NREL
NATIONAL RENEWABLE ENERGY LABORATORY

National Renewable Energy Laboratory Sustainability Report FY 2009

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.

Cover Photos (clockwise)

Researchers develop models and tools for renewable energy research. PIX 16560
The National Wind Technology Center. PIX 18010
Photovoltaic array at NREL's South Table Mountain site. PIX 16560

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Message from the Director

NREL is the only federal laboratory dedicated to the research, development, commercialization and deployment of renewable energy and energy efficiency technologies. NREL leads the way in helping meet the growing demand for clean energy and advancing the U.S. Department of Energy's and our nation's energy goals.

NREL's budget for infrastructure construction has increased by a factor of ten over just the past few years. In 2009, this historic growth is reflected in a 35% growth in personnel and construction starts at South Table Mountain (STM), including the:

- Research Support Facility (RSF), a 218,000 ft^2 office building scheduled for completion by June 2010
- Integrated Biorefinery Research Facility (IBRF), a 42,700 ft^2 expansion of the Alternative Fuels User Facility, scheduled for completion in 2010
- Energy Systems Integration Facility (ESIF), a 130,000 ft^2 research building scheduled for completion in 2011.

With the completion of these buildings along with a second RSF, which is to begin construction in 2011, NREL is realizing a decade-long ambition of consolidating NREL staff at the STM site.

Design and planning for these highly energy-efficient buildings enable NREL to model sustainability to the nation. Furthering NREL's commitment to sustainability, in February 2009 we created a Sustainability Program to focus on lab-wide activities such as: enhancing NREL's sustainability policy, implementing a Sustainable NREL Master Plan, and supporting sustainable campus planning–traffic mitigation and integrating sustainability in NREL's Environmental Management System.

Our leadership in sustainability strengthens our standing as the nation's preeminent institution for renewable energy and energy efficiency R&D. In support of our mission, we continue to proactively pursue sustainability in all of our operations–incorporating on-site wind and photovoltaic (PV) projects at most of our facilities that produce 5,054,193 kWh annually. (For details refer to the section on Renewable Energy.)

Our work is enormously challenging and essential to our energy future. It is a crucial part of creating a sustainable energy future for not only our laboratory, but for the nation and the world.

Dan Arvizu, NREL Director

PIX 01735

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ACKNOWLEDGMENTS

The Sustainable NREL Program is based on laboratory-wide performance objectives, supporting goals, specific implementation strategies and the overall management plan. The Program is managed by Frank Rukavina, NREL's Director of Sustainability and supported by Ellen Fortier, NREL Sustainability Coordinator.

The following NREL management and staff members have primary roles in implementing the Sustainable NREL Program: NREL Executive Management (laboratory stewardship and direction); Drew Detamore (site planning and new buildings); Chandra Shah (water and green power purchasing); Otto VanGeet and Chris Gaul (electricity and natural gas use); Kari Burman (greenhouse gas reductions); Tim Peele (transportation); Karri Bottom and the Near-Zero Waste Committee (materials); Maureen Jordan (environmental management systems); Grace Griego (communications); Laura Michael (policies and procedures); Kerry Masson (public responsibility); and Barb Stokes (financial stewardship).

Overview

NREL's scientists and researchers support critical market objectives to accelerate research from scientific innovations to market-viable alternative energy solutions–thereby contributing to the nation's goal for finding new renewable ways to power our homes, businesses, and cars. At the core of this strategic direction are NREL's research and technology development competencies including:

- Renewable electricity–solar, wind, and geothermal
- Renewable fuels–biomass and hydrogen
- Integrated energy systems–buildings, vehicle systems, and electricity and transportation infrastructure
- Strategic energy analysis–policy, economic, financial, and market analysis, and planning and portfolio prioritization.

The successful deployment of clean energy efficiency and renewable energy technologies will help:

- Reduce the nation's dependency on imported oil
- Improve energy security
- Reduce pollution and greenhouse gases that contribute to global climate change
- Contribute to a cleaner environment and increased wellness
- Boost the economy through the creation of new jobs
- Increase affordable clean energy options for consumers.

LABORATORY BACKGROUND

Established in 1974, NREL began operating in 1977 as the Solar Energy Research Institute as a government-owned, contractor-operated laboratory of the U.S. Department of Energy (DOE). In September 1991, it was designated a national laboratory and renamed the National Renewable Energy Laboratory. NREL conducts research primarily for DOE's Office of Energy Efficiency and Renewable Energy. The DOE Golden Field Office provides oversight to the laboratory, which is operated by the Alliance for Sustainable Energy, LLC.

Converting biomass to fuels is one of many scientific innovations that support the nation's energy goals.

PIX 16371

Sustainability Goals

Our energy choices have global implications that affect greenhouse gas emissions, energy consumption, water resources, and material use. Energy efficiency and renewable energy use are pivotal in addressing many of the top challenges facing our nation and the world as a whole: protecting the environment, achieving energy security, and reducing petroleum dependence.

As the nation's preeminent institution for renewable energy and energy efficiency R&D, it is NREL's goal to provide leadership and serve as a global model for sustainability under DOE Order 430.2B which establishes aggressive goals as it relates to energy efficiency, renewable energy use, sustainable building requirements, and conservation efforts at federal agencies.

DOE Order 430.2B

DOE Order 430.2B (Departmental Energy, Renewable Energy, and Transportation Management) consolidates the 2007 Executive Order (E.O.) and a follow-up DOE initiative, both of which were enacted to strengthen federal environmental, energy, and transportation management.

- E.O. 13423 established comprehensive, aggressive federal agency goals for increased energy efficiency, renewable energy generation and use, petroleum reduction/alternative fuel use, sustainable building standards, water conservation, and environmental protection.
- DOE Order 430.2B required that a binding Executable Plan to achieve compliance with all stipulated goals be submitted by December 31, 2008. DOE approved NREL's Executable Plan as meeting or exceeding all goal requirements.

