1. INTRODUCTION

The National Renewable Energy Laboratory (NREL) is one of ten Department of Energy (DOE) national laboratories and is dedicated to the research, development, and technology transfer of renewable energy and energy efficiency technologies. The DOE Solar Energy Research Institute began operations in 1977, and achieved national laboratory status and became NREL in 1991. The Midwest Research Institute and their subcontractors, Battelle Memorial Institute and Bechtel Corporation, operate NREL for DOE. The laboratory is comprised of three main sites: 1) South Table Mountain (STM); 2) Denver West Office Park (DWOP); and 3) The National Wind Technology Center (NWTC). The STM and DWOP sites are referred to as the STM Complex and are the subjects of this environmental document. The NWTC has been reviewed under a separate NEPA process that was completed in May 2002. Additional information is available at the following Internet site: http://www.nrel.gov.

In accordance with DOE NEPA implementing regulations, DOE is required to evaluate the Site-Wide EA after five years and annually thereafter to determine whether the documentation and findings continue to adequately address current agency plans, functions, programs, and resource utilization with respect to environmental impacts. A Site-Wide Environmental Assessment (EA) for NREL's STM site was published in 1993 (DOE-EA-0620). Since 1993, DOE and NREL have reviewed the EA for continued relevance to ongoing activities and NEPA compliance. In 2002, DOE determined that a new comprehensive Site-Wide EA should be prepared for the site to address new on-site activities.

In compliance with the National Environmental Protection Act (NEPA) (42 U.S.C. 4321) and DOE's NEPA implementing regulations (10 CFR section 1021.330), this Site-Wide EA examines the potential environmental impacts of changing site operations, a program of proposed improvements at the NREL sites, and a No Action alternative.

The 327-acre STM site is located on the southeast side of South Table Mountain, north of I-70 and west of the I-70 and Denver West Boulevard interchange in unincorporated Jefferson County, near Golden, Colorado. The STM site provides laboratory and office space and a visitor's center. The DWOP site is located east of the STM site in the vicinity of the I-70/Denver West Boulevard interchange near Golden, Colorado. DOE and NREL occupy three buildings located at the eastern end of the office complex (Buildings 15, 16, and 17) and one building (Building 27) located north of I-70 just east of the STM site. DWOP provides administrative offices and space for limited laboratory activity.

The STM Complex supports research and development needed to improve technical designs, improve power generation efficiencies, increase economic competitiveness, transfer technologies to industry, and fully characterize and minimize environmental impacts from various technologies. The Office of Energy Efficiency and Renewable Energy (EERE) research and development program focus areas include, but are not limited to:

- Solar
- Wind and Hydropower
- Geothermal
- Distributed Energy, Electrical Infrastructure and Reliability
- Biomass
- Industrial Technology
- Freedom Car and Vehicle Technology

- Hydrogen and Infrastructure
- Buildings
- Weatherizations and Intergovernmental Grants
- Federal Energy Management Program

In addition to EERE program focus areas, the STM Complex supports:

- Other DOE-Sponsored Programs.
- Work for Others Supporting the DOE Mission.

The following discussion further describes the research activities in energy efficiency and renewable energy technologies at the STM Complex:

- **Photovoltaics (PV) –** The program investigates and develops advanced solid-state materials, technologies, and systems for turning sunlight into electricity. Activities on the STM site over the next 5 years could include expanding fundamental research and development for conventional and non-conventional PV technologies; projects involving intelligent processing, in-situ diagnostics, and related areas to meet industry needs; supporting new initiatives; demonstrating more efficient PV cells and modules of various types; demonstrating potentially low-cost, high-quality, thin-layer silicon growth on a foreign substrate; demonstrating the feasibility of a e-junction device for a 38 percent-efficient solar cell under concentration; supporting the successful transition of cadmium-telluride demonstrating a monolithic, series-connected, multi-junction polycrystalline thin-film device; refining and transferring a manufacturing-friendly electro-optical-based diagnostic technique to the PV industry; demonstrating the achievement of voltage addition in an r-junction device; developing a complete capability to evaluate multi-junction concentrator cells and modules; participating in various projects to support industry in improving efficiency and lower cost of energy; and participating in projects to help industry move rapidly from laboratory-scale demonstration of new technologies to commercial manufacturing and intelligent manufacturing.
- **Biopower –** The objective of this program is to develop and expand the use of materials and technologies for combusting biomass to generate electricity and process heat. Activities on the STM site over the next five years could include testing of gasification/internal combustion systems, investigation of issues arising from integration of biomass gasification with microturbines and fuel cells, and performing life-cycle assessments relevant to biopower systems.
- **Concentrating solar power –** This program develops systems and materials for producing power from concentrated sunlight. Activities on the STM site over the next five years could include conceptual design feasibility testing for small-scale dish systems, and evaluating the feasibility of system designs for remote power applications.
- **Solar buildings –** The mission of this program is to advance the development and widespread use of competitive solar technologies for use in buildings in both domestic and international markets. Activities on the STM site over the next five years could include developing and testing field-scale prototypes of the "next generation" of solar systems for water and space heating; installing various technologies as demonstrations on the STM site; and continuing outdoor and ultra-accelerated durability testing of polymer glazings, absorbers, and coatings.
- **Hydrogen –** Activities of this program involve research and validation of technologies to enable renewable hydrogen to make the transition to a major energy carrier for electricity, heat, and transportation. Activities on the STM site over the next five years

