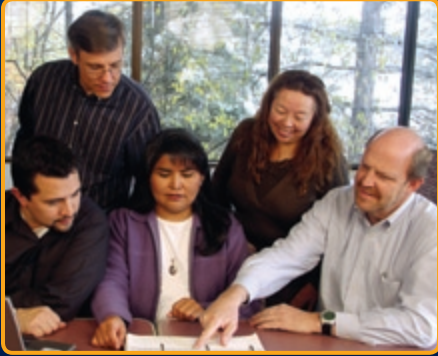




**National Renewable Energy Laboratory**

*Innovation for Our Energy Future*



**FY06**

# **Business and Operating Performance**



*A national laboratory of the U.S. Department of Energy  
Office of Energy Efficiency & Renewable Energy*

# Message from the Director



2006 was a year marked by change. Early in the year, a “perfect storm” of events created a catalyst for progress in the energy arena. World events drove oil prices to historic levels, and natural gas prices rose sharply during the heating season, in part because of the loss of infrastructure in the Gulf of Mexico following devastating hurricanes. In addition, new research findings supported concerns about the environmental impacts of fossil fuel emissions.

With energy a dominant part of the daily national dialogue, President Bush visited NREL in February as part of his rollout of the Advanced Energy Initiative. NREL responded to his call for leadership on the Advanced Energy Initiative and rose to the daunting challenge of accelerating technology solutions to these national needs during a year with research funding constraints.

Enabled by new clarity and focus established through NREL’s strategic roadmap and a significant reorganization that aligned leadership roles and responsibilities and technical and business assets with the strategy, the Laboratory outperformed expectations in an ever-changing environment.

I welcome your interest in NREL and invite you to read this report to learn more about the business operations that help ensure the Laboratory’s success. For additional information about our Laboratory, please visit us at: [www.nrel.gov](http://www.nrel.gov).

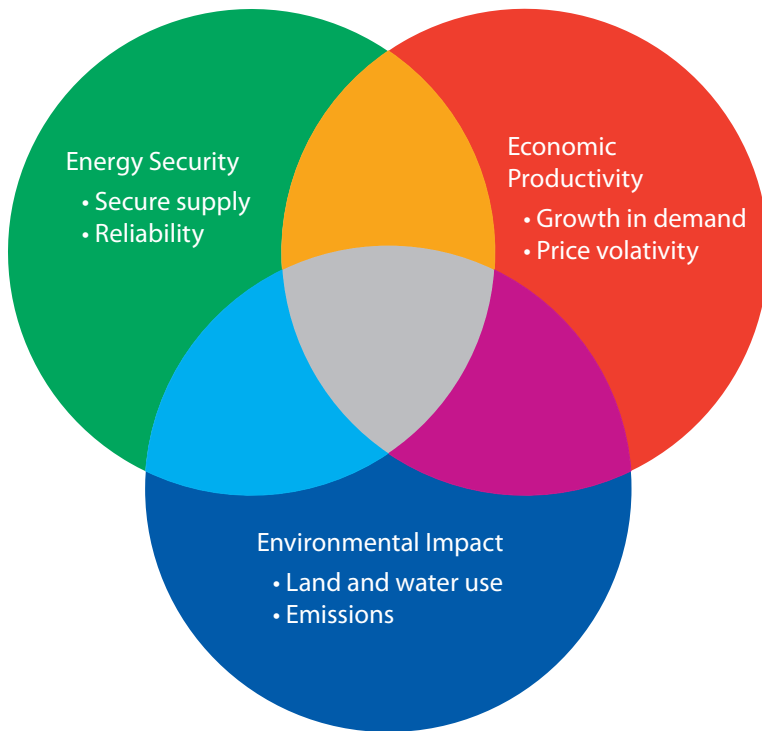
Dan Arvizu  
Director

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# Foreword



NREL focuses on innovative solutions to national energy goals.

## ***The Laboratory's Mission:***

*NREL develops renewable energy and energy efficiency technologies and practices, advances related science and engineering, and transfers knowledge and innovations to address the nation's energy and environmental goals.*

The National Renewable Energy Laboratory (NREL) is a science and technology facility whose mission is the advancement of renewable energy, energy efficiency, and related technologies and practices. NREL, a federally funded research and development center managed and operated by the integrated Midwest Research Institute and Battelle management team, is a partner and strategic advisor to the Department of Energy's (DOE's) Office of Energy Efficiency and Renewable Energy (EERE).

NREL conducts focused research to advance renewable fuels and electricity technologies and technologies to use these resources efficiently in buildings and vehicles. The Laboratory places a strong emphasis on strengthening the interfaces between basic science and applied research and development, and between the Laboratory and the marketplace in order to accelerate adoption of these important technologies. Work at the Laboratory promotes the nation's energy security while minimizing environmental impacts—all in a manner that supports enhanced economic productivity. NREL's highly skilled staff support multi-disciplinary work to rapidly translate energy-related scientific discoveries into new knowledge and technical innovations.

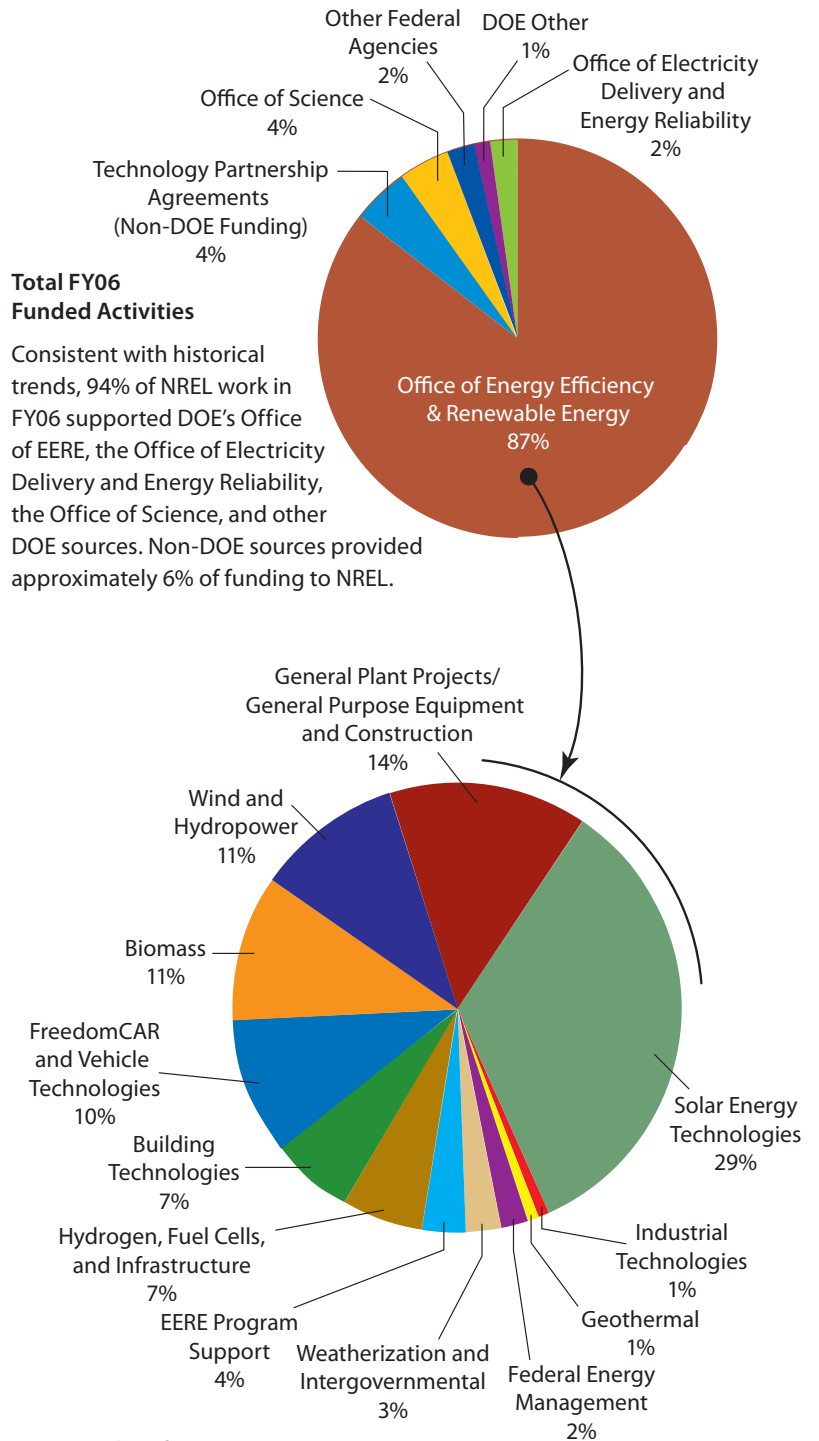
A key enabler of NREL's science and technology mission is strong and cost-effective business and operational management. NREL consistently strives to be the best-value provider to DOE by delivering business management and operational infrastructure that is efficient, effective, and responsive and that maximizes R&D output per dollar invested at the Laboratory. This report profiles the management, delivery, and continual improvements that enable mission success.



# NREL's Core Mission and FY06 Budget

As DOE's primary laboratory for renewable energy and energy efficiency technology, NREL provides expertise across the continuum of research, development, and demonstration and supports implementation strategies to accelerate market adoption. These efforts are underpinned by highly effective program management, which yields significant outcomes that advance DOE's energy goals. In FY06, NREL received 87% of its total funding from EERE, the Laboratory's steward and primary sponsor. Work with DOE's Office of Science (which accounted for 4% of funding) promoted fundamental research that will lead to breakthrough technologies and scientific advances in energy efficiency and renewable energy. Three percent of the Lab's funding came from the Office of Electricity Delivery and Energy Reliability and other DOE offices, and another 2% was received from other federal agencies. Technology partnership agreements represented 4% of the Laboratory's FY06 total budget. In partnership with EERE, NREL supports 10 programs by conducting research and development to advance renewable and energy efficiency technologies, providing technical assistance to support the application of technologies, and conducting strategic analyses to inform portfolio planning, research direction, and policy formulation.