This report describes NREL's progress in meeting and exceeding these goals in the areas of:

- Energy use reduction
- Renewable energy generation and use
- Greenhouse gas reduction
- Sustainable design/high performance buildings
- Petroleum and alternative fuel use
- Water use reduction
- Material use.

NREL's leadership in sustainability serves as a global model.

Courtesy of the Denver Chamber of Commence

About Sustainable NREL

NREL Sustainability Vision

NREL's vision is to build a laboratory of the future that is committed to sustainability, which is built on a framework of economic viability, environmental health, and public responsibility over the long term through appropriate investment decisions and operating practices.

Laboratory activities are integrated in our Environmental Management System, which emphasizes minimal use of resources such as energy, materials, and water, while maximizing the value of those resources.

This report shows NREL's progress in making sustainability an integral part of its corporate culture and providing a global sustainability model.

Sustainability Management Framework

Economic Viability

- Growth of the laboratory
- Small business commitment.

Environmental Stewardship

- Electricity/natural gas
- Energy efficiency
- Renewable energy
- Environmental footprint
- GHG reduction
- Environmental management
- Campus
  - Sustainable green buildings
- Transportation
  - Traffic management
- Water conservation
- Materials (reduce, recycle, reuse, rebuy)
- Educational communication.

Social Responsibility

- Local traffic reduction
- Community outreach
- Education outreach
- Ecomonic outreach.

NREL's laboratory of the future is committed to sustainability.

PIX 14540

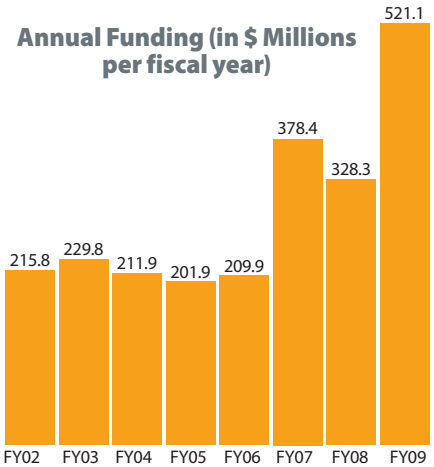
Economic Viability

NREL continues to advance the nation's energy goals by developing innovative technologies to change the way we power our homes and businesses, and fuel our cars–while reducing the laboratory's environmental impact and carbon footprint.

In the process of accomplishing these goals, the laboratory's sustainability practices enable NREL to maximize its resources, both natural and financial. Thanks to leaders across the nation, and their focus on renewable energy and energy efficiency, NREL experienced an increase in resources in FY 2009.

Economic Growth

Budgets increased to $521.1 million from $328.3 million the previous fiscal year and the number of NREL workers to carry out the laboratory's mission grew 35% to a total of 1,845.



Staffing Increases				
Year	Staff Regular & Temp	Research Program Participants	Non Pay-rolled	Total Campus
Sept. 2008	1004	126	234	1364
Sept. 2009	1250	175	410	1845
35% Increase from FY 2008				

This growth not only benefits the nation in our increased ability to find clean energy solutions, but also benefits the economy–creating more jobs and opportunities for large and small businesses.

Small Business Commitment

Working with small businesses is a cornerstone of NREL's philosophy. The Small Business Partnerships Development manager continually seeks to partner with small, small-disadvantaged, women-owned, HUBZone, veteran-owned, and disabled-veteran owned businesses.

Another key feature of NREL's commitment to small business concerns is through our Technology Partnerships Program. NREL works with DOE in processing Cooperative Research and Development Agreements (CRADAs) and Work for Others (WFO) agreements to build a better understanding of the market drivers for the renewable energy community. With the renewable energy market continuing to develop, small businesses that want to be competitive in the market place are bringing funds to NREL to support technology maturation and commercialization. NREL's commitment to small business makes it possible to build lasting and successful technology partnerships.

A further reflection of NREL's commitment to the small business community is through a workplace culture that embraces diversity. Additionally, NREL's Office of Education Programs develops and implements science programs that engage the minds of our future leaders, scientists, and engineers that ultimately increase the number of women and other minorities in science and engineering careers.

Small Business Partnerships		
Small Business Type	NREL Goal	NREL Actual
Small Business	60.0%	58.40%
Women Owned Business	5.0%	10.92%
Small Disadvantage Business	5.0%	11.80%
HubZone	3.0%	3.97%
Veteran-Owned	2.0%	3.84%
Service Disabled Veteran Owned	3.0%	1.67%

Environmental Stewardship

NREL has accepted DOE's challenge to provide leadership in environmental stewardship the DOE complex by achieving or exceeding Executive Order 430.2B. By actively working to maintain a sustainable environment in our own workplace the laboratory demonstrates its commitment to minimal use of resources and balance environmental, economic, and human impacts.

Energy Efficiency

Energy Use Reduction Goal

DOE Order 430.2B. **Beginning in FY 2006 improve energy efficiency through reduction of energy use intensity by 3% annually through the end of FY 2015 or 30% by the end of FY 2015 as compared to the baseline energy use in FY 2003.**

Progress. **In FY 2009 NREL's energy use intensity decreased 7% from our FY 2003 baseline. This did not include the allowable Renewable Energy Credit (REC) reductions. NREL will exceed the FY 2015 goal through the significant additions of highly energy efficient new buildings (exclusive of the use of RECs).**

Energy use reduction on NREL's campus is focused on the design and construction of highly energy-efficient new buildings (see the section on Sustainable Green Buildings). Cost-effective energy-efficiency retrofit opportunities have, for all practical purposes, been implemented. Specifically, NREL expects to exceed the required FY 2015 energy use intensity reduction goal of 30% by significantly exceeding the energy use requirements of the federal energy efficiency new construction requirements.