could include using a new process development unit and the existing Thermochemical User Facility for bio-oil reforming; isolating hydrogen-producing algal mutants with enhanced oxygen tolerance; developing efficient nitride-based materials for photoelectrochemical water splitting; developing and refining technologies for storing hydrogen; operating a microbial water-gas shift pilot plant; evaluating the commercial potential of a cyclic algal hydrogen production system; performing detailed life-cycle assessments of hydrogen production systems; and developing the necessary codes and standards for the introduction of hydrogen technologies.

- **Geothermal energy –** The mission of the geothermal energy program is to work in partnership with United States (U.S.) industry to establish geothermal energy as an economically competitive contributor to the U.S. energy supply. Program activities include developing advanced heat-transfer technologies for improving the performance of geothermal power plants and direct use applications. Activities on the STM site over the next five years could include supporting testing of advanced condenser designs for use with ammonia-water working fluid and laboratory tests of innovative thermodynamic cycles that employ mixed working fluids.
- **Distributed power –** This program develops, promotes, and advances standards, codes, and technologies for integrating modular, distributed electrical generating systems into electrical grids. Activities on the STM site over the next five years could include research in system interconnection, reliability, and safety; and design and initiation of distributed power systems model development and validation through systems analysis and field-testing.
- **Superconductivity –** This program researches superconducting materials, wires, and tapes for use in highly efficient electrical transmission and storage. Activities on the STM site over the next five years could include continued development of thallium oxide superconductors suitable for application to power-related components; support of demonstration and commercial scale-up of the single-layer tellurium compounds using thick-film-processing methods such as electrodeposition and spray techniques; development of a long length biaxially textured tellurium tape; and collaboration with other NREL programs to develop a renewable oriented energy storage program.
- **Energy analysis –** NREL's Energy Analysis Office conducts technology and application, market, and benefits analyses for DOE's Office of Power Technologies and many of its individual programs. One of its primary areas of focus is on the analysis and technical support for developing green power markets nationwide. Activities on the STM site over the next five years could include continuing analysis work, and placing increased attention on emerging areas such as deregulation and distributed energy resources.
- **Biofuels –** The primary goal of this program is to develop cost-effective, environmentally friendly technologies for producing alternative transportation fuels and fuel additives from plant biomass. Activities on the STM site over the next five years could include developing updated performance data for the enzymatic conversion of corn stover to ethanol; implementing a corn stover-to-ethanol conversion demonstration (probably 50 tons/day) with an industrial partner; and reducing the cost of cellulase enzyme.
- **Fuels utilization –** This program provides technical expertise in technologies involving motor fuels, engines, emission control, and vehicle systems; studies developing a sound understanding of the environmental effects of transportation emissions; and moving these technologies into the marketplace. Activities on the STM site over the next five years could include developing advanced petroleum-based fuels and lubricants for the next generation of compression ignition engines to meet goals for operating at high efficiency and meeting future emission standards; testing advanced engine systems for

natural gas and optimizing them for heavy-duty engines; developing optimized engine management/fuel/emission control technologies; and developing a sound understanding of the relative role of gasoline and diesel vehicle exhaust to ambient levels of particulate matter, ozone, and regional haze.