A key strength of the Laboratory is its ability to work with, and for, a broad range of groups outside of DOE, including industry, universities, state and local governments, other federal agencies, and domestic and international non-governmental organizations. This is accomplished through vehicles such as memorandums of understanding, technology partnership agreements, and licenses that promote transfer of the knowledge and technologies produced at NREL. Through these partnerships, DOE's return on investment is realized as the knowledge created is put to use in relevant markets and sectors locally, nationally, and internationally. Through cost-sharing partnerships, NREL also leverages the dollars invested at the Laboratory in support of the DOE mission.



## FY06 Funding from EERE

NREL's work spans a variety of energy resources and uses, which positively impacts a broad range of energy issues. Actual FY06 funds received from EERE were approximately \$183 million.

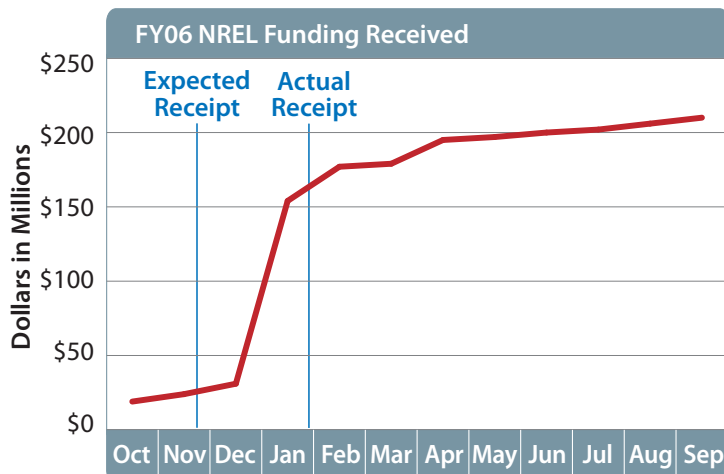
# Laboratory-Level Business Management Outcomes

The priority that NREL places on continual improvement was evidenced by delivery of effective business and operational support while demonstrating flexibility and agility in meeting evolving customer needs and making improvements to management systems.

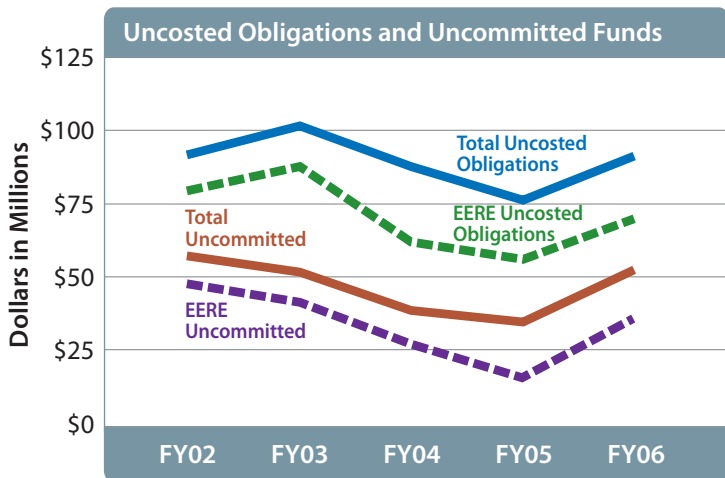
Following passage of the FY06 Energy and Water Appropriations bill, NREL implemented an aggressive plan to manage operations at reduced funding levels. NREL's responses dramatically mitigated the impact of the funding shortfall and allowed the Laboratory to maintain critical capabilities. Throughout the year, funding was reviewed and realigned to support research needs. It is within this context that exemplary performance was achieved.

Excellence in financial accounting, planning and budgeting, finance oversight, modeling, and projection capabilities enabled the Laboratory to meet target financial goals, sustain internal controls, and ensure financial accountability. NREL maintained excellent ongoing project management and greater control over daily cash balances.

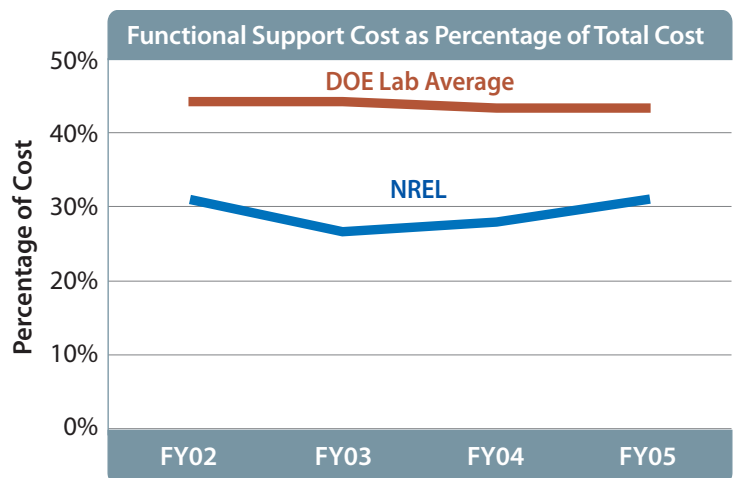
Clarity of focus and agility allowed NREL to remain a leader in the DOE system for delivering efficient, effective, and responsive business and operational support. This level of performance is earning increased external recognition. For example, NREL was recognized by EERE for providing clear and timely response to a new DOE requirement for periodic analysis of uncosted funding balances. No NREL funds were identified as "excess" funds.



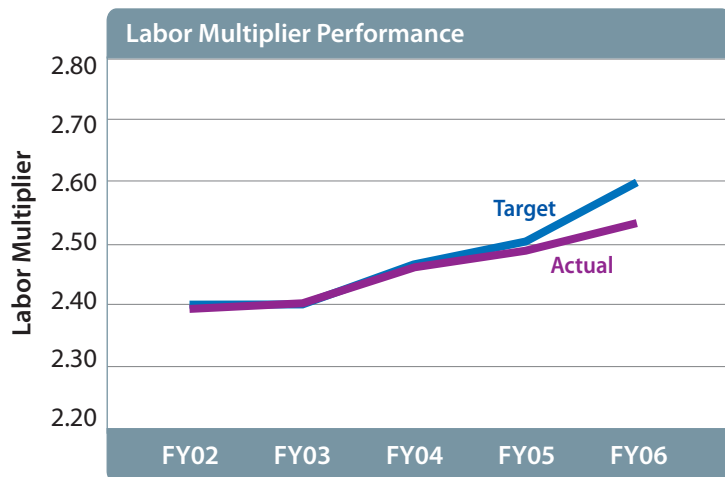
Receipt of funding was delayed due to continuing resolutions for the fifth year in a row. Late receipt of funding presents challenges to the initiation and subcontracting of work and can influence year-end uncosted balances. Thoughtful and aggressive financial management allowed NREL to mitigate these challenges.



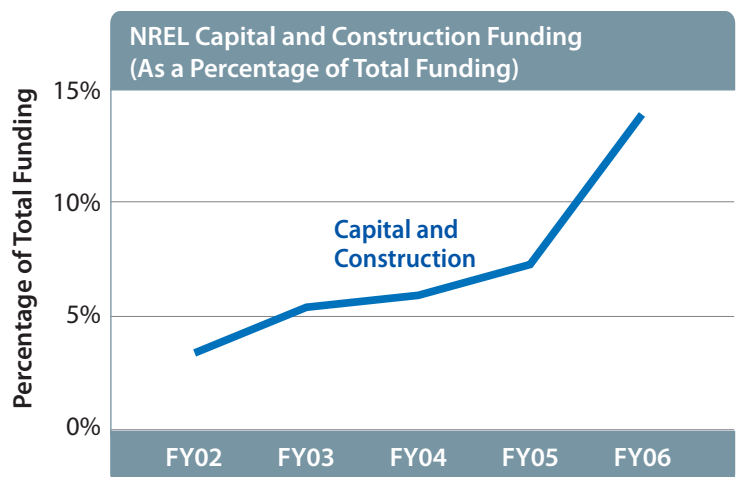
Uncosted balances for EERE programs ensure that the Lab is able to continue in-house operations and meet its legal, contractual, and financial commitments. The increase in uncosted obligations for FY06 is the result of \$9.9 million funding for a new Research Support Building to be constructed in FY07 and an increase in capital equipment funding for occupation of the Science and Technology Facility.



DOE conducts a study of support costs by functional activity for all contractor locations. NREL consistently performs better than the average of all DOE contractors in controlling support costs. (FY06 data was not available for comparison.)



Proactive management and timely response to changing requirements and priorities enabled NREL to keep the labor multiplier as low as practical. However, continued pension and medical cost escalation (factors outside the Laboratory's control) dictated an increase to the multiplier in FY06. To mitigate increasing medical costs, NREL re-competed its medical insurance coverage.



NREL received increased support for capital equipment and construction projects. DOE's investment at the site supports critical capabilities to realize the goals of the president's Advanced Energy Initiative.

# Environment, Safety, and Health

The Laboratory maintains a high level of environment, safety, and health performance and is a recognized leader in sustainability.

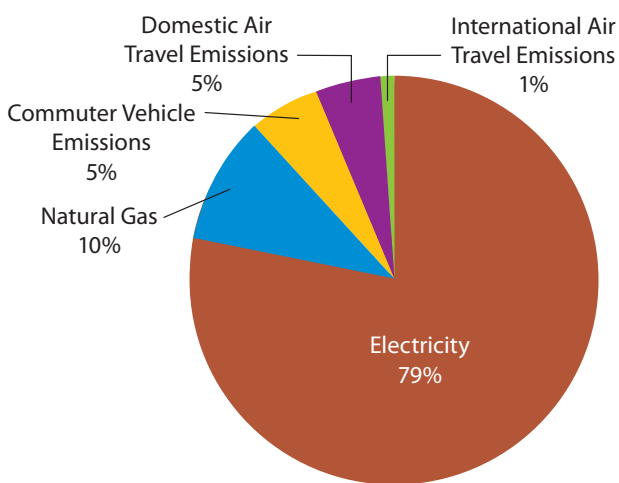


Planned emergency management activities demonstrated the Lab's excellent emergency medical response capabilities. NREL completed a high angle rescue exercise with full participation of external agencies.