Renewable Energy

Renewable Energy Generation and Use Goals

DOE Order 430.2B. **Use of renewable energy shall be 3% for each year from FY 2008 through FY 2009; 5% from FY 2010 through FY 2012; and 7.5% from FY 2013 forward. At least half of the statutorily required renewable energy consumed each fiscal year shall come from "new" (post January 1, 1999) renewable sources.**

Progress. **FY 2009 renewable energy use was 100% of annual electric consumption achieved primarily through the utilization of on-site renewable energy projects and the purchase of RECs. One hundred percent of the renewable energy use was from "new" renewable energy resources. These results significantly exceed the FY 2013 renewable energy electric generation and use goals.**

NREL's Mesa Top PV system located in Golden, Colorado has a 750 kW capacity and generated 1,015 MWh of electricity from January 1, 2009 to September 30, 2009. This electrical production represents 7% of NREL's STM site electrical consumption. This system was installed under Power Purchase Agreements (PPAs) with a third-party developer, and one will be purchased utilizing appropriations. The Mesa Top PV system was the first DOE PPA agreement. Additional on-site renewable energy projects are in the process of being completed. PV is planned for all new major buildings.

A 1.5 MW General Electric wind turbine, purchased by DOE, was installed at the NWTC on August 21, 2009; it began operation in October 2009. The estimated production from the DOE/GE

NREL's mesa top PV system produces 7% of NREL's STM site electrical consumption.

PIX 17748

turbine is 1,600,000 kWh/year (enough to serve 142 homes). In FY 2010 NREL plans to sell the power produced by this R&D turbine to the grid through a "sale of power" agreement with the local utility. The Siemens Turbine 2.3 MW, installed at the NWTC on September, 24, 2009, has an estimated production of 2,800,000 kWh/year (enough to serve 249 homes). It began operation in October 2009.

The thermal output of the Renewable Fuel Heating Plant (RFHP) positions NREL to significantly exceed the DOE Order 430.2B renewable energy thermal generation goal (7.5% of annual thermal energy use by FY 2013). The RFHP was installed through an energy savings performance contract (ESPC) and has been in full operation. Thus far there has been an 11% savings of natural gas.

In support of our mission and this DOE mandate, we continue to proactively pursue sustainability in all of our operations–incorporating on-site renewable energy projects shown in the table below.

DOE-GE 1.5-megawatt utilty-scale wind turbine at the National Wind Technology Center.

PIX 17705

On-site Renewable Energy Electric Generation			
Site	**Rating**	**Annual Energy**	**Operational Year**
South Table Mesa Top	720 kW	1,200,000 kWh	12/2008
Science and Technology Facility (S&TF)	94 kW	134,813 kWh	10/2009*
National Wind Technology Center (NWTC)	1,083 kW	1,913,661 kWh	10/2009*
Research Support Facility I (RSF I)	741 kW	976,009 kWh	6/2010*
RSF I Parking Garage	630 kW	829,710 kWh	6/2010*
Totals	3,268 kW	5,054,193 kWh	

*Scheduled operation dates

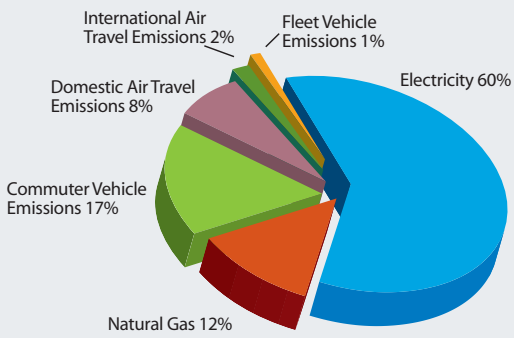
Environmental Footprint FY 2009

NREL began tracking its CO_2 emissions in FY 2003. NREL quantifies its "carbon footprint" by including emission sources beyond the laboratory's boundary, such as laboratory leased space, air travel, and the commuting of staff members 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 the graph.

The quantification of this footprint provides a metric which allows the laboratory to:

- Take into account the carbon implications of its investment decisions
- Measure progress towards achieving carbon reduction goals
- Benchmark performance
- Take responsibility for its actions.

FY 2009 CO_2 Emissions	
Source	**Kg CO_2 Eq.**
Electricity	19,306,657
Natural Gas	3,807,131
Commuter Vehicle Emissions	5,328,288
Domestic Air Travel Emissions	2,706,567
International Air Travel Emissions	707,823
Fleet Vehicle Emissions	249,893



FY 2009 CO_2 Emissions Breakdown

Greenhouse Gas Reduction

Greenhouse Gas (GHG) Reduction Goals

DOE Order 430.2B. Reduce GHG emissions by 3% annually, or 30% by the end of FY 2015, relative to GHG emissions in FY 2003.

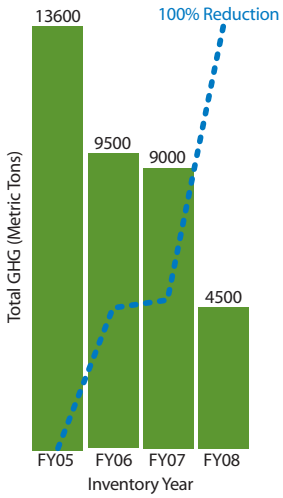
NREL Goals. NREL will achieve "carbon neutrality" annually. NREL has pledged through the Environmental Protection Agency (EPA) Climate Leaders Program (CLP) to reduce its total U.S. GHG emissions by 75% from 2005 to 2009.

Progress. In conjunction with energy use reduction performance, NREL is exceeding the DOE GHG reduction goals. NREL has met its FY 2009 EPA Climate Leaders GHG reduction goal.

New federal GHG reduction requirements are expected to be mandated as soon as 2010. These mandates will focus on GHG emission measurement and reduction and utilize these reductions as its primary metric.