- **Advanced automotive technologies –** This program develops, models, and analyzes systems for hybrid electric vehicles and fuel cells. The primary goal is to research, develop, and validate technologies that will enable domestic market introduction of advanced vehicles. Activities on the STM site over the next five years could include continuing to develop technologies and systems for hybrid electric vehicles and fuel cells; using systems analysis tools to assist industry with advanced vehicle development; developing and testing an optimized systems design for a vehicle climate control system that reduces energy use by 50%; developing a thermal comfort mannequin that simulates complex heat and mass transfer from vehicle occupants; and developing prototype, next-generation, medium- and heavy-duty natural gas vehicles that are fully comparable to diesel-powered vehicles.
- **Buildings technologies –** This program develops, promotes, and integrates energy technologies and practices to make buildings more efficient and affordable and communities more livable. These activities are supported by NREL's research in heat transfer, thermodynamics, and systems engineering. Activities on the STM site over the next five years could include exploring options for integrating emerging technologies like fuel cells into production buildings; improving the reliability of electrochromic window systems so that large-scale demonstrations can begin with industry partners; creating innovative building energy systems, including renewables, for adoption by builders; developing and demonstrating low-energy, desiccant-based dehumidification systems for hot and humid climate regions; and developing the next generation of switchable window technology.
- **Federal Energy Management Program –** The mission of this program is to promote prudent utility management within all federal facilities through energy and water efficiency and encourage the use of renewable energy. This work is facilitated by partnerships with the private sector primarily through energy service companies, utilities, and other industry associates.
- **Basic Sciences (Material, Chemical, and Biological Sciences) –** Basic sciences work involves capabilities in fundamental materials sciences, chemical sciences, and energy biosciences. NREL integrates the basic energy research with its applied research in renewable energy technologies. Over the next five years, activities on the STM site could include expanding, continuing, or demonstrating the following basic science technical areas:
  - growth, application and analysis of semiconductor materials;
  - creation and application of advanced computational tools for the development of solid state theory;
  - fabrication of advanced semiconductor devices based on improvements in device design and analysis;
  - exploration of properties and applications of new, advanced, and innovative materials such as those with nanostructured architecture (i.e., carbon nanotubes);
  - development of innovative approaches to heterogeneous and homogeneous photoconversion based on photoelectrochemical, photochemical, and photobiological phenomena;
  - application of innovative electrochemical science for developing improved fuel cells, thin-film batteries, and electrochromic devices;

- implementation of new catalyst designs with emphasis on the synthesis of electrocarrier and electrocatalyst molecules that facilitate the use of CO_2 for fuel and chemical production; and
- development of advanced models and experiments in the microbiology and biochemistry of producing renewable fuels, chemicals, and biodegradable materials.

The Proposed Action is to operate the STM site for alternative energy research with new and improved capability to support DOE's mission to research, develop and transfer to industry renewable energy technologies. The Proposed Action consists of new activities and new and modified facilities. Construction will include permanent physical improvements to the site that involve buildings and equipment, utilities, and other infrastructure. Implementation of the Proposed Action is expected to occur between 2003 and 2008.

The No Action Alternative would leave the STM in its current configuration, add no new facilities, and maintain current levels of research, operation and management activities.

1.1 PURPOSE AND NEED FOR THE PROPOSED ACTION

The Proposed Action is to support DOE's mission in the research and development of energy efficiency and renewable energy technologies. DOE's EERE leads the national research effort to develop clean, competitive, and reliable energy technologies for the 21st century. The goal of the EERE program is to improve the Nation's overall economic strength and competitiveness, energy security, and environmental health through the development of clean, competitive, and reliable power technologies.

The purpose and need for the Proposed Action is to provide and maintain enhanced facilities and infrastructure to adequately support state-of-the-art alternative energy research. These improvements are needed to allow for growth of NREL's research programs.

1.2 SITE DESCRIPTION

1.2.1 Site Background and History

NREL's STM Complex is comprised of the STM and DWOP sites. A regional location map is presented in Figure 1-1. A local setting map showing the location of NREL facilities within the DWOP is presented in Figure 1-2. A site map for the STM facility is presented in Figure 1-3.

The 327-acre STM site is located on the southeast side of South Table Mountain, north of I-70 and west of the I-70 and Denver West Boulevard interchange in unincorporated Jefferson County, near Golden, Colorado. Only a portion of the site, 136 acres, is available for development. All existing facilities are within this 136 acres. Only 13 acres of the 136 developable acres are located on the mesa top. A total of 177 acres is protected by a conservation easement. Approximately 10 acres on the southeast corner of the STM site are designated for a future Jefferson County Open Space trail easement to provide public access to conservation easement lands. Development on the remaining 14 acres is restricted by utility

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easements. There are currently six laboratory facilities, a few small test facilities, and several support buildings on the site (see Figure 1-3). The STM site includes acreage on the South Table Mountain mesa top, slope, and toe, and was formerly part of the Colorado National Guard facility, established between 1903 and 1924, at Camp George West.

In July 1999, the southernmost 25 acres within the STM site was acquired from Jefferson County Open Space as part of a land exchange. As part of the same land exchange, DOE established a conservation easement. The conservation easement includes approximately 177 acres of land on the top and slopes of South Table Mountain. Approximately 10 acres on the southeast corner of the STM site are designated for a future Jefferson County Open Space trail easement to provide public access to conservation easement lands. This action provided the DOE with additional acreage for site development and protected the slopes and most of the mesa top area within the STM site from any future development.