NREL strengthened its environment, safety, and health posture through increased management communication and presence, ongoing process improvement, rigorous inspection and assessment, rapid and appropriate response to issues, and strong commitment by NREL workers. An independent assessment team identified the strong safety culture, clear lines of management and personal responsibility for safety, and rigorous process for work planning and work authorization as strengths of NREL's Integrated Safety Management System.

NREL's commitment to excellence in environmental management was acknowledged by the U.S. Environmental Protection Agency's Climate Leaders Program. The Laboratory achieved a 10% greenhouse gas reduction from 2000 to 2005. Through onsite energy efficiency and renewable energy projects and the purchase of renewable energy certificates, the Laboratory achieved "carbon neutrality" in all of its facilities and operations. NREL is the only federal facility or national laboratory to achieve these results based on a comprehensive "environmental footprint."

NREL's commitment to the environment was most recently recognized with a DOE Pollution Prevention Star Award. In addition, the Lab's Sustainable NREL program recently received the White House's Closing the Circle Honorable Mention. NREL continues to participate in voluntary programs such as the National Environmental Performance Track and the Colorado Environmental Leadership Program.



## FY06 CO<sub>2</sub> Emissions Breakdown

NREL developed its "carbon footprint" to include sources beyond the Laboratory's boundary, such as those associated with staff travel to and from work. Sources with negligible emissions such as fleet vehicle emissions, solid waste disposal, and water (associated electricity or natural gas consumed) are not included in this graph.

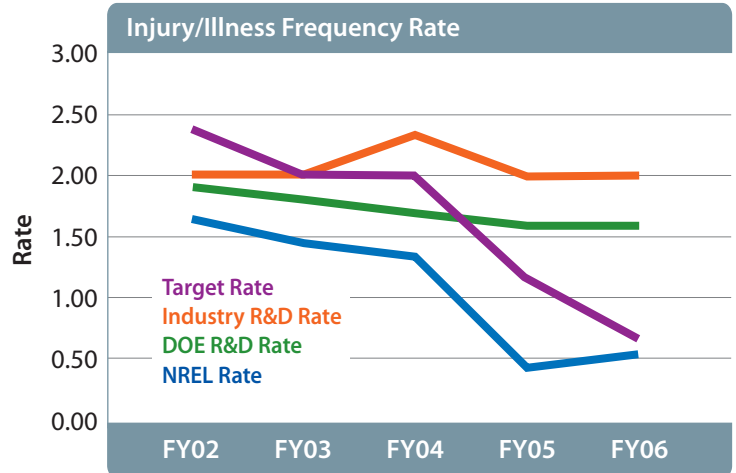




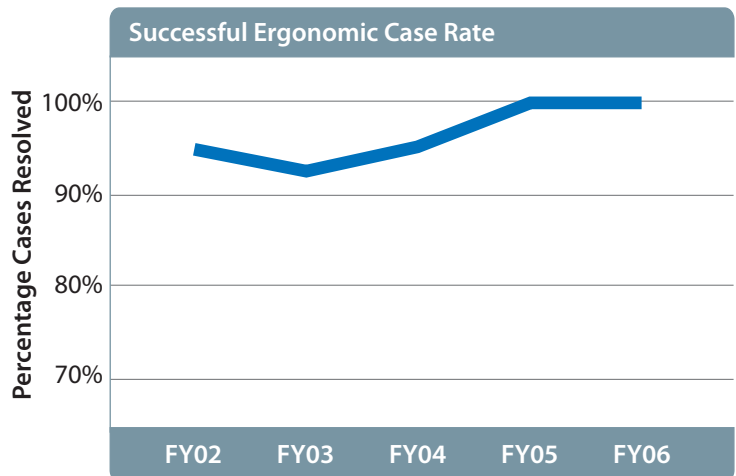
NREL significantly improved its chemical management system through work that included a lab-wide chemical re-inventory. To date, the Lab's chemical inventory is more than 97% accurate—reflecting best-in-class performance. Upgrades to its chemical inventory management software improved accessibility, enhanced reporting, promoted the ability to develop new metrics, and streamlined the process of transferring chemical ownership accurately.

NREL's Electrical Safety Program earned high marks for the year following a comprehensive review of the program. The program was acknowledged for clearly defining roles and responsibilities, is widely used as a reference, and is consistently implemented across the site. Most importantly, NREL staff displayed an excellent understanding of Electrical Safety Program requirements.

NREL's workers' compensation costs are less than \$0.01/hour worked per employee. This compares with a general industry average of \$0.17/hour. This low cost is a clear testament to the effectiveness of NREL case management. The Laboratory's focus on early reporting and aggressive treatment of ergonomic issues continues to yield solid performance. NREL continues to be a leader in effective ergonomic case management.



NREL's commitment to the safety and health of its workforce is demonstrated by performance. The Laboratory's total recordable case (TRC) rate is 0.54, well below the DOE research contractor TRC rate of 1.6 and DOE Office of Science target rate of 0.65. The Bureau of Laboratory Statistics formula for TRC is: number of recordable injuries/illness per 100 workers/year. The NREL TRC includes all workers on NREL sites (employees, agency temporaries, subcontractors, and volunteers).



An indicator of injury severity is how effectively ergonomic-related injuries are resolved when they do occur. This is demonstrated by the percentage of ergonomic injury claims that are resolved without lost workdays or invasive medical treatment. For the second consecutive year, 100% of all ergonomic cases at NREL were successfully treated without the need for surgery.

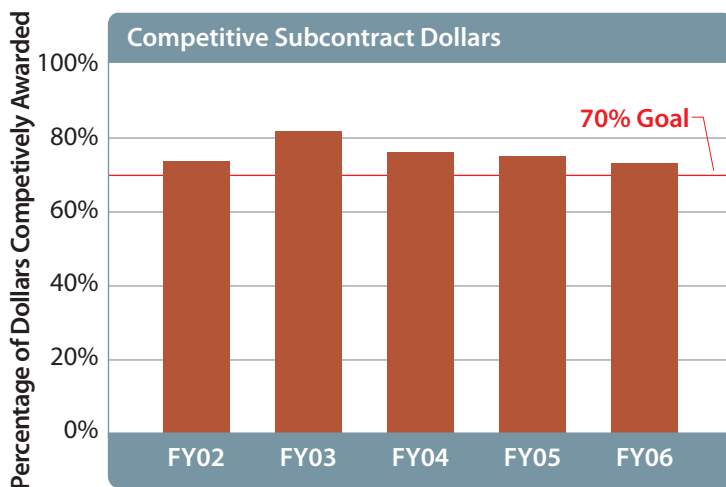
# Contracts and Procurement

NREL's strong contracts and procurement processes enable the Laboratory to meet or exceed the majority of its subcontracting goals and reflect a commitment to effective and meaningful competition, socioeconomic goals, leveraging of DOE funding, and timely subcontract closeouts.

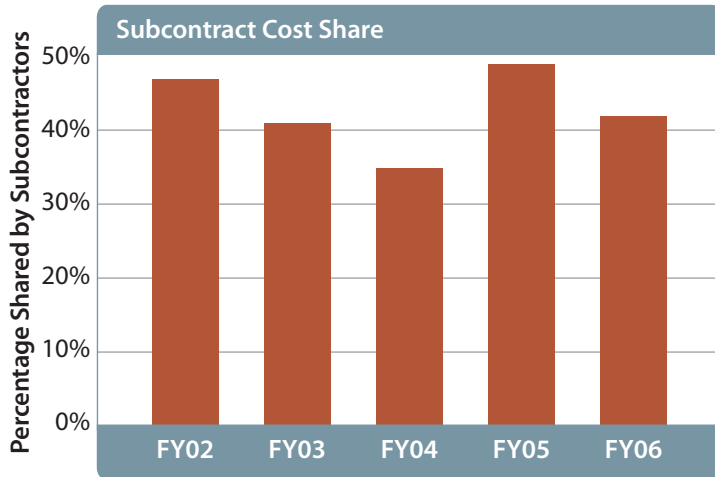
Clarity of focus and agility allow NREL to be a leader in the DOE system for delivering efficient, effective, and responsive business and operational support, as acknowledged in the DOE functional cost report. This level of performance earned special external recognition in FY06. A DOE national laboratories' Procurement Evaluation and Re-Engineering Team Peer Review recognized facets of NREL's procurement practices as noteworthy, including its purchase card administration, small business program administration, subcontract documentation, closeout processes, and effective teamwork, communication, and leadership.

Cost-shared subcontracting provides greater leverage of DOE R&D funds and is a significant component of NREL's portfolio. Of the subcontracts awarded in FY06, 73% were competitive awards, with 42% of the cost shared by industry partners. This allowed NREL to meet key strategic objectives for industry participation and leverage DOE funds despite budget constraints that significantly affected funds available for subcontract awards.

NREL continued to deliver the Laboratory's integrated management and operating prime contract online while flowing requirements to workers through electronic policies, procedures, and forms. In FY06, DOE's Office of Procurement recognized NREL's Requirements Management System as a "best practice" and model for tracking major contract deliverables.



Indicative of NREL's commitment to effective and meaningful competition, the Laboratory continued to surpass its goal for competitively awarding subcontract dollars.