NREL is well positioned to provide leadership in this area, having established a GHG emission inventory with reduction goals since FY 2000 through the EPA CLP. NREL met its first goal in FY 2005, reducing its GHG emissions by 10% from the FY 2000 baseline. The laboratory set a second CLP goal of reducing its total GHG emissions by 75% from FY 2005 to FY 2009. NREL has exceeded this goal to totally offset the laboratory's CO_2 footprint with energy retrofits, on-site renewable energy projects, minimum Gold level ratings of the Leadership in Energy and Environmental Design (LEED®) standards for new construction and "green power" purchases of RECs and carbon credits.

Climate Leaders Program
NREL Total GHG Emissions



Environmental Management

NREL's Environmental Management System (EMS) provides effective environmental stewardship of its federally-owned sites and minimizes the environmental impacts of our activities wherever we are working, whether on our own sites or the sites of partners or subcontractors. The laboratory's environmental management efforts:

- Ensure biodiversity by protecting and enhancing the vegetation, wildlife, and natural resources of our sites
- Comply with environmental requirements
- Encourage continuous improvement in environmental protection.

NREL prepares an annual environmental performance report, summarizing NREL's environmental protection programs and activities. It includes a brief summary of how the program is managed in each area, including any permitting or notification efforts that have been completed during the reporting period. These reports are available on the NREL Environmental Health and Safety Website, www.nrel.gov/eshq/environmental_management_system.html.

NREL's EMS conforms to the International Standards for Environmental Management Systems described by ISO 14001:1996(E). It also meets the criteria of Executive Order 13148, Greening the Government through Leadership in Environmental Management, and DOE Order 450.1, Environmental Protection Program, which requires each federal facility to implement an EMS.

The International Standard methodology is based on Plan-Do-Check-Act and is described as follows:

- Plan. Establish the objectives and processes necessary to deliver results in accordance with the organization's environmental policy.
- Do. Implement the processes.
- Check. Monitor and measure processes against environmental policy, objectives, and targets, legal and other requirements and report the results.
- Act. Take actions to continually improve the performance of the environmental management system.

The new highly energy-efficient RSF I uses renewable resources and is being constructed with enviroment-friendly materials.

PIX 16634

Campus–Sustainable Green Buildings

Sustainable Design/High Performance Buildings Goals

DOE Order 430.2B. **New construction and major renovations shall comply with the Guiding Principles for Federal Leadership in High Performance and Sustainable Building (Guiding Principles). Fifteen percent of the existing building inventory as of the end of FY 2015 will incorporate the sustainable practices in the Guiding Principles. DOE sites will achieve a LEED "Gold" rating on all new buildings.**

Progress. **All laboratory new construction complies with the Guiding Principles. As of FY 2009, 13% of NREL's existing building inventory incorporates the sustainable practices in the Guiding Principles. With the completion of the RSF I in FY 2010, NREL will significantly exceed the FY 2015 15% goal.**

The first priority of the NREL campus energy strategy is to invest in site design and building development to maximize energy efficiency with appropriate building orientation and mass. This strategy takes advantage of passive solar design for heating, cooling, and natural lighting in all new building construction. Low-energy design strategies in office buildings focus primarily on reducing energy for lighting and cooling. Strategies in laboratories focus on reducing the energy needed to meet ventilation requirements.

NREL's new major building, the RSF I, is a 220,000 sq. ft. office building scheduled for occupancy in June 2010. The RSF I is a design-build project with a conservative energy budget of 32,000 Btu/sq. ft. The RSF I is also being designed as a highly energy-efficient building at the LEED Platinum level.

Increased demand for renewable energy and energy efficiency technologies requires critical laboratory space and partnering facilities. Attributes of the planned space include energy efficiency, carbon neutrality, and LEED Platinum or Gold certification.

In addition, NREL manages the impact on the environment caused by the placement and general design of NREL structures–maintaining, protecting, and restoring natural and landscaped environments to sustain natural and native ecological systems, within and around NREL campuses.

Transportation

Petroleum and Alternative Fuel Use Goals

***DOE Order 430.2B*. Reduce total fleet petroleum product consumption by 2% annually through the end of FY 2015 as compared to the FY 2005 baseline.**

Increase the total fleet fuel consumption that is nonpetroleum-based by 10% annually.

***Progress*. NREL made negative progress in this area. See alternative-fuel vehicles and biobased fuels.**

Alternative-fuel vehicles and bio-based fuels

NREL's fleet of vehicles currently consists of one diesel commercial leased vehicle and 46 GSA vehicles. Thirty-six of the fleet use alternative fuels, three use diesel, and seven use unleaded gasoline.

In FY 2009, NREL's fleet consumption increased significantly. The use of E85 fuel increased 34% due to (but not limited to) several factors:

- E85 fuel was not made available at the nearest E85 station (within five miles or 15 minutes).
- NREL's on site FAST CNG (compressed natural gas) station has been inoperable since April 2009.
- Local mileage increased.
- The alternative fuel vehicles used for snow removal were unable to fuel with alternative fuel due to fuel unavailability.
- NREL replaced two GSA CNG dedicated 15-passenger vans with two GSA diesel buses to assist in shuttling NREL's employees on site. NREL's shuttles are increasingly used to transport employees to and from local bus stops and for tours, visitors, etc. Fewer employees are using their personal vehicles on-site.
- NREL replaced one GSA bi-fuel CNG pickup truck with a C4500 unleaded box truck to assist NREL's Shipping and Receiving (S&R) Department with their deliveries to include (but not limited to) gases, chemicals, large research equipment, etc. The smaller vehicle did not meet the requirements which impacted S&R's mission.

