National Renewable Energy Laboratory:

Dedicated to Advancing Clean Energy

The National Renewable Energy Laboratory (NREL) is the U.S. Department of Energy's (DOE) primary national laboratory for renewable energy and energy efficiency. NREL's work focuses on advancing renewable energy and energy efficiency technologies from concept to the commercial marketplace through industry partnerships.

The Alliance for Sustainable Energy, LLC, a partnership between Battelle and the Midwest Research Institute, manages NREL for DOE's Office of Energy Efficiency & Renewable Energy.

History

NREL began operating as the Solar Energy Research Institute (SERI) on July 5, 1977. SERI was dedicated to harnessing power from the sun and quickly caught national attention. In 1978, President Carter was the first U.S. president to visit the lab; fast forward to 1991, and another U.S. president, George H. W. Bush, elevated SERI to a national laboratory and changed the name to the National Renewable Energy Laboratory. NREL became the only national laboratory with the single focus to create clean and renewable energy technologies.

Making a Difference

NREL's discoveries in renewable energy have shaped our transportation alternatives and provided options to power our homes and businesses. For example, the cost of wind energy has declined from 40 cents per kilowatt-hour when the lab was founded, to 6–9 cents today. These lower costs have helped wind energy become the fastest growing source of new electricity in the nation. The cost of electricity from photovoltaic (PV) panels, which convert sunlight directly into electricity, has dropped from several dollars per kilowatt-hour to 18–23 cents a kilowatt-hour. The projected cost of ethanol made from biomass has plummeted from almost $6 per gallon to about $2, helping spur the construction of the first cellulosic ethanol plants in the United States.

Fast Facts

- NREL's main 327-acre campus is in Golden, Colorado.
- The laboratory operates the National Wind Technology Center located on 305 acres, 13 miles north of Golden.
- NREL's staff of nearly 2,300 hails from 70 countries. Collectively, they boast more than 2,600 college degrees.
- Total NREL payroll in 2010 was more than $130 million; economic impact totals $714 million in the state of Colorado.

NREL's main campus on South Table Mountain in Golden, Colorado

NREL is a national laboratory of the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, operated by the Alliance for Sustainable Energy, LLC.

Science & Technology

NREL's research not only improves today's renewable energy and energy efficiency technologies, it develops tomorrow's innovations to meet the nation's energy goals and change the way we power our homes, businesses and transportation.

The laboratory's science and technology teams work in the full-range of research and development (R&D), from basic science to applied research, engineering to testing, and scale-up to demonstration. NREL is developing nanoscale materials to convert the sun's energy into electricity, improving understanding of wind aerodynamics, and diving into the cellular structure of plants to make cost-competitive renewable biofuels. NREL also boasts strong R&D efforts in materials for renewable energy, buildings, transportation, electric infrastructure systems, and hydrogen, ocean and geothermal energy.

NREL's research facilities provide unique partnering capabilities. The Integrated Biorefinery Research Facility, the Process Development and Integration Laboratory and facilities at the National Wind Technology Center allow R&D partners in biofuels, solar energy and wind energy to collaborate, explore and innovate using state-of-the-art facilities. At the Energy Systems Integration Facility, being designed now, NREL and its partners will explore the impacts of large-scale renewable energy and energy efficiency deployment on the nation's energy delivery system.

Our staff has earned 47 R&D 100 awards and scores of other honors from the science and technology community. NREL recently was ranked among the top institutions worldwide in environmentally related research by the science publisher Elsevier. And, the 2008 Thomson Reuters Science Citation Index for energy and fuels ranked NREL second in the world and third in citation impact among 3,000 institutions.

Energy Analysis

Understanding current and future interactions and roles of energy technologies, policies, markets, resources, environmental impacts and infrastructure is critical to the nation's energy future. NREL analysts use their knowledge and expertise to integrate and draw insights from complex sets of data across several renewable energy and energy efficiency technologies. They explore policy and technology options to evaluate their implications for carbon reduction, job creation and energy security.