The DWOP site is located east of the STM site in the vicinity of the I-70/Denver West Boulevard interchange near Golden, Colorado. DOE and NREL occupy three buildings located at the eastern end of the office complex (Buildings 15, 16, and 17) and one building (building 27) located north of I-70 just east of the STM site. DWOP provides administrative offices and space for limited laboratory activity. Limited laboratory activity is defined by a document entitled: "Risk Assessment Guide for Laboratory Backfill in Denver West Building 16." The general limitations include:

- Major work must be capable of being done on bench top.
- Chemical processes are excluded that require routine use of the local exhaust ventilation system (e.g. laboratory hood) for capturing airborne contaminants or for capturing a catastrophic release (e.g. canopy hood over process). Work requiring use of laboratory hoods shall be limited to intermittent ancillary support activities, such as sample preparation.
- Laboratory activities will be excluded from the first floor.
- Second and third floor interior laboratory space will be restricted to "dry" activities only. Activities requiring any ventilation beyond standard building ventilation are excluded.

More specific limitations and associated processes for approval of new or modified facilities are presented in the referenced document.

1.2.2 Existing Facilities

The following discussion summarizes key aspects of the sites, facilities, and operations (see Figure 1-3 for existing STM site facilities and infrastructure). .

Buildings: At the STM site, DOE owns 324,231 gross square feet (gsf) of space, the total of all interior space, including the following primary facilities.

- The largest building, built in 1985, is the recently expanded Field Test Laboratory Building (FTLB) (118,091 gsf) that is used as a multi-purpose facility with low-bay laboratories, stockroom facilities, and high-bay research areas.
- The Solar Energy Research Facility (SERF) (115,556 gsf), built in 1993, provides low-bay laboratories and associated office space.

- The Alternative Fuels User Facility (AFUF) (32,597 gsf), completed in Fiscal Year (FY) 1994, absorbed the Biotechnology Research Facility (BTRF) and contains laboratory and office space, as well as the Process Development Unit (PDU) pilot plant.
- The Outdoor Test Facility (OTF) (11,247 gsf) provides office space and indoor laboratories in support of the outdoor PV array test area adjacent to the OTF to the east.
- The Thermal Test Facility (TTF) (10,682 gsf) provides office space, an open bay test area and a roof top test area.
- The Solar Radiation Research Laboratory (SRRL)/Metrology building (2,688 gsf) was constructed in FY 2000, and provides office space, indoor laboratory space, and outdoor areas for meteorological monitoring equipment.
- The Shipping and Receiving facility (S&R) (14,207 gsf) provides space for shipping and receiving functions. The Visitor Center (6,459 gsf) provides technology displays and meeting space.
- The Site Entrance Building (814 gsf) houses around-the-clock site security, visitor greeting, "badging," and the monitoring of alarms.

NREL leases space in four buildings at DWOP, Buildings 15, 16, 17, and 27. These buildings house over 50 percent of NREL's workers, as well as DOE Golden Field Office (GO) staff. These facilities provide space for laboratory research, administration, research support activities, and government offices. The site includes 191,787 square feet (sf) of leased space. Three buildings are used for administrative activities and one building (DW Building 16) is used for research support activities as well as limited laboratory research.

1.2.3 Site Planning Process, Decision Protocol, and Environmental Management Commitments

Formal strategic and annual planning processes in effect at NREL establish work tasks and direct site development decisions in pursuit of the NREL mission. These planning and decision-making processes are integrated so that all necessary information is available for consideration, and that the information flows from one element of the planning process to another in the proper sequence. All of the planning processes and commitments described in Section 1.2.3 were considered during the development of the Proposed Action described in Chapter 2. Elements of this formal planning process interact in continuous feedback and improvement loops, and include the following:

- An *Institutional Plan* that sets forth the organization's mission, critical outcomes, and performance objectives, and identifies specific activities and resources (e.g., staff and facilities) necessary to achieve the objectives. The Institutional Plan is revised annually and includes specific environmental, safety, and health (ES&H) objectives and resource needs.
- An NREL *One-Year Plan* that translates the NREL mission defined in the Institutional Plan into specific work tasks, including research activities and site development, to be completed each fiscal year. Coordinated Annual Operating Plans (AOPs) are developed by each internal organization (e.g., technology program, science and technology center, and operations support office) in support of the *One-Year Plan*. The AOPs identify specific performance objectives, work tasks, and resource requirements for each organization for the FY.