Traffic Management

To help ease traffic concerns, address planned parking management, and to decrease the reliance on single occupant vehicle trips, NREL developed a transportation program to help manage traffic at the STM site. The program includes alternative commuting, flexible work practices, telecommuting, and a traffic Mitigation Plan.

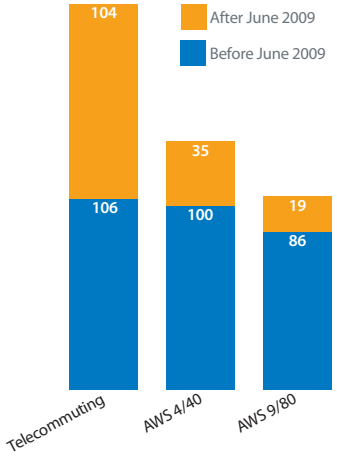
Alternative Commuting

- NREL provides free Eco Passes to use the Regional Transportation District (RTD) public transportation. This includes unlimited RTD regional, express, local, light rail, and Call-n-Ride services
- Alternative-fuel shuttle vehicles help reduce miles traveled at NREL's STM and Denver West sites in Golden, Colorado.

Flexible Work Practices

Conferencing by video, telephone, and the internet as well as alternative work schedules (AWS) provide flexibility in how people work–saving time, energy, and money. An AWS policy allows employees to work varying schedules (with management approval), including four-day workweeks–reducing the miles driven by employees to and from the laboratory.

Number of Employees Telecommuting & Alternative Work Schedules



Telecommuting Program

A Telecommuting Pilot Program began in FY 2009 and was offered to 492 employees in 12 NREL offices and programs. The pilot program's success is resulting in a laboratory-wide program which will be available to all NREL employees in FY 2010. Telecommuting benefits include:

- High performing workforce. Higher morale and commitment, improved recruitment and retention of global talent
- Sustainability. Reduced greenhouse gases, energy use, waste generation, facility size, parking requirements, traffic impact on-and off-site
- Economics. Reduced employee commuting costs (fuel and vehicle maintenance)
- Work-life balance.

Traffic Mitigation Plan

NREL engaged Felsburg, Holt, and Ullevig and Urban Trans Consultants to propose a Traffic Mitigation Plan to address the traffic impacts associated with the growth on the STM campus. The goal of the Traffic Mitigation Plan is to reduce morning and afternoon peak hour vehicle trips to and from the STM site by 24.4%.

Specific recommendations of the plan address internal policies and programs, trip linkages, transit accessibility, parking management and on-site transportation demand management strategies all of which enable NREL to address traffic and parking objectives.

The Traffic Mitigation Plan will be implemented in three phases:

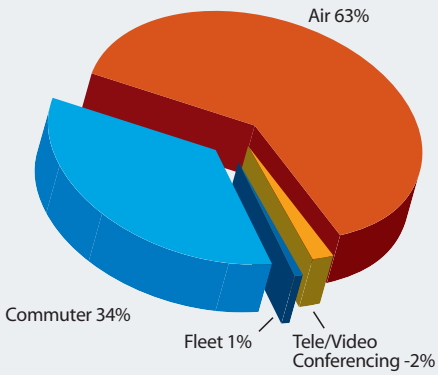
1. Startup (2008-2010)
2. Occupancy, which will begin when employees at Denver West Office Park begin to relocate to the STM site
3. Build-out of the STM site.

Teleconferencing Reduces Commuter Miles

The use of video conferencing, webinars, etc. displaced approximately 553 flights, 3,300 air miles, and 3,868 hours of flight time. This calculation was based on activities of the laboratory's two main offices located in: Golden, Colorado and Washington, D.C. In FY 2009, it is estimated that NREL's audio, video conferencing and webinars increased approximately 45% from FY 2008. International and domestic air travel represents 63% of the total commuter miles traveled. The pie chart summarizes the various commuting methods used by NREL.

PIX 16578

FY 2009 Commuter Miles



Traffic Mitigation				
Strategy Categories	Recommendations	Phases		
		Startup	Occupancy	Build-out
Program Management	Designate Transportation Program Coordinator	X		
	Distribute Information and Resources	X	X	X
	Promote Regional Program/Events	X	X	X
	Develop Marketing Materials	X	X	X
	Facilitate Carpool Ridematching		X	X
	Incentive Program Administration		X	X
	Shuttle Operations Management		X	X
	Parking Program Administration		X	X
	Program Evaluation and Monitoring		X	X
Flextime	Flextime Program Policy Planning	X		
	Implement Flexible Work Schedules		X	X
Telework	Telework Program Policy Planning	X		
	Telework Program Implementation		X	X
Shuttles	Prepare Shuttle Service Plan	X		
	Implement Increased Shuttle Service		X	X
Carpool/Vanpool	Implement Carpool Ridematching		X	X
	Establish Vanpools		X	X
Facilities/Amenities	Implement Site Facilities/Amenities (Sidewalks, Bike Racks, etc.)		X	X
Incentives	Continue RTD Eco Pass Program	X	X	X
	Implement Incentive Program		X	X
Parking Management	Develop Parking Management Plan	X		
	Implement Preferential Parking		X	X
	Parking Program Implementation		X	X

Water Conservation

Water Use Reduction Goal

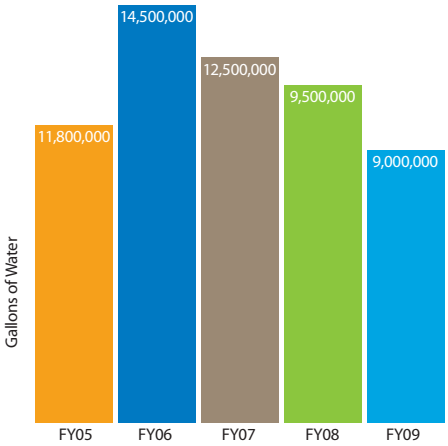
***DOE Order 430.2B*. Beginning in FY 2008, NREL will reduce water consumption intensity by 2% annually through the end of FY 2015 or 16% by the end of FY 2015, relative to the baseline water consumption in FY 2007.**

***Progress*. In FY 2009, NREL reduced its water consumption by 27% relative to the FY 2007 baseline. To exceed the overall reduction goal of 16%, NREL will continue to incorporate water saving measures in all new construction facilities to achieve the minimum LEED Gold rating.**

The FY 2007 NREL water consumption baseline is 13.2 million gallons or a water consumption intensity of 28.7 gallons/sq. ft. In 2009, NREL reduced its water consumption by 27% relative to the FY 2007 baseline. For FY 2009, the S&TF had a water consumption intensity of 20.79 gallons/sq. ft. The water consumption table shows the total annual laboratory water consumption from FY 2005 to FY 2009.