NREL is a leader in renewable energy technology, market, sustainability, policy and systems analysis. Market analyses provide information that make it easier to understand the uses of clean energy technologies in electricity and fuels markets. Sustainability analyses look at environmental, life-cycle, climate and other impacts of clean technologies. Analyses inform policy design and investment decisions related to renewable energy technologies at the state, national and global levels.

Systems analyses examine the potential timeframes, costs, benefits and risks of renewable technologies when applied with other technologies. A slate of NREL-developed energy analysis models and tools help inform energy decisions across all renewable energy and efficiency technologies.

Capabilities

NREL's renewable energy and energy efficiency research spans fundamental science to technology solutions.

Renewable Fuels

- Biomass
- Hydrogen and Fuel Cells
- Vehicle Technologies (advanced vehicles, fuel quality and testing)

Renewable Electricity

- Solar (PV, concentrating solar power and solar thermal)
- Wind and Water
- Geothermal
- Electric Systems (smart grid technology & standards, transmission & distribution systems integration, energy storage)
- Building Technologies (building efficiency, building-integrated PV)

Energy Science

- Chemical and Biosciences
- Scientific Computing
- Materials Science

Strategic Energy Analysis

- Technology
- Economic, Environmental and Security
- Markets
- Policy, Government and Programs

Biofuels research at NREL

Commercialization & Deployment

Ongoing research at NREL provides Americans with key options for solving our energy problems. NREL focuses on increasing the speed of moving new energy technologies into the marketplace and expanding the scale at which they are used.

NREL's commercialization and deployment activities aim to accelerate new technology commercialization and remove barriers to market adoption of existing clean energy solutions. To this end, NREL has streamlined the way we do business, and enhanced the entrepreneurial environment, providing greater access to capital and engaging strategically with industry and stakeholders.

Partnerships are at the core of NREL's strategy. We expand our reach by collaborating with industry, academia, non-profit organizations and federal agencies; state, local and tribal governments; and international institutions to commercialize and deploy renewable energy and energy efficiency technologies. The laboratory engages with the private sector through a variety of sponsored research contracting mechanisms, as well as through licensing new technologies. Overall, federal investment in these partnerships has leveraged private funds by a factor of six. NREL links entrepreneurs with investors, helps small businesses and supports the emerging clean energy business sector through its enterprise development program and annual Industry Growth Forum.

NREL advances integrated, sustainable energy solutions to meet local and regional energy needs by looking at the entire renewable and energy efficiency portfolio, tailoring cost-effective solutions based on locally available resources. NREL's deployment efforts often include technical assistance, where staff help communities assess renewable options and provide training to help build a skilled, green workforce.

Partnerships

In 2010, NREL had agreements in place with 431 industry partners, 68 universities, 31 not-for-profit organizations, and 17 government entities.

NREL currently has active partnerships in 47 states and seven countries.

Subcontracts

816 total active contracts currently valued at $599.4 million.*

NREL established 131 new partnership agreements in FY10 with a contract value of $81 million.

NREL has more cooperative research and development agreement (CRADA) activity than any other DOE laboratory. In fact, with 186 active CRADAs—48 are new and 86 are with small businesses—NREL is responsible for one-quarter of all CRADAs in the DOE system. In addition, 32 intellectual property agreements, 21 memorandums of understanding, 40 material transfer agreements and 204 non-disclosure agreements were signed in FY10.

(*As of December 2010, this is the NREL contract amount; funds expected to be spent over period of performance.)

Patents

Issued

- United States – 189
- Foreign – 96

Pending

- United States – 117
- Foreign – 107

NREL's 750-kW solar system on the Mesa Top

Laboratory of the Future

NREL is building a state-of-the-art "Laboratory of the Future" with sustainable research buildings to foster innovation. NREL's South Table Mountain campus is bustling with construction activity with two projects continuing to take shape—the Research Support Facility (RSF) expansion and the Integrated Biorefinery Research Facility (IBRF).