- A *Capital Plan* having a five-year outlook that establishes resource and budget requirements for major projects (e.g., facility construction, infrastructure development, major equipment acquisitions).
- A *Site Development Plan* that captures the results of planning processes that identify, evaluate, and address opportunities and limitations of NREL's existing land and facilities. The plan's objective is to maximize the potential of NREL sites, while meeting the near-term and long-term facility and siting needs of the technology programs. A Master Site Planning process began in June 2002 and will be completed in mid-2003.
- *Site Operations Project Manager Handbook* that implements a formal design review process for all construction proposals for both new facilities and modifications to existing facilities.
- *The Design Advisory Board* that reviews specific development proposals to evaluate site development compatibility and visual quality issues, and participates in general site planning. The Board is comprised of professionals in the fields of architecture, landscape, and building design and planning, a member of the Pleasant View community, DOE representatives, and NREL staff.
- NREL *Policies and Procedures Manual* that includes NREL's ES&H Policies. The policies most directly related to the Proposed Action include the following:

  2-1 Integrated Safety Management
  6-1 Environment, Safety, and Health
  6-2 Environmental Management
  6-3 Property Protection
  6-4 Worker Safety and Health
  6-5 Occupational Medicine
  6-6 Risk Assessment

The following discussion elaborates on Policies 6-2 and 6-6 and other environmental commitments at the STM Complex.

Policy 6-2

Policy 6-2 Environmental Management sets forth NREL's environmental policy statement, general rules, responsibilities, related policies, and laboratory-level procedures. Policy 6-2 establishes NREL's general rules for environmental protection as follows:

> "NREL manages and operates this DOE site consistent with the following ongoing environmental protection goals to fulfill research objectives and to maintain good stewardship of the public land.

1. To maintain and enhance the environment on NREL's sites through restoration or other means which foster the preservation of native ecosystems.
2. To protect natural, historical, and archaeological resources.
3. To promote and preserve native ecosystems.
4. To incorporate pollution prevention practices in research and support activities.
5. To apply sustainability concepts to design and operation of facilities.
6. To continually improve the effectiveness of NREL's environmental management implementing programs.

7. To achieve a reputation in the public and regulatory community as a leader in environmental excellence through consistently high performance and open, responsive communications."

The general rules of Policy 6-2 also address "environmental hazard identification." At the STM Complex, new or substantially modified activities are evaluated in accordance with NREL Policy 6-6 Risk Assessment.

Policy 6-6

NREL Policy 6-6 Risk Assessment establishes a process that identifies hazards presented by planned research and support activities and facilities. Environmental considerations are an integral part of this process, including application of NEPA requirements. The Policy 6-6 process identifies controls necessary to maintain the risk presented by those hazards at an acceptable level. The following potential hazards are specifically referenced:

a. Emissions to air
b. Releases to surface water, including storm drains
c. Wastewater releases
d. Improper waste management
e. Contamination/releases to land
f. Impacts on communities
g. Use of raw materials and natural resources
h. Impacts to wildlife or vegetation
i. Erosion or contamination of storm water
j. Contamination of groundwater
k. Life-cycle impacts

The goals of Policy 6-6 are to address and prevent off-site impacts and proactively manage on-site activities to minimize any risks to safety, health, and the environment.

Controls identified, as necessary, during *Environmental Hazard Identification Reviews* incorporate the requirements found in numerous and specific environmental management implementing programs. These programs and NREL's permits are listed in Appendix A.

1.2.4 Other Environmental Commitments

NREL's environmental programs and policies are, in part, based on a series of regulations and recent Executive Orders (EO) on "Greening the Government." Key Executive Orders include:

- EO 13148, Leadership in Environmental Management
- EO 13101, Waste Prevention, Recycling, and Federal Acquisition
- EO 13123, Efficient Energy Management

1.2.5 Conservation Easement

The STM conservation easement provides permanent protection of the site's unique natural resources. Development is not allowed in this area. NREL manages this area to preserve the native ecosystem and maintain the health/viability of that ecosystem. Recreation in the form of hiking trails is allowed in the area; the trails are to be built and maintained by Jefferson County

Open Space. Certain existing utility corridors pass through this area. On occasion, local utilities may need to access their facilities through this easement.