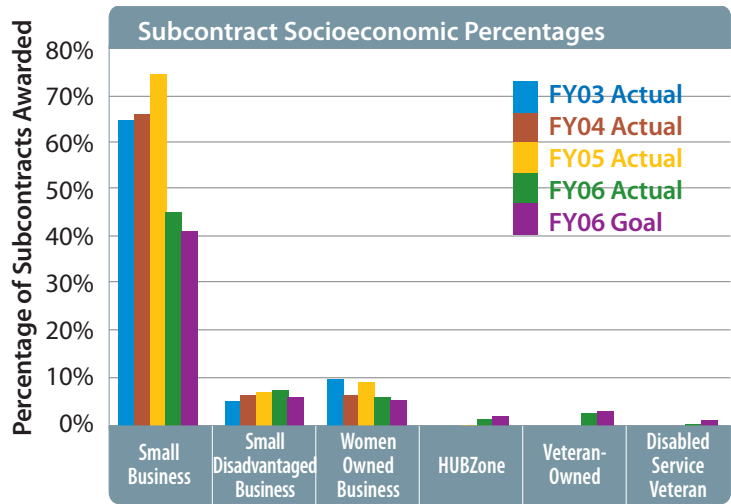


Continued high cost sharing (42%) for subcontracts demonstrates industry commitment and leveraging of DOE funding and EERE technologies.

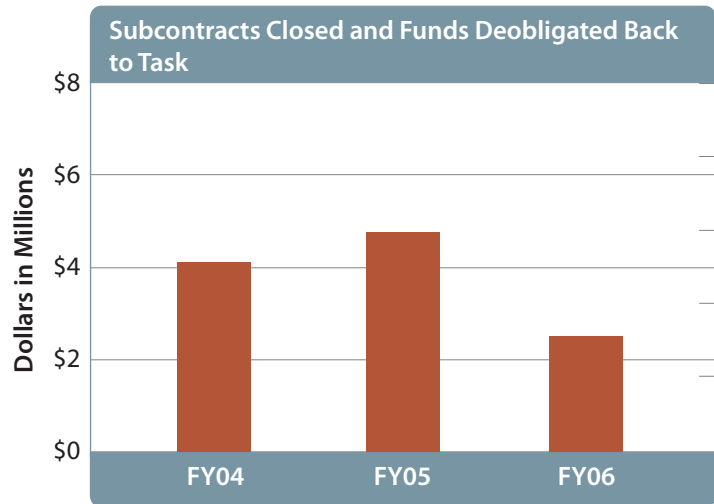
NREL is committed to promoting opportunities for small, minority, and women owned businesses to participate in the Laboratory's procurement activities. This was evidenced by the progress made in meeting established socioeconomic goals while including three new goals for HUBZone, veteran-owned, and disabled service veteran awards.

The Laboratory continued to enhance procurement efficiency and reduce cycle time between the receipt of requisitions and award of the subcontracts. The average cycle time for original subcontract awards was reduced approximately 17% from FY05 and nearly 28% from FY04. This reduction in cycle time is a true example of resource maximization and value-added performance through effective and efficient business and operational support.

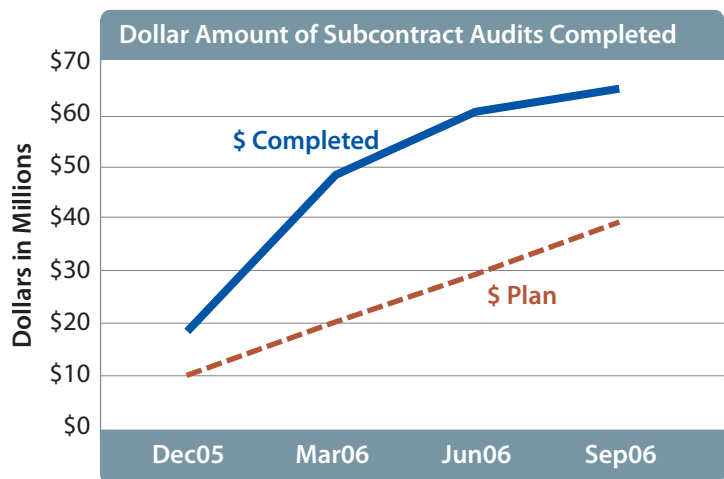
NREL maintained its focus on aggressively closing out subcontracts, which resulted in excellent progress in closing out older subcontracts. FY06 closeouts allowed NREL to return \$2.5 million of funding to programs early in the year when it was most needed, with a significant overall reduction of committed but unbilled subcontract program funds. To offset significant funding reductions, the return of unused funds to programs was critically important to NREL in FY06.



While keeping pace with existing socioeconomic contracting goals, NREL made progress against three new ones: HUBZone, veteran owned, and disabled service veteran businesses.



Timely closeout of subcontracts with unspent dollars continues to return funds to programs. This was particularly important in the context of FY06 funding reductions.



FY06 performance in closing out subcontracts greatly exceeded annual goals. Expedited audit closeouts were 67% more than the goal.

# Human Capital

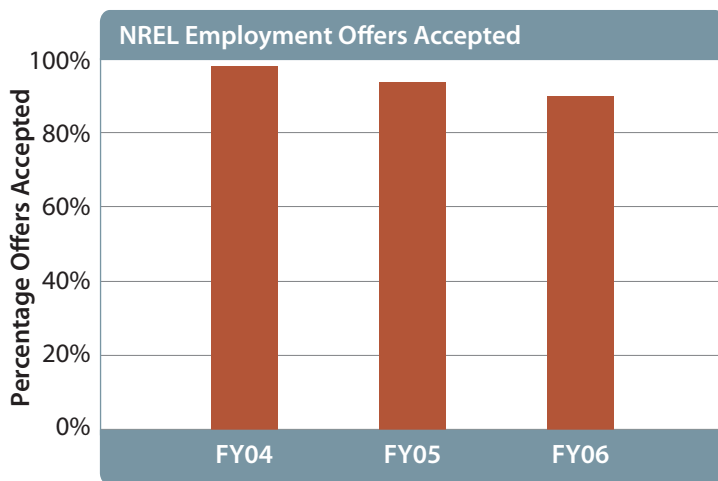
NREL recognizes that its people are its most important asset. Effective management of human capital allows the Laboratory to promote and maintain a culture that is aligned with its mission, values, and strategy.

Providing a comprehensive benefits package is critical for the Laboratory to attract and retain talented and dedicated staff. In FY06, a joint NREL-Midwest Research Institute committee evaluated the existing defined contribution retirement plan investment options for staff. As a result, the Lab consolidated to a single provider that offers significantly better options—including a diversified investment menu, enhanced services, and education for improved retirement planning—for staff. In addition, health care cost increases were held to 6.5%. National averages have increased by 10%.

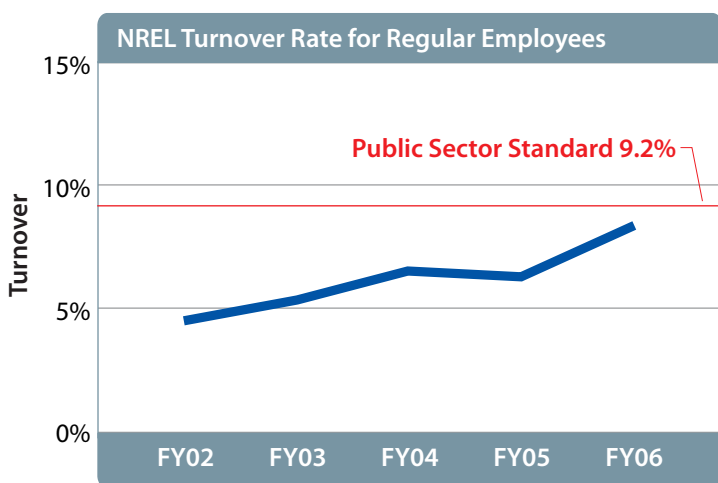
Continued attention to changes in the economy and competition for skilled employees has reinforced efforts to maintain average salaries at competitive levels. Although market wage and salary growth has accelerated over the past year, for the sixth consecutive year, NREL's average salaries were maintained within 5% of market. A smooth and successful change in the compensation planning year resulted in a closer tie between pay and performance and reduced the time lag between the end of the performance period and the receipt of pay increases by 50%.

In support of the Laboratory's goal of attracting superior talent, strategic outreach was conducted to fill key, senior-level positions, including those of the deputy laboratory director/chief operating officer, human resources director, ombuds program principal administrator, bio-mass systems integration principal analyst, and chemical and biosciences center director. The individuals selected for these positions are highly experienced and respected in their professional fields.

The Laboratory's values recognize the importance of diversity. NREL's expanded outreach continued to attract more diverse candidates. The Lab participated in a number of events with organizations such as the Society of Hispanic Professional Engineers, the National Society of Black Engineers, and Women in Science, Engineering, and Mathematics. These activities are critical to achieving a more diverse



At 90.3% the acceptance rate of NREL applicants remains very high.



\* Saratoga Institute

NREL's flexible compensation design and compelling mission help keep staff turnover below the Public Sector standard.



