investment: \$142K

Partnering with Alaska’s **Whitestone Power**, EERE is supporting efforts to develop a practical River In-Stream Energy Conversion (RISEC)—a device that can produce electricity from free-flowing rivers not suited to conventional hydroelectric generation, and that can do so in Alaska’s weather conditions. Rural areas of Alaska frequently experience high electricity prices due to the high costs of delivering fuel to those areas. Under those conditions, technologies like RISEC, when implemented at a commercial scale, may provide a source of cost-effective electricity. Whitestone’s project includes site analyses and surveys for RISEC facilities in Alaska, theoretical modeling of structural RISEC components, turbine blade and mounting prototype testing, and application strategies. The company’s research yielded several innovations that will drive future device designs, including developing site-specific engineering solutions for effectively applying RISEC technology in Alaskan river environments; integrating stock components that reduce design, construction, and component replacement costs; and constructing a modular design and flexible control system that have broad potential applications for meeting the power needs of remote Alaskan villages. Whitestone and other project participants contributed \$37,000 to this project.



Driving Wind Energy Adoption in Rural Alaska Communities



Anchorage, Alaska
EERE investment: \$2.5M

Supported by an EERE investment, the **Alaska Energy Authority (AEA)** has commenced a variety of projects designed to validate wind energy installations in the state's harsh climate. Wind energy installations can generate electricity and reduce the need for fuel deliveries, the costs of which can be extreme for remote rural communities, many of which are off the electric grid. Because of Alaska's weather, Alaska wind projects require more study for adaptation of equipment and proper siting than installations in other U.S. locations. AEA completed an Environmental Assessment for the Toksook Bay, Chevak, and Sand Point wind sites; AEA also constructed both a 400-kilowatt wind project in Chevak and a 1-megawatt wind project in Sand Point. AEA also organized and participated in outreach and education for wind and combination wind-diesel systems; completed site-specific, wind-resource modeling and feasibility studies for rural Alaskan communities; and constructed a foundation in Toksook Bay that is designed to handle the adverse soil conditions in the Yukon-Kuskokwim Delta. Future efforts will include developing education and outreach capabilities at the University of Alaska's Wind-Diesel Applications Center; expanding support for AEA's Anemometer Loan Program, which provides rural Alaskan communities the ability to collect and analyze wind resource data; and conducting a foundation monitoring and performance study at Toksook Bay. AEA and other project participants contributed \$2.8 million to this project.

Watching Whales: Measuring the Impact of Tidal Power Installations on Endangered Belugas



Cook Inlet, Alaska
EERE investment: \$600K

With EERE support, **Ocean Renewable Power Company (ORPC)** is conducting a two-year study on the effects of tidal turbines on endangered beluga whales in Cook Inlet, Alaska—home to some of the greatest tidal energy potential in the United States. To successfully permit and operate the tidal power project in Cook Inlet, ORPC must conduct a rigorous biological assessment of the potential and realized effects that the tidal turbines' physical presence and sound footprint could have on the distribution, relative abundance, and behavior of the whales. Prior to conducting the assessments, ORPC will collect baseline data at the proposed deployment areas near Fire Island and at the initial pilot project site near East Foreland. Researchers will compare measurement technologies and visual observation techniques and, based on the assessment results, will recommend a best practice for future data collection. When complete, this study will help the tidal industry understand the potential impacts of tidal energy projects on the belugas, which will inform future siting and operation decisions.



EERE-funded researchers are evaluating the potential impacts of tidal energy development on endangered beluga whales. *Photo from iStock/5049794*

Energy-Saving Homes, Buildings, and Manufacturing



Alaska State Energy Efficiency Appliance Rebate Program Helps Disabled Alaska Residents



Statewide
EERE investment: \$686K

Using EERE funding, the **State of Alaska** implemented a state rebate program that is targeted especially for the disabled. This program has helped bring energy-efficient appliances within the affordability envelope for Alaska many residents. In total, Alaska issued \$643,011 in rebates, ranging from \$300 to \$1,000 on ENERGY STAR® qualified clothes washers, dishwashers, refrigerators, and freezers. The state set higher rebate amounts for Alaskans who live in remote, rural areas to help offset shipping costs—which could be hundreds of dollars. Retailers helped advertise the program and organized bulk sales to reduce shipping costs. Contact in very remote areas of the state was often limited to group excursions to stores in hub communities that served these remote villages in surrounding areas. The rebate program saved an estimated 400 million British thermal units and \$28 million in energy and water cost savings annually.¹⁰

Alaska Gateway School District Adopts Combined Heat and Power



Tok, Alaska

In Tok, Alaska, the economic impact of high fuel prices was crippling the community's economy—especially for the **Alaska Gateway School District**, with staff laid off and double duties assigned to many. To help offset high energy costs,



the school district decided to replace its separated diesel heat and power systems with a biomass combined heat and power (CHP) system. Northwest Clean Energy Application Center, an EERE-supported organization, aided this project by providing technical support to develop a woody biomass CHP system, which uses a 5.5-million British thermal unit steam turbine (120-kilowatt capacity) in lieu of diesel heating and diesel power generation. The system heats the 80,000-square-foot local school and will soon allow the school to construct a greenhouse that will grow fresh vegetables for the school district’s food service program. Tok School spends more than \$300,000 annually on heating fuel and electricity, and the boiler will save an estimated \$125,000 per year on fuel. Once the CHP systems are fully operational, the rate of biopower consumption will increase, with an anticipated use of 5–6 tons of biomass per day; this biopower will displace approximately 65,000 gallons of heating fuel. Because of the biomass CHP project’s anticipated and realized savings, Tok School has been able to rehire three staff members for the school—a music teacher, counselor, and boiler operator. Once more savings are realized and biomass CHP is expanded into other sites, the school anticipates further improvements to student services.¹¹