1.2.6 STM Natural Resource Commitments

The following NREL commitments support conservation of the STM site's natural resources:

- The site is managed to preserve and enhance plant species and community diversity, preserve wildlife habitat, and maintain surface water quality and flow volumes;
- On-site environmental monitoring at STM is performed on an as-needed basis, and may include monitoring of off-site control areas. Although there is no routine environmental monitoring performed at STM, an occasion may arise for which monitoring of one or more environmental media is warranted, either in a localized area on-site or on a site-wide scale. This could include one or more of a variety of environmental media such as surface water, groundwater, air, soil, wildlife, or vegetation;
- Appropriate mitigation measures would be implemented for any disturbance to the conservation easement area and utility corridors. These measures would be designed on a case-by-case basis, but could include measures designed to address storm water discharge, erosion, sediment depositions, or revegetation;
- Vegetation management at STM is currently conducted on a site-wide basis with the objectives of controlling weeds, preserving species diversity, and maintaining ecosystem function to the maximum extent possible. This site-based vegetation management approach will continue, and will support the goal of preservation of plant species and communities in Conservation Management Areas. One component of the vegetation management program is integrated weed management, which incorporates a variety of weed control strategies. Techniques used at the site include such measures as: mechanical controls (e.g., mowing), cultural controls (e.g., minimizing vehicles being driven off established roadways), a variety of chemical controls (e.g., ground treatment with 4-wheel drive vehicles or backpack application), and restoration activities such as revegetation after soil disturbance. Revegetation following soil disturbance would be done using a native seed mix specifically designed for the STM site based on plants that naturally occur on the site;
- Consistent with EO 13148 (Greening the Government through Leadership in Environmental Management), NREL is implementing environmentally and economically beneficial landscaping practices whenever feasible. The principles of this type of landscaping focus on using regionally native plants for landscaping, promoting construction practices that minimize adverse effects on the natural habitat, preventing pollution, and implementing water and energy efficient practices; and
- Should any evidence of archaeological resources be discovered during construction at the STM site, NREL is committed to stopping the work in the vicinity until a qualified archaeologist can completely evaluate the significance of the find according to criteria established by the National Register.

1.2.7 Sustainable NREL

Based on the following definition of "sustainable" and NREL's Mission and Vision Statements, "Sustainable NREL" brings together NREL's commitments into a unified strategy.

> *Sustainable* \se-'sta-ne-bel\, adj. - minimal use of resources (energy, materials, water, etc.) and maximum value received from resources used, while balancing environmental, economic, and human impacts.

NREL Mission

> To develop renewable energy and energy efficiency technologies and practices, advance related science and engineering, and transfer knowledge and innovations to address the Nation's energy and environmental goals.

NREL Vision

> NREL will be the world's preeminent institution for advancing innovative renewable energy and energy efficiency technologies from concept to adoption. By partnering with our stakeholders, we will support a sustainable energy future for the Nation and the world. In achieving this next level of excellence, NREL will set the standard for others.

Sustainable NREL is:

- An initiative to help NREL become more sustainable in all its operations and a global model for sustainability.
- A management philosophy and corporate culture.
- A process of change.

In the future, Sustainable NREL envisions that NREL should be not only the preeminent laboratory in the world for research and development in all aspects of clean energy and energy efficiency, but should also demonstrate sustainable practices in all its operations.

Sustainable NREL's existing environmental stewardship commitments are in the areas of campus (master site planning); water; and energy efficiency (electricity/natural gas) through energy use reduction and new building design; transportation; materials; and greenhouse gas reduction.

The following are representative highlights of NREL's activities and accomplishments related to sustainability.

CAMPUS (Master Site Planning). NREL has undertaken the development of a 25-year General Development Planning process with a focus on sustainability.

WATER. A formal Water Conservation Management Plan was completed and two water conservation Best Management Practices (BMPs) were implemented in 100% of facilities.

ENERGY EFFICIENCY (Electricity/Natural Gas). NREL has achieved energy use reductions of some 26% as compared to the 1990 baseline. This reduction exceeds the DOE Order 430.2A requirements of reductions of 20% in 2005, and 25% in 2010. NREL will continue to annually implement additional energy use reduction measures.

ENERGY EFFICIENCY (New Building Design). The preliminary design of the new Science and Technology Facility (S&TF) was registered with the intent of securing a Leadership in Energy an Environmental Design (LEED) Gold level certification. The Laboratory space of the S&TF is

also being designed applying the principles of the Laboratories of the Twenty First Century program.

ENERGY EFFICIENCY (Peak Load Management). NREL completed installation of individual facility metering at all of its permanent facilities, including a major process load. The facility metering data will be used to further refine the operation of the energy management control systems (EMCS), and educate building occupants in order to secure future energy use reductions.

TRANSPORTATION. The Energy Policy Act (EPAct of 1992) required that 75% of new acquisitions in light duty vehicle fleets be alternative-fuel vehicles (AFVs). NREL has exceeded the EPAct 75% requirement for new vehicles acquired, with a goal of moving toward 100% AFVs or hybrids for all its nonexempt vehicles. NREL has also met federal requirements to decrease total gallons of fleet petroleum usage by 20% by 2005 as compared to 1999, and to raise fleet average rated fuel economy for non-AFV light duty vehicles.