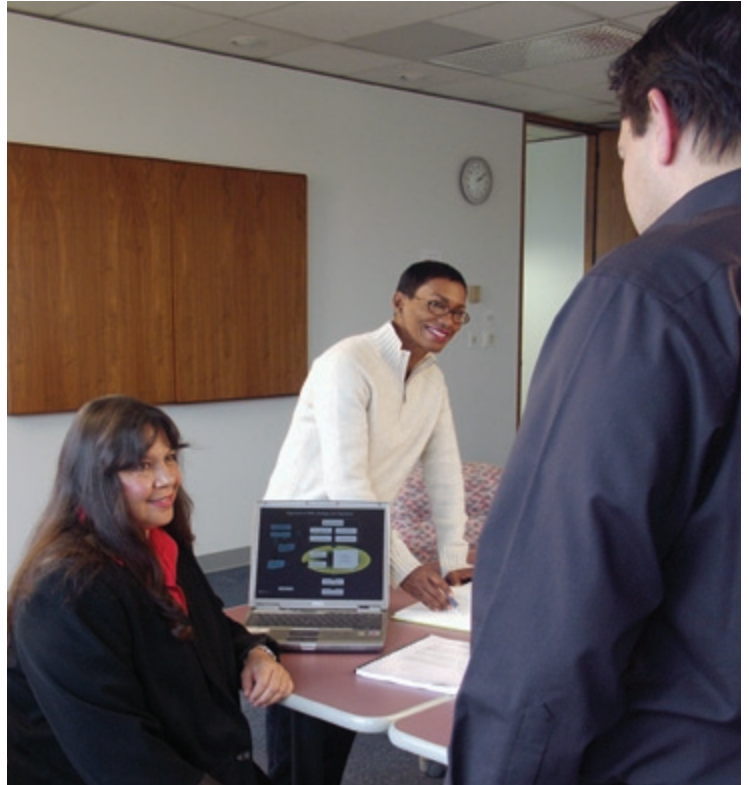
workforce. By fostering an environment that encourages the exchange of knowledge and ideas among individuals from differing backgrounds, NREL has a greater opportunity for creativity, innovation, and competitive advantage.

Several new channels were instituted for employees to report concerns and resolve conflicts at the lowest level. The object was to improve the culture and the quality of work life at NREL. The NREL Ombuds Office was established to provide a confidential, neutral, informal, and independent resource to assist staff with work-related issues. Employees are also encouraged to contact The Network, an independent company that offers an anonymous, phone-based reporting service for staff to share concerns about Laboratory practices and matters.

A Lab-wide reorganization realigned the span of control and improved accountability by creating new levels of management. A key focus during the reorganization was the benchmarking and design of NREL's management and leadership training. This ongoing initiative is vital to the development of the Laboratory's leaders. Emerging and existing managers and supervisors will profit from hands-on learning and training modules ranging from goal setting and conflict management to diversity coaching and team building.

Driving for effectiveness and efficiency, NREL enhanced several business practices. This included:

- The implementation of a management training module on the Fair Labor Standards Act
- The implementation of pre-employment drug testing for all external payrolled hires
- The consolidation of internships to create a single point of contact, consistency, and equity for all current and future undergraduate, graduate, and post-doctoral appointments.



NREL's diverse workforce encourages collaboration on ideas and projects throughout its campus.

# E-Business

The Laboratory recognizes the value of adapting to constant and continuous changes in its environment. In FY06, many existing business processes were enhanced through the use of information technologies that improve NREL's operational efficiency and flexibility.

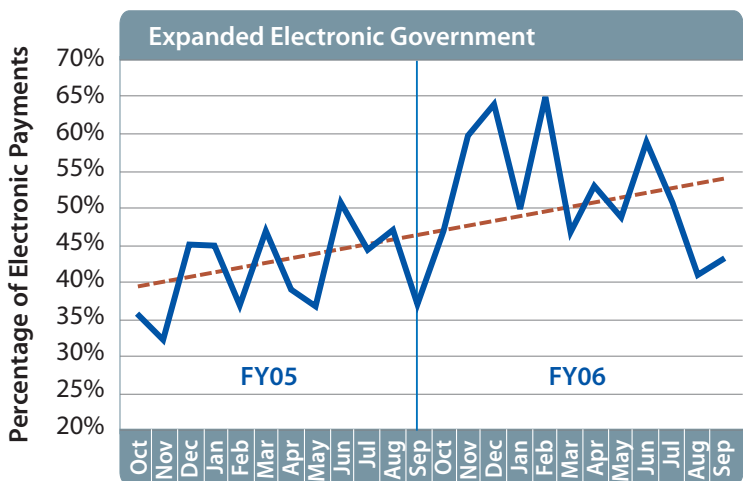


The successful upgrade of integrated Oracle applications significantly increased the security and stability of NREL's critical business systems. This was accomplished through numerous security patches and by streamlining the functionality of business applications through new technology.

Online access to mid-month project cost and labor information greatly enhanced project financial oversight and management. Four new reports improved access to mid-month project information on labor hours; procurement activity including status of purchase requisitions; purchase orders; invoices; and recharges.

During FY06, NREL increased its number of electronic payments from about 40% in FY05 to about 52%. The positive effects of this significant improvement include increased security of payments, reduced exposure to theft or loss, and reduced processing cycle time and average transaction cost.

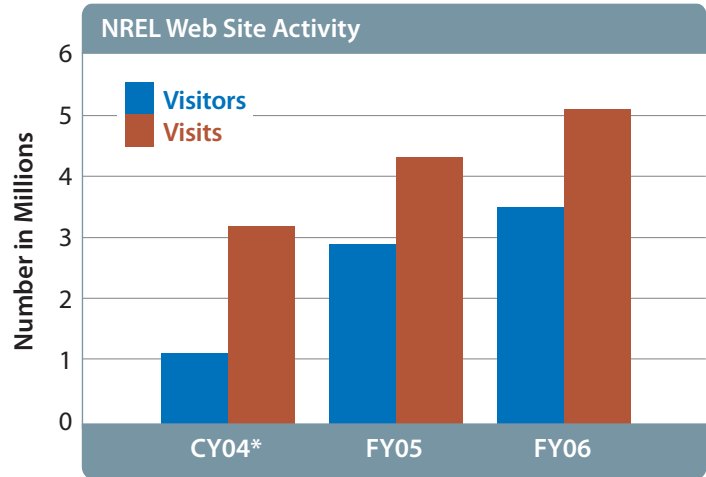
NREL achieved nearly 99.9% availability of its information technology infrastructure for core services, including e-mail, telecommunication, network, anti-spam, and business applications. Staff productivity remained high, thanks to the effective intrusion detection and prevention systems that thwarted increased levels of external cyber attacks. NREL had no downtime because of cyber-related incidents, and detection and prevention systems caught 418,000 viruses and removed 91,000 prohibited attachments.



NREL's electronic government efforts continued to expand, with a 30% increase in the number of electronic payments made from FY05 to FY06.

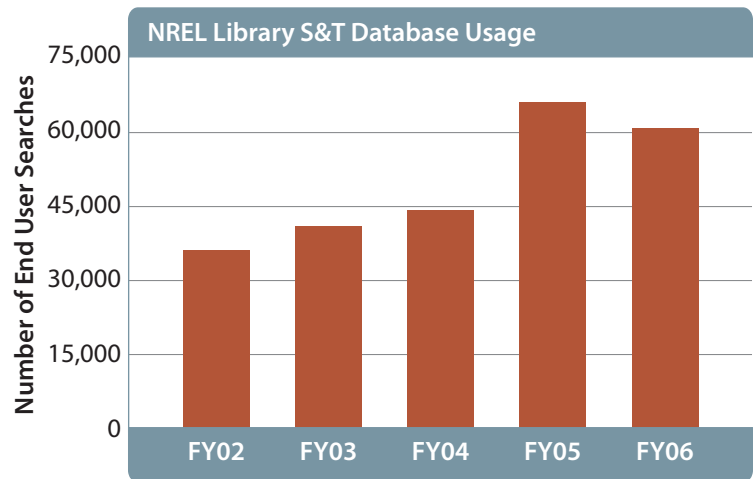
Electronic communications also continued to grow throughout the year. Employees created 15 new Web sites, redesigned a dozen more, and maintained 130 existing sites—all of which contribute to the successful outreach efforts of NREL and DOE's EERE. NREL's Web site continues to be the most popular method for visitors to learn about the Lab's cutting-edge research. In FY06, online users made more than 5 million visits to the NREL site, which represents an increase of 19% over the previous fiscal year.

Database searches play an important role in the Laboratory's research and publication processes. NREL's library services provide a channel for researchers to more easily and expeditiously share their findings and access the latest research performed around the world. NREL's cost-effective online library services continued to support research and technical staff by providing access to more than 125,000 articles and handling 65,000 database searches. In addition, NREL continues to effectively support Laboratory publishing needs. More than 1,170 publications were added to the publications database in FY06.



\* Data were tracked by calendar year prior to FY05.

There were 3.5 million visitors to the NREL Web site in FY06, compared with 2.9 million visitors in FY05. This represents a 21% increase. The number of visits increased 19%.



Although slightly down from last year, desktop database usage remained high. NREL's research and technical staff performed 60,775 searches of major Science and Technology databases in FY06.

# Site and Facilities

The Laboratory provides exceptional stewardship and protection of DOE facility and equipment assets and investments to ensure they are adequate to carry out the mission – for today and for the future.



The completion of the S&TF ushers in a new way of doing research to develop the next-generation solar, hydrogen, and other promising clean energy technologies.



The National Wind Technology Center with the Flatirons in the background.

Construction of the Science and Technology Facility (S&TF) was completed within scope, five months ahead of schedule, and under budget. This critical facility provides much-needed space and capabilities to support accomplishment of the DOE mission in areas such as photovoltaics, hydrogen, solar, buildings, solid-state lighting, thin-film energy coatings and devices, electrochromics, and nanotechnology. The facility was constructed to obtain a Leadership in Energy and Environmental Design (LEED)<sup>™</sup> Gold standard and demonstrates NREL's commitment to walking the talk of sustainability. The S&TF has already received a number of recognitions, including a DOE FEMP Energy Savers Showcase Award for outstanding design of country-wide and regional significance.