NREL will incorporate water conservation measures in all new construction facilities as a part of achieving the minimum LEED Gold certification. Meeting LEED requirements will result in a 34% water consumption reduction at the RSF I. Based on the RSF I design, this facility will consume 786,700 gallons of water-a water consumption intensity of 3.6 gallons/sq. ft. For existing buildings, water conservation retrofit goals have been established and are being implemented.

Water Consumption



Material Use

Material Use Goals:

***DOE Order 430.2B*. Ensure that the laboratory reduces the quantity of toxic and hazardous chemicals and materials acquired, used, or disposed of by the laboratory; increase diversion of solid waste as appropriate; and maintain cost effective waste prevention and recycling programs.**

***NREL Goal*. Near Zero Waste (working to eliminate the laboratory's waste stream).**

***Progress*. Since FY 2003, NREL's recycled waste has increased by 58%, even with our campus increasing by 117,263 sq. ft. This does not include scrap metal, batteries, e-waste and other items. NREL has implemented comprehensive reduce, reuse, recycle and re-buy activities.**

NREL is working toward near-zero waste–taking the 4Rs program (reduce, reuse, recycling and re-buy) to a higher level–systematically eliminating the laboratory's waste stream.

Reduce

NREL reduces material use by:

- Replacing paper drafts with electronic files
- Installing duplex modules on all network printers for double-sided printing option
- Reusing cardboard boxes, packing peanuts, plastic containers, and drums
- Sharing chemicals and redistributing extra chemicals through a chemical management system.

Reuse

NREL's Reusable Office Supply Depot provides opportunities for centers and offices to save money and help the environment by reusing office supplies that could end up in a landfill. Staff members are encouraged to take (and reuse) office supplies from the Depot or donate any new or good-as-new items for others to use.

Recycle

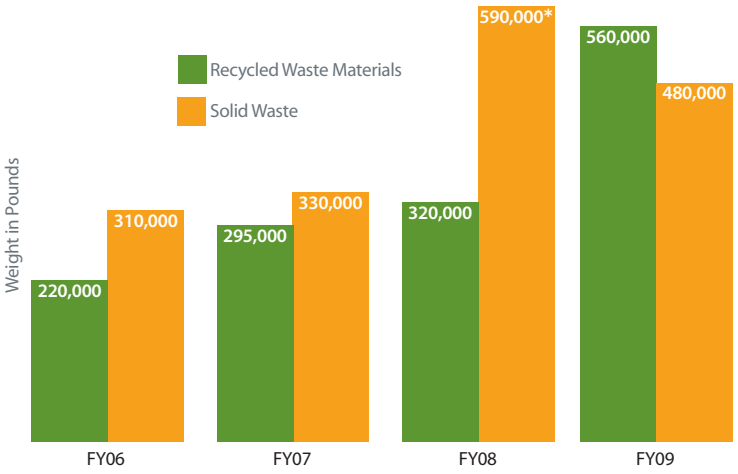
NREL's long-established recycling effort includes a recycling station in each building. All recyclable materials are commingled in specified bins; there are separate bins for large cardboard; containers for batteries; designated areas for printer toner cartridges; and each office/cubicle contains a small recycle basket. Scrap metal, wooden pallets, computer monitors, and fluorescent light bulbs are also recycled.

Prior to FY 2005, all recycled materials were separated and weighed and a monthly report was provided to NREL. In FY 2009 the recycling vendor went to a single stream, commingled pick-up. The vendor was unable to give weights, however they did provide NREL with estimates based on the different sizes of recycle bins. In FY 2009, the vendor provided NREL with a measurement system to more accurately calculate the weights for each pick-up.

Re-buy

NREL makes green purchasing possible through an online catalog featuring environmentally preferable (recycled content). These items include binders, paper, pens, post-its, calendars, file folders, etc. The laboratory's biggest purchase is of recycled toner cartridges which totaled $96K in FY 2009. Since 1999, 100% of all carpet and office paper have contained recycled content.

FY06-FY09 Total Waste Comparison



*This was a onetime clean up of the NWTC's "bone yard" which increased the FY 2008 numbers in NREL's solid waste significantly. Many materials were not recyclable (fiberglass turbine blades), but all scrap metal was recycled which is reflected in the table below.

Other Recycled Items (by pounds)				
Breakdown of Recycled Materials	**FY06**	**FY07**	**FY08**	**FY09**
Scrap metal	35,460	39,263	456,150	268,620
Batteries	4,304	3,803	64,595	11,905
Fluorescent light bulbs	1,058	426	260	661
Computer monitors	2,384	2,640	39,860	4,950
Wood	0	0	33	40,500
E-waste	0	0	0	19,280
Concrete	0	0	8,106,397	0

Social Responsibility

NREL works to improve sustainability of the local community and educate others about sustainability through a variety of outreach mechanisms including traffic reduction and community, education and economic outreach.