MATERIALS. NREL met or exceeded federal requirements for purchasing products and services that are energy efficient (including EPA Energy Star labeled equipment) and/or contain recycled content recycled and/or biobased content. NREL also met or exceeded federal requirements to limit the standby power use of equipment including computers, monitors, and other peripherals. In addition, NREL actively promotes recycling of various types of materials.

ENVIRONMENTAL MANAGEMENT (Green House Gas (GHG) Reduction). As the first federal facility member of the EPA Climate Leader Partnership program, NREL has established a GHG baseline and "targeted" reductions of 10% by 2005. NREL was formally acknowledged by the EPA as one of the first charter members to have voluntarily made a reduction commitment.

The following standards, orders, and documents provide valuable guidance on energy efficiency and sustainability in building design:

- American Society of Heating, Refrigerating and Air-Conditioning Engineers' (ASHRAE's) Energy Conservation Standard 90.1 "Energy Standard for Buildings Except Low-Rise Residential Buildings;"
- DOE Draft Order 430.2X; "Departmental Energy and Utilities Management;
- Code of Federal Regulations (CFR) 10CFR435; (CFR), Part 435--Energy Conservation; Voluntary Performance Standards for New Buildings; Mandatory for Federal; Buildings;
- Whole Building Design Guide, http://www.wbdg.org;
- Roadmap for Integrating Sustainable Design into Site-Level Operations, PNNL-13183, K. L. Peterson and J.A. Dorsey; and A Design Guide for Energy-Efficient Research Laboratories, http://ateam.lbl.gov/Design-Guide/; and
- Green Building Rating System, V. 2.0, Leadership in Energy and Environmental Design (LEED), U.S. Green Building Council, http://www.usgbc.org/.

1.3 CHARACTERISTICS OF A SITE-WIDE ENVIRONMENTAL ASSESSMENT

This document is a "Site-Wide Environmental Assessment" similar to the document NREL prepared for the STM site in 1993. DOE defines a Site-Wide environmental document as follows:

> "A broad-scope Environmental Impact Statement (EIS) or EA that is *programmatic* in nature and identifies and assesses the individual and cumulative impacts of ongoing and reasonably foreseeable future actions at a DOE site." (10 CFR Part 1021)

NEPA and other environmental regulations define the term "programmatic" and the application of programmatic environmental documents. In general, a programmatic document applies to a series of related projects and where the projects should be analyzed as an overall program. This approach is proper for analyzing a series of projects that are related either:

1. Geographically;
2. As logical parts in a chain of contemplated actions;
3. In connection with the issuance of rules, regulations, plans or other general criteria to govern the conduct of a continuing program; or
4. As individual activities carried out under the same authorizing statutory or regulatory authority and have generally similar environmental effects that can be mitigated in similar ways.

The Proposed Action, as described in Chapter 2, is composed of improvements that are related geographically and are part of a series of interconnected actions to be implemented by NREL.

This Site-Wide EA provides an analytical superstructure for subsequent, more detailed analyses, as necessary. The document will serve as a planning tool that aids decisions about future development of the site. As details are developed in the future, NREL will conduct subsequent environmental reviews that would incorporate the analyses from this programmatic document. Future reviews would be focused only on those issues that have not been adequately addressed.

In addition to the NEPA reviews, DOE requires that Site-Wide NEPA documents be evaluated periodically by means of a "Supplemental Analysis." The Supplemental Analysis determines whether the Site-Wide EA remains adequate or a new Site-Wide NEPA document is required. NREL is scheduled to prepare the next Supplemental Analysis in 2008.

1.4 ORGANIZATION, CONTENT, AND OBJECTIVES OF THIS ENVIRONMENTAL ASSESSMENT

This EA is organized in a manner consistent with NEPA and DOE's NEPA implementation guidelines, including the specific guidelines for Site-Wide EAs. The EA has seven sections. The first section is a Summary. The organization, content, and objectives of the EA's remaining chapters are as follows:

Chapter 1 Introduction presents the purpose and need for the program, describes the site, characterizes the purposes and objectives of a Site-Wide EA, summarizes the organization, content, and objectives of this EA, sets forth future NEPA documentation protocol and checklists, and summarizes the scoping process and results.

Chapter 2 Proposed Action and Alternatives presents a detailed description of the short-term and long-term program of improvements on the site and describes the No Action Alternative.

Chapter 3 Affected Environment describes environmental baseline information about the site and surrounding area.