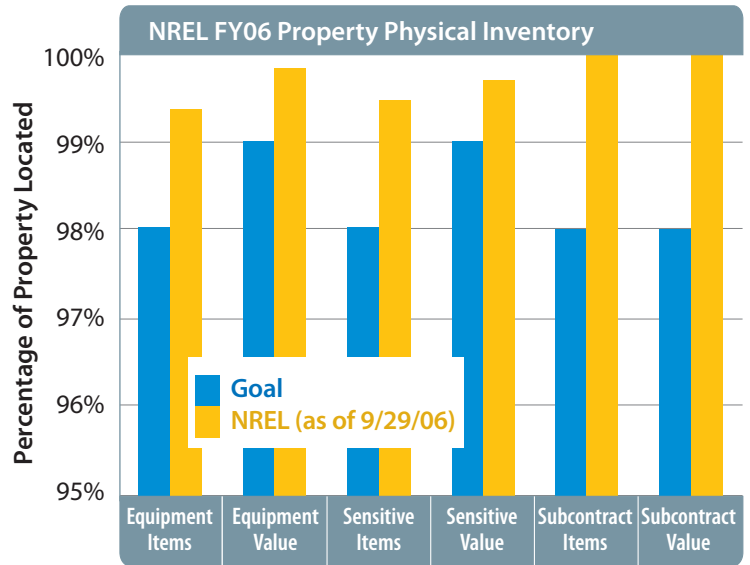
The need for expanded project management control is greatest when a project's risks, costs, and complexity are high. To ensure that all major construction (i.e., more than \$20 million) and information technology project work is planned, budgeted, and scheduled in time-phased "planned value" increments, the Laboratory continued to refine its capital project management process by responding to the new Earned Value Management System (EVMS) certification requirement. NREL implemented its comprehensive EVMS to encourage contractors to use effective internal cost and schedule management control systems, to improve reliability of timely data produced by those systems for determining product-oriented contract status, and to meet all EVMS certification requirements in support of DOE's goal for Laboratory certification.



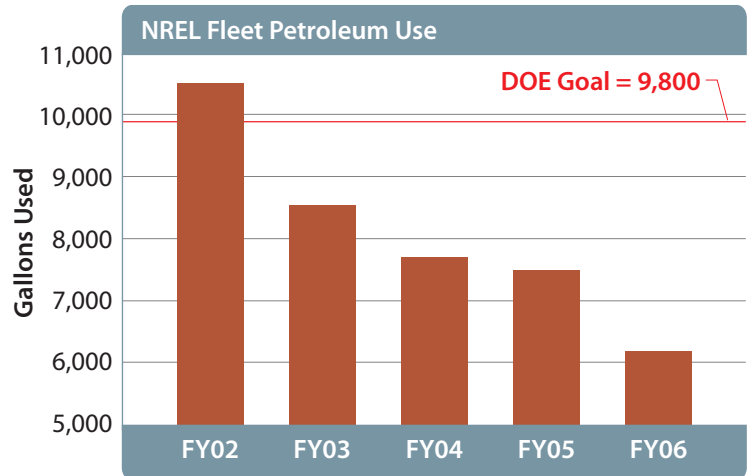
An example of effective stewardship of DOE assets can be found in NREL's property management system, which is rated among the best in the DOE laboratory complex. NREL's approach incorporates effective controls on acquisitions and use of property, whether it is at the Lab or in the custody of subcontractors. Results of an FY06 physical inventory indicate that NREL exceeded DOE's goal for the percentage of located property in all categories (i.e., equipment, sensitive, and subcontract).

The Laboratory has made a major commitment to the use of bio-based fuels in its fleet. Of NREL's 48 vehicles, 34 burn alternative fuels. Through administrative actions, increased accessibility and efficiency in delivering alternative fuel resources, and enforcement of the use of these resources, NREL was able to further reduce its petroleum consumption in FY06.

NREL also developed a more specific concept for building out the heart of the South Table Mountain site. This plan is based on the initial General Development Vision (or 25-year site plan) prepared in early FY04. Called the Grand Buildout Vision, this concept reflects the long-range intentions of the EERE programs as understood by NREL management and provides capabilities that NREL believes will be critical to meet the nation's future energy challenges. Developing and discussing this concept with stakeholders raised awareness of the magnitude of NREL's mission, the Laboratory's core competencies, and the potential of the Laboratory to affect the nation's energy future.

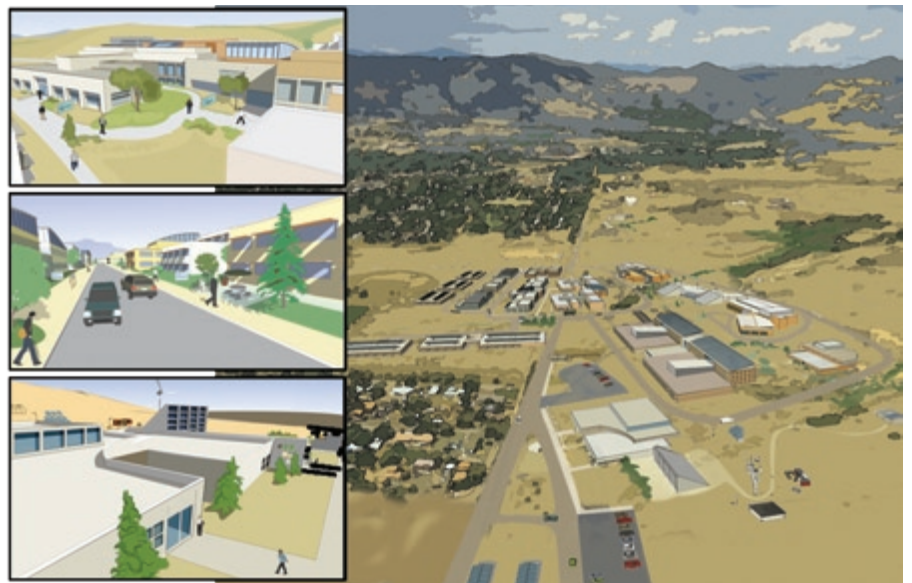


NREL surpassed DOE goals for located property percentages in all categories.



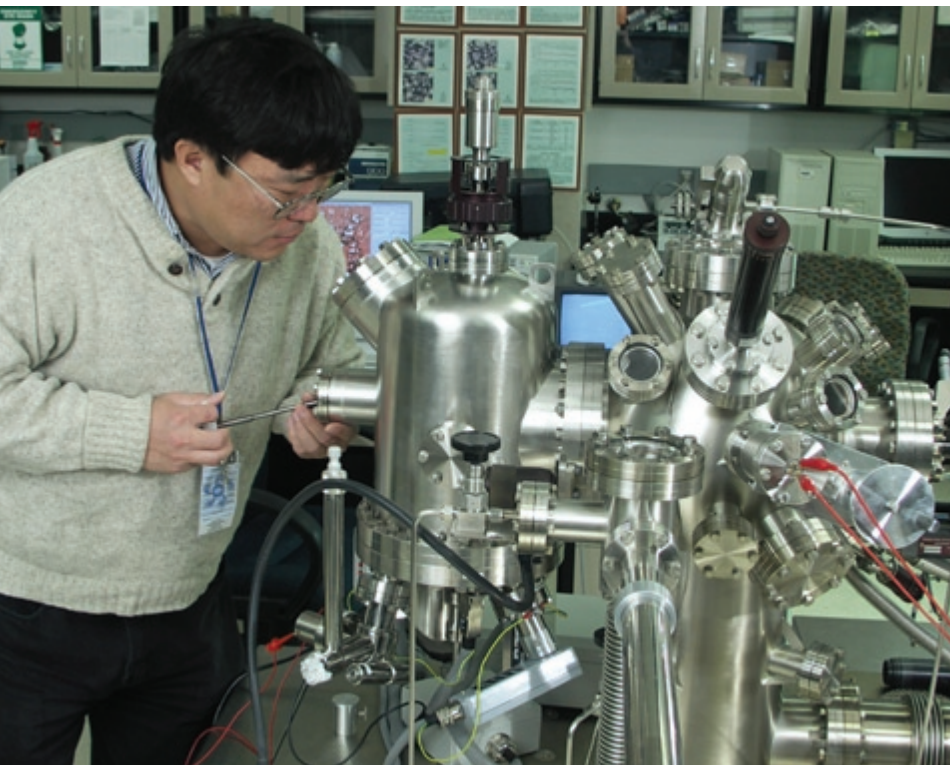
NREL's FY06 petroleum consumption was 37% less than DOE's established goal of 9,800 gallons for the Laboratory. Approximately 71% of NREL's vehicle fleet is alternatively fueled.

An artist's rendition of NREL's Grand Buildout Vision for its South Table Mountain Site in Golden, Colorado, incorporates new facilities and enhanced capabilities.



# Science and Technology

NREL is focused on bridging the critical interface between science and applied R&D. Effective translation of foundational science knowledge to applied R&D—translational research—is essential to accelerate progress toward national energy goals.



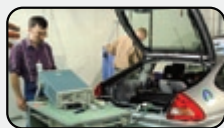
NREL FY06 PV R&D work set several world records for efficiency of solar energy capture, including one for the most efficient thin-film cell yet.

As the national center for energy efficiency and renewable energy technology, NREL works across the research and development spectrum, from fundamental underlying science concepts to commercial product testing and validation. For example, at the scientific end of the spectrum, super-computer modeling of semiconductors at the atomic scale guides research toward crystal structures that are likely to have the most advantageous properties for solar cells. At the opposite end of the spectrum, NREL's techno-economic analyses identify research to reduce cellulase enzyme cost as the key for cost-competitiveness of cellulosic ethanol.

The wellspring for the innovations and contributions of NREL is the strength of its distinctive competencies, foundational capabilities, and communities of practice. Together, these create a unique technical signature for the Laboratory that forms the basis for delivering value to existing and new customers and attracting partnerships and talent. Distinctive competencies are evident in the combination of our internationally recognized talented and experienced staff, showcase facilities, and state-of-the-art equipment. NREL continues to strengthen its distinctive competencies by investing in new talent, forming partnerships, and conducting laboratory-directed R&D (LDRD) projects. NREL focuses its capability enhancement work on supporting the Laboratory's strategic priorities—i.e., bridging the interface from basic to applied research, facilitating systems-driven applied research, and accelerating the transfer of knowledge and technology. At the same time, NREL will continue to refine comprehensive plans for developing its competencies over a multiyear period.