The Tok School is realizing significant energy savings thanks to its biomass-fueled combined heat and power system. *Photo from Tok School*

Deploying Clean Energy Solutions in Alaskan Communities

EERE invests in the deployment of energy efficiency and renewable energy projects in communities across Alaska. These investments catalyze economic development, create jobs, generate clean energy, and reduce utility bills. Many of these investments have been through American Recovery and Reinvestment Act (ARRA) funds. Of the more than \$73 million in ARRA funds allocated to the State of Alaska from EERE specifically for deployment projects, more than 90% 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 138 communities have selected and overseen the completion of hundreds of projects that are delivering the benefits of clean energy to citizens throughout Alaska. EERE allocated more than \$55 million in ARRA funds to support activities that

- Contributed to increased energy efficiency and cost savings for more than 1,300 buildings (nearly 6 million square feet) through building retrofits
- Installed 5 renewable energy systems, including wind, solar, and geothermal energy systems
- Funded approximately 1,000 workshops, teaching more than 10,000 people to perform energy audits and install renewable energy systems.

Weatherizing Homes for Lower Income Families

Alaska has spent more than 82% of the more than \$18 million in ARRA funds it received to weatherize 2,600 homes, surpassing its goal. Statewide, this has resulted in annual energy savings of more than 75 billion British thermal units and has averted nearly 7,000 metric tons of greenhouse gas emissions to date—the equivalent of taking more than 1,400 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.¹²

Deployment Project Examples

Upgraded “AKWarm” and “ARIA” Systems Will Improve Energy Efficiency Efforts in Alaska



Statewide
EERE investment: \$1.7M

The **State of Alaska** used this investment to improve the capabilities and usability of its building energy modeling program, AKWarm, and its “back-end” building retrofit information database, Alaska Retrofit Information System (ARIS). AKWarm was expanded from a residential-only program to include commercial buildings. Alaska then conducted investment-grade energy audits on as many schools and municipal buildings as possible. The State uploaded data collected from this effort into ARIS, and now has in-depth knowledge of the energy performance for many public buildings across Alaska. Knowledge obtained from the experience of this project will help improve the design, construction, and operations of Alaskan public buildings. The energy audits performed through this project provide information for many municipalities and school systems to now be able to apply for low interest loans from the Alaska Energy Efficiency Loan Program to install the efficiency measures that the audits recommended.



Deploying Energy Efficiency Measures in Remote Alaska Villages



Statewide

EERE investment: \$3.7M

The **Alaska Energy Authority (AEA)** installed energy efficiency measures that are enabling 51 remote villages across the state to save money both immediately and for years to come. AEA installed measures that include upgraded lighting and mechanical systems at selected buildings. For these upgrades, AEA furnished and installed all necessary wiring, thermostats, motors, pumps, and electrical control system modifications. AEA also provided weatherization services to residential homes. AEA completed these improvements in the face of daunting challenges with regard to climate, access, logistics, materials, and energy costs. Many villages have a very limited construction season, as road access is seasonal—even non-existent at times. Materials must be barged in from Portland or Seattle, and only when the ice has melted from Alaska's rivers and bays, because shipping in materials by air is prohibitively expensive. Much of the work on this project was contracted to local residents, who were trained to operate and maintain the installed systems. These investments will support local jobs and reduce costs to communities, as they will not need to hire outside technicians. These energy efficiency measures are expected to save Alaska communities 574 kilowatt hours of electricity and 84,000 gallons of heating fuel annually; the measures are also expected to pay for themselves in about 3 years.

Tlingit and Haida Tribes Provide Training and Technical Assistance



Tlingit and Haida Indian Tribes

EERE investment: \$666K

The **Tlingit and Haida Indian Tribes** of Alaska, serving southeastern Alaska, was selected to receive funds for its Weatherization Training Center, as the center has proven to be a great resource for researching resolutions to marine cold climate issues. The Tlingit and Haida Indian Tribes are also working with the University of Alaska Southeast to train tribal weatherization crews.

Remote Community of Tanana Residents Increasing Energy Independence



Tanana, Alaska

EERE investment: \$1.5M

The City of **Tanana**—a small community of less than 300 on the Yukon River in central Alaska—is improving the energy efficiency of public buildings and installing biomass heating units. Energy efficiency is particularly important in Tanana, as some residents have been forced to leave due to Tanana's historically very high energy costs. The city believes that clean energy, specifically energy efficiency and harnessing local biomass sources, is the key to its future. Instead of shipping in fuel on costly seasonal barges or propeller planes, residents are now harvesting their own energy sources in the form of driftwood floating down the Yukon River. Self-reliance is critical in Tanana's isolated location, and these activities allow residents increase their energy independence. Tanana is also working with other rural communities throughout Alaska to share best practices and lessons learned.

Front page photo from iStock/6855177; page 2: iStock/17393871; Dennis Schroeder, NREL 19156; page 3: Jim Tetro, U.S. Department of Energy Solar Decathlon

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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.¹³
- 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.¹⁴
- 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.¹⁵
- 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).¹⁶

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.¹⁷

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.¹⁸
- 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.¹⁹

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.²⁰
- 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.)²¹
- 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.²²
- 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.²³

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.