Chapter 4 Environmental Consequences and Mitigation Measures describes potential impacts of the Proposed Action and No Action alternatives, compares the impacts, presents required and recommended measures to reduce impacts, and makes "significance" findings.

Chapter 5 List of Preparers identifies the individuals who prepared the EA and their roles.

Chapter 6 Bibliography and References presents a listing of key documents used in the preparation of this EA and consultations that took place as part of the EA process.

1.5 SCOPING PROCESS AND RESULTS

A scoping notice was published in the local newspapers on April 4 and 5, 2002, and a scoping letter was prepared and distributed to an extensive list of agencies, organizations, and members of the public on April 10, 2002. Appendix B presents the scoping letter, a complete list of the scoping letter recipients, and a complete list of response letters that were received during the 30-day scoping period.

1.5.1 Environmental Issues

The scoping letter for the Proposed Action identified the following environmental topics to be addressed in the EA:

- Land Use, Planning, Socioeconomics, and Public Policy;
- Traffic and Circulation;
- Air Quality and Noise;
- Visual Quality/Aesthetics;
- Water Resources;
- Soils and Geology;
- Biological Resources;
- Cultural Resources;
- Waste Management;
- Public Facilities, Services and Utilities; and
- Energy.

The following discussions summarize the relevant input received during the scoping period that ended on May 15, 2002. The issues raised by this input are addressed in the EA:

- Visual Quality/Aesthetics: degradation due to the locations and designs of new facilities and associated lighting, especially on top of South Table Mountain;
- Biological Resources: threatened and endangered species: Preble's Meadow Jumping Mouse (PMJM) and other protected species and habitats;
- Land Use, Planning and Public Policy: compatibility and consistency with existing land uses, planning policies, zoning designations, and other local government processes and procedures, including open space conservation easements;
- Soils and Geology: expansive soils and slope failure
- Resource Conservation: energy consumption inefficiency from site development pattern – facilities on South Table Mountain and recycling;
- Traffic;

- Air Quality: odor;
- Cultural Resources: outdoor amphitheater; and
- Cumulative Impacts.

NREL has modified the Proposed Action that is the subject of this EA based on the findings of a traffic study completed in November of 2002. The study indicated that the ultimate 20-year STM site buildout, as envisioned by the Proposed Action in the Scoping letter, would cause potentially significant impacts on traffic. Because projected site conditions and surrounding traffic conditions 20 years from now are speculative, DOE and NREL decided to scale back the EA to analyze only the activities that are reasonably foreseeable over the short-term (five-year) time horizon. The revised Proposed Action is presented in Chapter 2. In summary, the revisions reduce anticipated worker levels and appropriately redefine the long-term scenario as not reasonably foreseeable at this time. Longer-term activities and potential impacts will be analyzed in future environmental documents.

The land on top of South Table Mountain is subject to various local government policies and agreements intended to limit development. Previous plans to develop these areas have met substantial public criticism, generated broad community controversy and/or have been denied by local government. As a federal agency, DOE is generally exempt from local government regulation, but is sensitive to community concerns. It is NREL's and DOE's intent to minimize development on the mesa top, while still fulfilling its mission of research, development, and technology transfer of renewable energy and energy efficiency technologies.

NREL has developed research facilities on the mesa top while agreeing to preserve the majority of the mesa slope and mesa top land within the STM site with a conservation easement involving Jefferson County Open Space. Visual quality and aesthetic impacts from further development on the mesa top by NREL were the primary topics raised by the public during the scoping process.

1.5.2 Alternatives

The following alternatives were defined prior to the scoping period:

- Proposed Action;
- No Action Alternative;
- Site Development Configuration Alternatives;
- Reduced Development Intensity Alternative.

No additional alternatives were raised during the scoping period.

At this time, the Proposed Action and the No Action Alternative are the only alternatives addressed in the EA. The Proposed Action alternative is to continue operation of the STM Complex for alternative energy research with new and improved capability. The No Action Alternative would leave the site in its current configuration, add no new facilities or infrastructure, and maintain current levels of research, operation, and management.

Other alternatives raised prior to the scoping period were considered, but were eliminated from further analysis. The rationales for eliminating these alternatives follow.

- New Site and Off-Site Improvements Alternative: not considered feasible because of the technical and cost implications associated with decentralized operations and site/infrastructure complications.
- Other Site Development Configuration Alternatives: not considered feasible because of the interrelated nature of the proposed facilities, site development constraints, and the inherent flexibility of the Proposed Action with respect to future facility footprints.
- Reduced Development Intensity Alternative: not considered feasible because it is inconsistent with the Proposed Action's purpose and need and the intent of preparing this Site-Wide EA.

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