The 220,000 square-foot RSF is a model for sustainable, high-performance building designs. The RSF is expected to achieve an aggressive energy efficiency goal of 32,000 Btu/sq. ft. per year and receive a LEED® (Leadership in Energy and Environmental Design) Platinum designation. An expansion of this facility is slated to open in late 2011. The IBRF process bays were completed in 2010 with work continuing on adjacent office areas. The IBRF expands NREL's capabilities to develop new cellulosic ethanol technologies and allows the laboratory to work simultaneously on multiple research projects with multiple research partners.

Design work is underway for the 175,000 sq. ft. Energy Systems Integration Facility (ESIF). The building will house research to overcome challenges related to the interconnection of distributed energy systems and the integration of renewable energy technologies into the electrical grid. ESIF will also include a state-of-the-art, high-performance computing and data center that will expand NREL's capabilities in modeling and simulation of renewable energy technologies. The ESIF data center will be designed to be one of the most energy efficient in the world.

NREL's goal is to maximize the use of on-site renewable energy and to purchase Renewable Energy Credits to offset greenhouse gas emissions. In 2010, NREL achieved "carbon neutrality" for the second consecutive year.

The Laboratory of the Future is just one more asset in NREL's portfolio that will ensure the laboratory's leadership in addressing the nation's energy challenges.

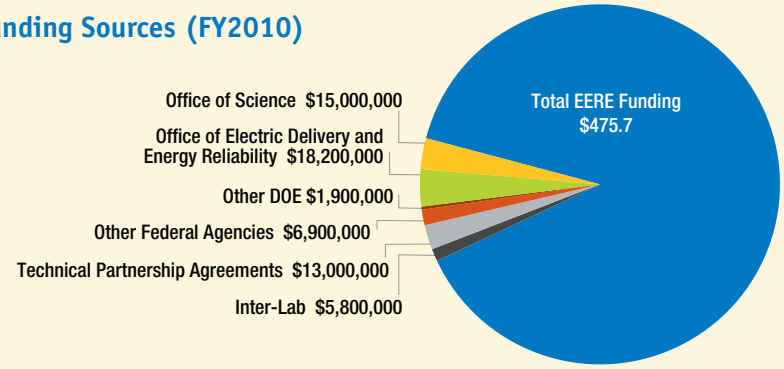
NREL Funding

More than 90 percent of NREL's funding is through DOE's Office of Energy Efficiency & Renewable Energy.

Funding FY2006–FY2010

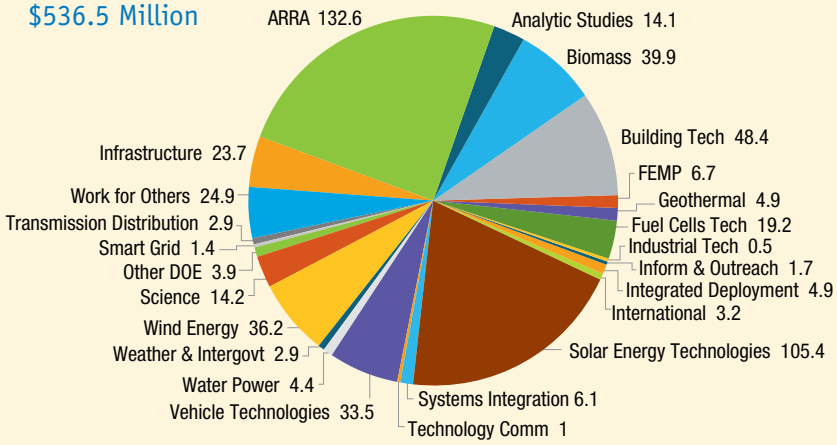
	FY06	FY07	FY08	FY09	FY10
Operating	180.6	260.5	241.0	339.4	460.2
Capital Construction	29.0	116.9	87.3	185.7	76.3
Total	209.6	377.4	328.3	525.1	536.5

Funding Sources (FY2010)



NREL Portfolio (FY2010)

$536.5 Million



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NREL
NATIONAL RENEWABLE ENERGY LABORATORY

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