Local Traffic Reduction

NREL's STM site is growing. The addition of RSF I, scheduled for completion in June 2010, will provide workspace for 850 NREL and DOE workers. Because this growth will impact local traffic conditions significantly, NREL and DOE have taken steps to alleviate congestion and parking shortages.

- A Traffic Mitigation Plan for the STM campus was conducted, signed, and implemented by DOE GO and NREL. (See Section on Traffic Management.)
- An NREL Commuting Council was formed with the objective of promoting effective and efficient commuting and working practices at NREL. The Commuting Council is tasked with:
  - Reviewing and updating NREL's alternative commuting and working related plans, policies, and procedures to reflect the strategic direction of the lab
  - Assessing alternative means of performing work from home, when appropriate, as well as the use of AWS to achieve energy savings for employees and NREL.

Community Outreach

NREL has engaged community organizations to help implement sustainability practices and expand its clean energy technology research and development. Sustainable operations mentoring has been implemented through community meetings, laboratory tours, and community newsletters garnering community support for implementing sustainability goals.

NREL's demonstration of clean work practices improves the local quality of life and sets an example for future community development.

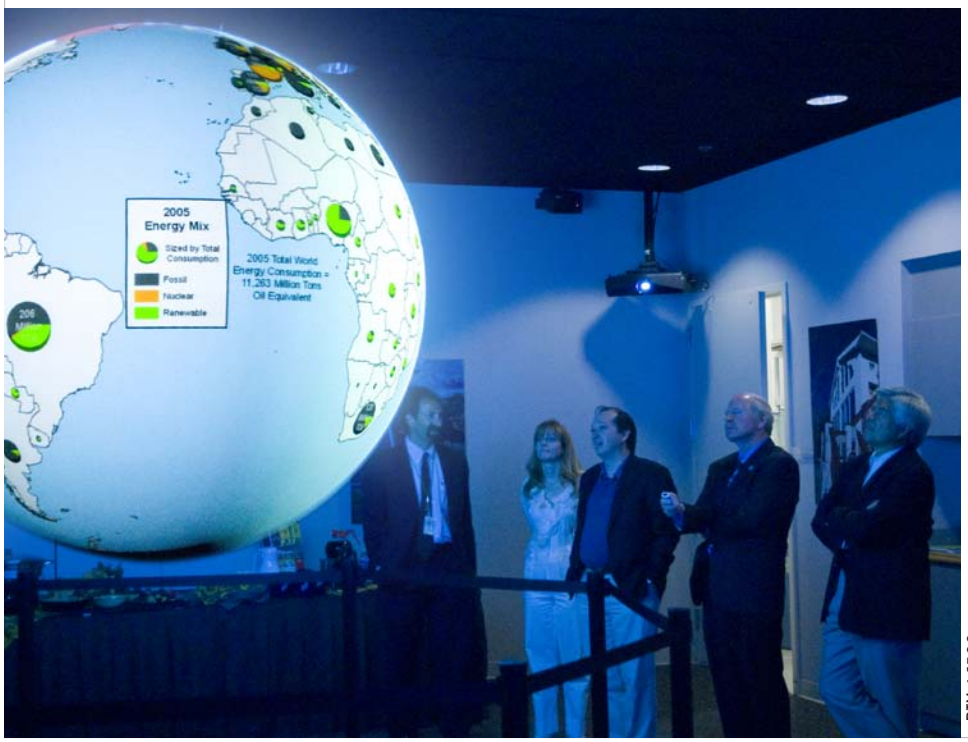
Education Outreach

The Visitors Center is central to NREL's interaction with the public. It is NREL's "front door" to the more than 14,000 visitors to the laboratory each year, and it is an educational resource for consumers, teachers and students.

In FY 2009, the laboratory's education programs reached several levels of learners including:

- K-12 students – engaging young minds in renewable energy and providing teacher support
- College and post-graduate students – developing a capable and diverse workforce for the future through mentoring research internships and fellowships

The Science on a Sphere exhibit, monthly instructional workshops, and other events attract thousands of visitors to NREL's Visitors Center.



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- Fourth grade students – assisting students from 20 Denver Public Schools with reading and science through NREL's Coalition for Learning Opportunities with United Tutors (CLOUT). NREL provided 1,056 volunteer hours in addition to 4,200 teacher coordinator hours.
- Middle school students – assisting Powell Middle School's Environmental Technology class design a unit that helps students make eco-friendly choices.
- University Partners –
  - Helping the University of Colorado with their carbon neutrality planning and analysis through Technical Assistance Program (TAP) funding to the city of Boulder.
  - Participating with Cornell in the Climate Neutral Research Campus work.
- Wind Powering America's Wind for Schools project – developing a skilled workforce by:
  - Developing and implementing standards-based curricula at the K-12 level using hands-on methodologies
  - Working with the NEED Project, WindWise, Kidwind, and Wind for Educators
  - Developing Wind Application Centers (WACs) at universities where students assist in implementing school wind turbines and participate in wind courses
  - Installing small wind turbines at community "host" schools
  - Implementing teacher training with interactive curricula at each host school.

Economic Outreach

Throughout 2009, NREL employees gave time, money, and energy to help the community. They were backed by a commitment from the Alliance for Sustainable Energy to provide financial support that allowed NREL to work in community organizations, support local economic development efforts, and educate teachers, students and consumers about renewable energy and energy efficiency.

NREL's engagement with state and local business, government, and community leaders was at an all-time high this year. Economic outreach activities ranged from forums for the Metro Mayors' Caucus to visits by Colorado's Congressional Delegation and tours of NREL by economic development organizations, workforce boards and municipal planning committees.

Through NREL's Charitable Giving Campaign, NREL employees donated $182,200 to Mile High United Way and Partnership Colorado and the 300 organizations that they serve; the Alliance for Sustainable Energy donated another $20,000 bringing the total gift to $202,200. NREL employee participation exceeded the campaign goal. Community Shares selected NREL as Campaign of the Year in FY 2008 and FY 2009.