Although it primarily pursues established DOE program goals, NREL also invests in innovative concepts that could lead to breakthrough

## Distinctive Competencies



**Integrated Energy System  
Engineering & Testing**



**Renewable Electricity  
Production & Use**



**Renewable Fuels  
Formulation & Use**



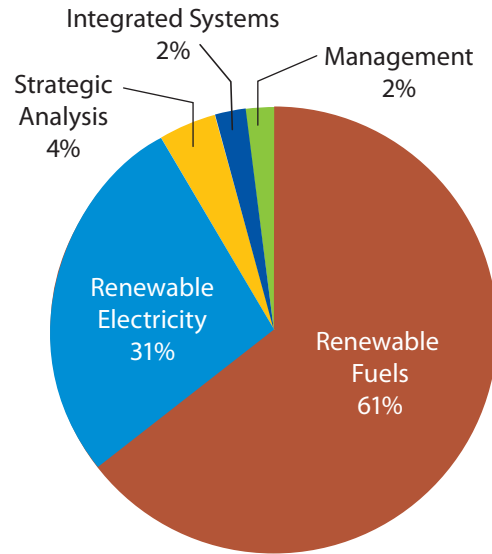
**Strategic Energy Analysis**

Four distinctive competencies underpin NREL's role in helping transform the nation's energy system.

technologies. For example, NREL's LDRD program provides the important link between the realm of discovery and the creation of advanced solutions by investing in early-concept research to help solve energy challenges. FY06 LDRD projects were closely aligned with NREL's distinctive competencies and research areas.

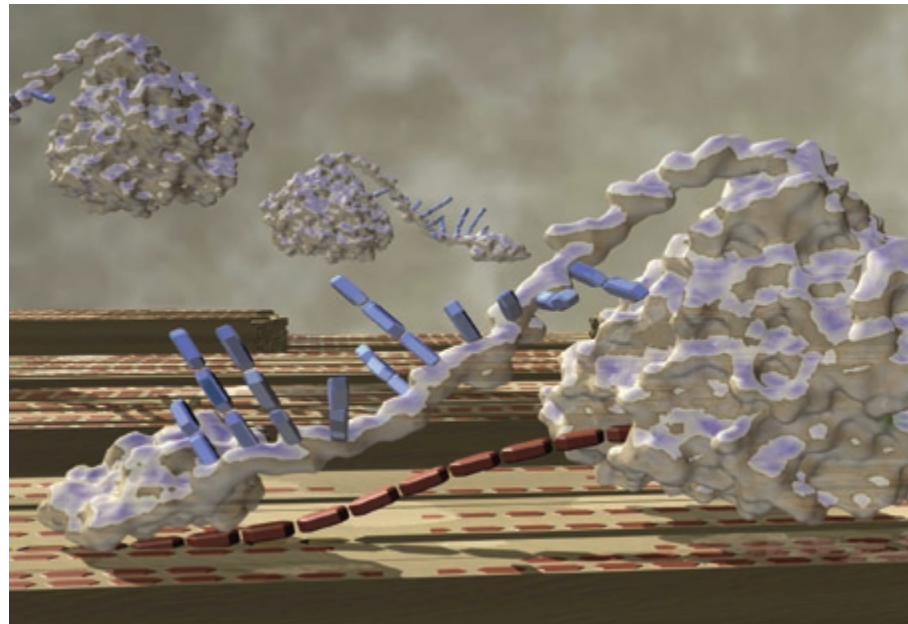
Photovoltaic (PV) conversion of sunlight to electricity by solar cells is the epitome of renewable energy. NREL scientists play key roles in the development of the technical foundation for the current U.S. PV industry and the groundwork for the next generations of solar cells. NREL's FY06 work on multiple-exciton generation in nanoscale materials is a classic example of translational research. Nanoscale (one-billionth of a meter) materials can have very different—and often exciting—properties from their bulk counterparts. In the PV arena, NREL scientists continued to demonstrate that nanoscale structures of certain materials show potential for significantly higher solar conversion efficiency than previously thought possible. To accelerate progress toward effective and efficient nanostructure-based PV devices, NREL researchers applied their scientific expertise, including modeling and computer simulations, to identify promising nanoscale materials.

Renewable alternatives to imported oil are a national energy priority, and NREL is a leading player in the development of technology for producing fuel ethanol from cellulosic biomass—the fibrous bulk of plant material. NREL's computational modeling of the function of cellobiohydrolase enzymes revealed unanticipated changes in shape as the enzymes act on biomass. Understanding these changes could be critical to future technology improvement because these enzymes play a key role in breaking cellulose down to sugar to allow fermentation to ethanol.



#### LDRD Funding Commitment by Distinctive Competency

The early-stage concepts explored through NREL's LDRD program provide a basis for initial exploration of new technical concepts that have potential to impact DOE goals.



Computational modeling of the enzymatic breakdown of cellulose gave NREL researchers key new insight into how the process functions.

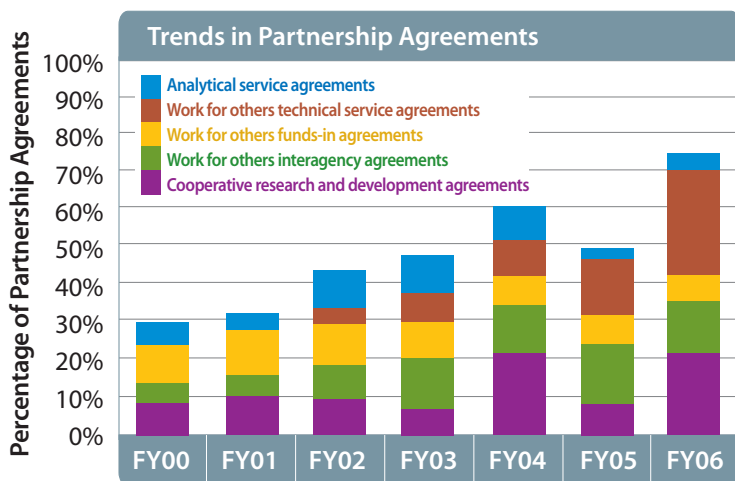


# Technology Transfer

NREL leverages and advances the Laboratory's knowledge and technology assets to meet increased national and world energy market needs. The Laboratory's technical knowledge helps optimize the design of commercial energy projects and production processes, informs technology and policy decisions, and removes market barriers.



NREL works with industry to develop research partnerships.



Commercial interest in NREL's accumulated knowledge and expertise continues to grow.

The development of robust technology partnerships is key to delivering NREL technology and knowledge assets to transform the commercial market. Partnerships that advance NREL technologies come in the form of license agreements and a variety of technology maturation partnerships.

Eight new commercial licenses were executed in FY06 to advance technology toward commercialization. Among the licenses were several thin-film patents and a hydrogen sensor patent. Strict diligence provisions and royalty rates ensured that licensees are committed to timely commercialization. In addition to the commercial licenses, 10 research licenses and two material transfer agreements were executed.

The number of technology partnerships based on cooperative research and development agreements and work for others agreements increased dramatically in FY06—to more than double the previous fiscal year's. There was a marked increase in commercial interest in NREL's accumulated knowledge and expertise in leveraging biomass technology into fuels, chemicals, and value-added products. Eighteen partnership agreements were signed or developed, bringing more than \$2.3 million to advance the biochemical and thermochemical conversion of biomass. These projects run the gamut from providing technical reports based on public data to initiating new long-term research directions. In the electricity area, 18 partnership agreements—valued at more than \$9.6 million in new funding and shared resources—were developed for work on solar, energy efficiency, and renewable technologies.



An innovation management system was also created and implemented to strengthen and develop the transfer of NREL knowledge and know-how to commercial partners. Through this management system, NREL strengthened its practice of proactive engagement with researchers to identify and manage innovations that exhibit strong commercial promise.

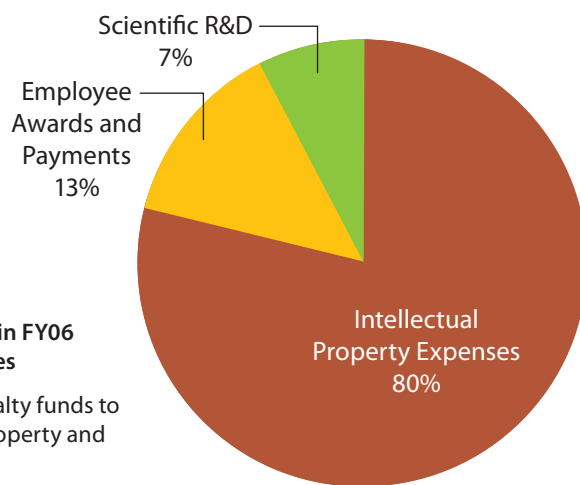
At the beginning of FY06, NREL had accumulated \$1.7 million in license revenue from prior years. During the year, the Lab received an additional \$287,000, about half of which was from licenses executed in FY06. Laboratory expenditures in FY06 totaled \$478,000, the majority of which was for patent protection and maintenance, followed by payments to inventors and scientific R&D. NREL has continued to facilitate work for others projects by using revolving loans of license revenue to meet the DOE-required 90-day advance funding when it cannot be obtained from the client. Of the license funds available at year end, about 44% was committed to outstanding loans.

Concerted efforts were undertaken in FY06 to remove knowledge, policy, and institutional barriers that impede end user adoption of renewable energy and energy efficiency technologies and practices. NREL knowledge was provided to identify barriers and assess policy alternatives. In addition, NREL educated market players and policymakers and made tools and data available to enable other organizations to conduct their own assessments of options.

In FY06, NREL recognized its researchers who received intellectual property awards.

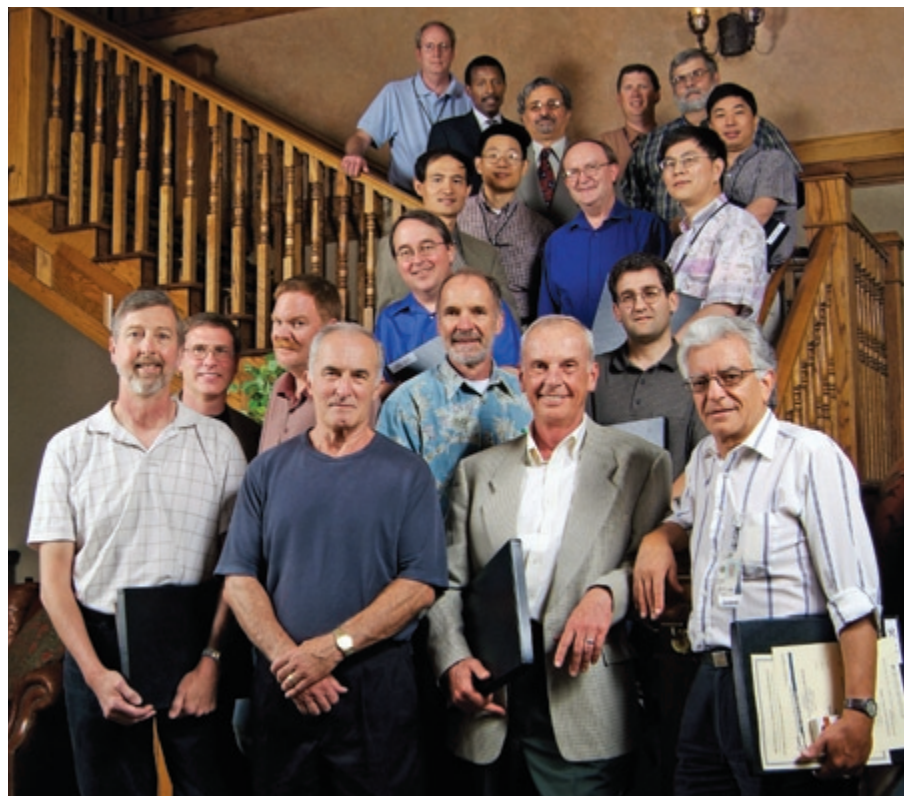
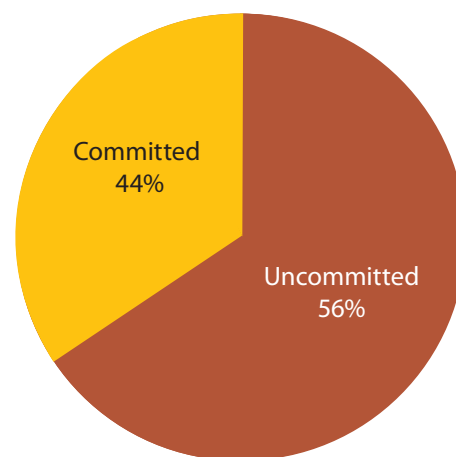
**Use of Royalty Funds in FY06  
\$478,000 Expenditures**

NREL leverages its royalty funds to protect intellectual property and promote innovation.



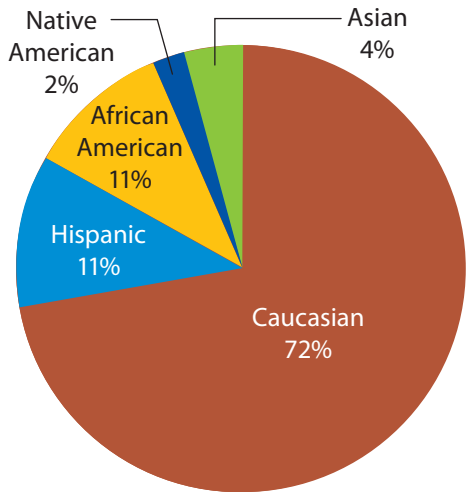
**Funds Available for Expenditure**

NREL's uncommitted funding is used to develop additional R&D partnerships in the private sector.



# Public Responsibility

Through numerous education and outreach programs, NREL reached more educators, students, and consumers than ever before, further instilling an appreciation of science, mathematics, technology, and engineering.



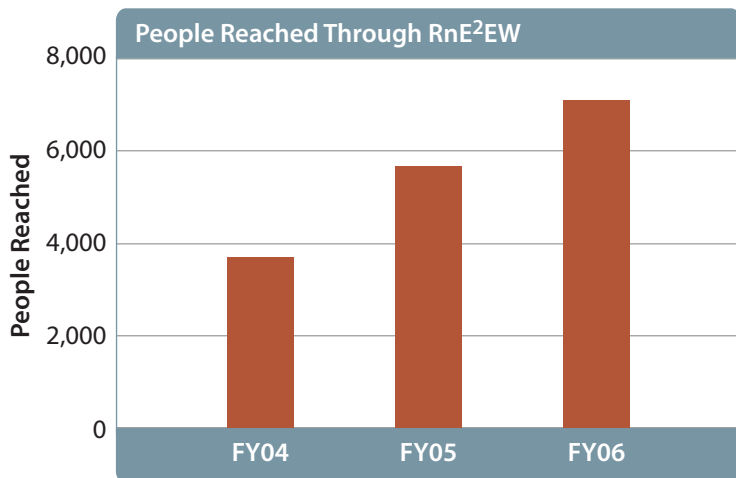
### Intern Ethnicity

NREL's Office of Science intern program demonstrates the Laboratory's commitment to diversity.

NREL internships increased Laboratory visibility through workforce development and supported the advancement of NREL's scientific knowledge. Recognized for its stellar internship program by DOE's Office of Science, NREL provides opportunities for students to participate in the Laboratory's state-of-the-art research and development programs, initiate new areas of research, and establish a base for ongoing collaborations. NREL's intern program was ranked among the top four of all national labs in program excellence. Internships continue to contribute to the development and diversity of NREL.

The Laboratory's commitment to science and technology education is evident by the opportunities it provides for thousands of underserved students. The Coalition for Learning Opportunities and United Tutors, a hands-on science literacy enhancement program, helps fourth-grade students from area elementary schools improve their science reading skills through one-on-one tutoring. Indicative of the program's success, the number of participating schools increased 43% in FY06, and participation among students increased 58%.

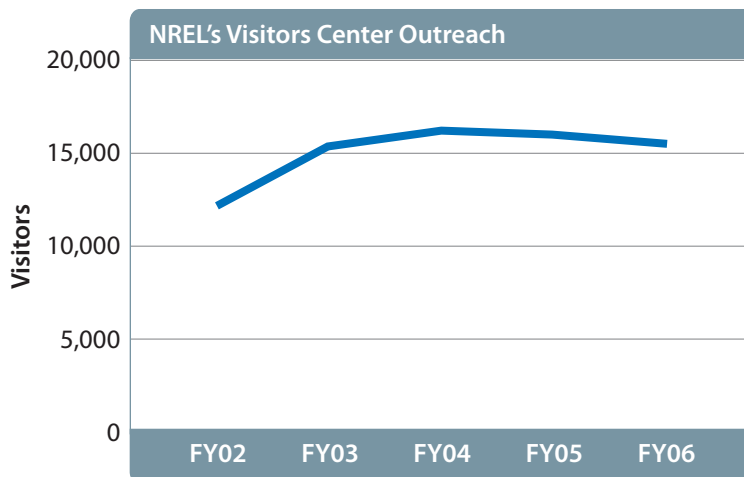
NREL also sponsors other educational programs such as RnE<sup>2</sup>EW, an educational-outreach vehicle that is the result of a successful BP America-NREL partnership. RnE<sup>2</sup>EW has proved to be an effective way to take renewable energy and energy efficiency sciences to students, teachers, and the community. In FY06, RnE<sup>2</sup>EW reached almost 23% more people than the year before.



RnE<sup>2</sup>EW educates students, teachers, and the community about renewable energy and efficiency sciences and showcases DOE/NREL research and technology.

NREL's Visitors Center continues to showcase technologies that can save energy, improve the environment, and lower energy bills. Innovative programs and special events in FY06 included public programs, consumer workshops, solar home tour activities, and a day-long Smart Energy Living Expo. The Visitors Center's successful programs and interactive exhibits, combined with outreach strategies and increased consumer interest in renewable energy, continue to attract a large number of visitors to NREL.

NREL's 1,160 scientists and other employees are dedicated to advancing renewable energy and energy efficiency research and development. Operating out of a cluster of buildings at the foot of South Table Mountain off Interstate 70 in Golden, Colorado, the Laboratory serves as a magnet for and generator of scores of enterprises that develop commercial technologies to harness the power of wind, solar, and biomass energy. NREL operates on a budget of about \$200 million a year. More than one-third is awarded through competitive subcontracts to industrial partners and researchers at universities across the country; the remainder is spent in the local economy. Through contracts with Colorado businesses and universities, NREL contributed \$20 million to Colorado's economy in FY06. The Laboratory's payroll in the state was \$68 million. The Lab also spent nearly \$61 million in non-payroll expenses, which worked its way through the state's economy to support other workers. Other contributions to the state include facilitating startup businesses and donating more than \$130,000 to charities. All together, NREL contributed \$149 million to the state of Colorado in FY06.



The attraction of NREL's Visitors Center is indicative of the Laboratory's strong reputation as a resource for consumer information and educational opportunities.



Showcasing DOE-NREL research and technology, RnE<sup>2</sup>EW reached a record number of teachers, students, and consumers in FY06.

NREL annually reports on various aspects of performance such as research accomplishments, technology transfer, and site sustainability. Please visit [www.nrel.gov](http://www.nrel.gov) to learn more about the work performed at the Laboratory.



# National Renewable Energy Laboratory

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