CLOUT offers fourth grade students in Denver Public Schools opportunities to improve their science and reading skills.

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Memberships & Awards

2009	Gold-Level Award, Federal Electronics Challenge. The Office of Federal Executives and the EPA recognized NREL for reducing the environmental impacts of electronics in all three life-cycle phases.
	Gold-level Leader, State of Colorado. CDPHE's Environmental Leadership Program.
2008	Silver-Level Award, Federal Electronics Challenge. The Office of Federal Executives and the EPA recognized NREL for reducing the environmental impacts of electronics in all three life-cycle phases.
	Laboratory of the Year Special Mention Award. R&D Magazine.
	Colorado Renewable Energy and Sustainable Design in Buildings–Institutional. Colorado Renewable Energy Society.
	ASHRAE Technology Award-Institutional Buildings–New Construction. ASHRAE Region X.
	Transformation Energy Action Management Renewable Energy Award. DOE Federal Energy.
	Transformation Energy Action Management Renewable Energy Award. DOE Federal Energy Management Program.
	Gold-level Leader, State of Colorado. CDPHE's Environmental Leadership Program.
	Pollution Prevention Star Award, Leadership in Environmental and Energy Design for the S&TF.
	Gold-Level Recognition. Colorado Environmental Leadership Program.
	Sustainable Building Award for the S&TF. Colorado Renewable Energy Society.
2007	LEED Platinum Designation. U.S. Green Buildings Council's LEED Green Building program. NREL's S&TF is the first LEED Platinum federal building. Only 28 other buildings in the world have achieved this rating.
	Gold-Level Recognition. Colorado Environmental Leadership Program.
	Chairman's Award for Outstanding Contributions to the Labs21 Team. Presidential Award for Federal Energy Management.
2006	White House Closing the Circle Pollution Prevention Honorable Mention.
	Federal Energy Saver Showcase Award for the S&TF.
	Silver Hard-Hat Award, Outstanding Sustainable Design. Colorado Construction Magazine.
	Jefferson County Commissioners' Award, Design Excellence for NREL's S&TF.
	U.S. EPA Climate Protection Award.
	Gold-Level Recognition. Colorado Environmental Leadership Program.
2005	U.S. Department of Energy Pollution Prevention Star Award for Green Fleet Team. Petroleum reduction through alternative fuels.
	Gold-Level Recognition. Colorado Environmental Leadership Program.
	U.S. Department of Energy Federal Energy and Water Management Award.
2004	U.S. Department of Energy Pollution Prevention Best-In-Class Awards: Office of Energy Efficiency and Renewable Energy Sustainable NREL: New Building Program Sustainable NREL: Recycling Program Sustainable NREL: Education, Outreach and Information Sharing.
	U.S. EPA National Environmental Performance Track.
	Gold-Level Recognition. Colorado Environmental Leadership Program.
2003	University of Colorado Wirth Chair Award in Environmental and Community Development Policy.
	U.S. Department of Energy Departmental Energy Management Achievement Award. Effective Program Implementation of Sustainable NREL.
2002	U.S. EPA Green Power Partnership for NREL's commitment to purchasing 10% of its annual electric use in wind energy and for becoming the first federal laboratory member.

Moving Forward

NREL is emerging as a national leader in sustainability thanks to the mission that was established in 1977 when the lab began operating as the Solar Energy Research Institute (SERI).

Over the years our discoveries have made a difference–providing practical renewable energy and energy efficiency technologies for homes and businesses. Many of these technologies are being showcased in the new buildings being constructed at NREL's South Table Mountain campus.

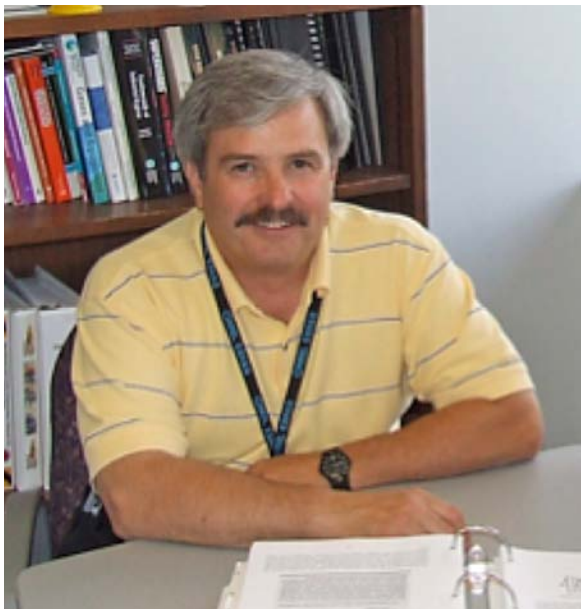
When the build-out of this campus is complete, NREL will be a model for builders of future government and commercial buildings around the world. The new Research Support Facility (RSF) in particular is being dubbed the "Workplace of the Future." It will provide 800 employees with a new type of office space–one that produces as much energy as its occupants consume and one that is open and encourages interaction and collaboration.

NREL is committed to incorporating sustainable principles in all aspects of its work and this is reflected in the lab's economic viability, environmental stewardship, and public responsibility.

The lab's growth in funding and staffing is a testament to the confidence that our national leaders have in our ability to advance the nation's energy goals. By maintaining a sustainable environment in our workplace, the laboratory walks the talk by minimizing the use of valuable resources and reducing our carbon footprint by encouraging alternative commuting and work practices. In addition, NREL engages with the community and local and national leaders to promote clean energy technology and sustainability practices.

Moving forward, our goal is to lead by example by integrating new sustainable principles into our culture, implementing cutting-edge renewable energy technologies, and exceeding executive orders to fulfill the vision of the laboratory of the future.

Frank Rukavina, NREL Director of Sustainability



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