National Renewable Energy Laboratory
Innovation for Our Energy Future

Growing Pains: What to Expect When Construction Begins at NREL

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Director

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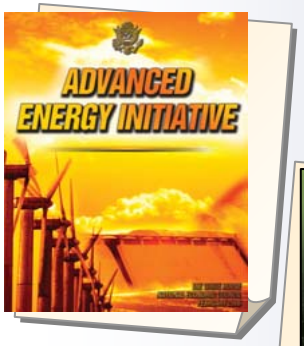
NREL is a national laboratory of the U.S. Department of Energy Office of Energy Efficiency and Renewable Energy operated by the Alliance for Sustainable Energy, LLC

Call for Action

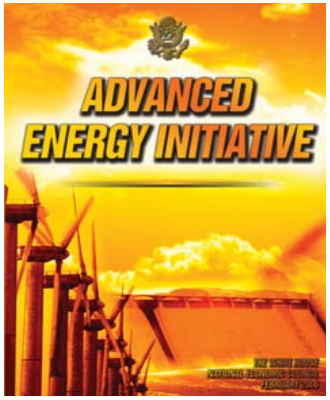


- Supply Diversity
- Environmental Stewardship
- Energy System Reliability
- Energy Productivity

Mission: 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.

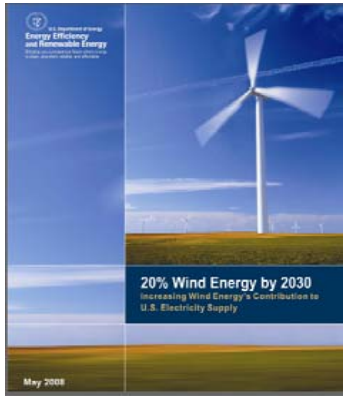
Investing in capabilities …
…and the facilities to house them

Renewable Energy: The Vision



Solar Vision

10% U.S. electricity by 2025



Wind Vision

20% U.S. electricity by 2030

Energy Independence & Security Act 2007

36 billion gallons of renewable fuels by 2022

Requires investment in new infrastructure:

- Overall in U.S. = $2 trillion
- Worldwide = $22 trillion

Current NREL Facilities

Denver West

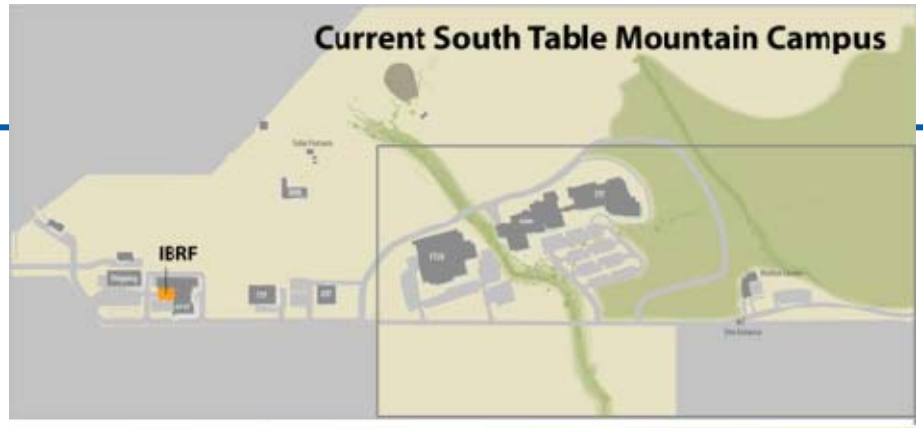
Field Test Laboratory Building

Solar Energy Research Facility

Science & Technology Facility

Alternative Fuel Users Facility

South Table Mountain Buildout Plan



NREL Project Site

Research Support Facilities

First construction project

- Model for sustainable, high-performance building design
- Incorporates concepts of safe design into the planning, design, construction and operation of the facility
- Meets the requirements of the workforce of today and tomorrow while maximizing the total number of occupants
- Provides the lowest attainable energy use per square foot
- Designated to achieve a LEED® (Leadership in Environmental and Energy Design) Platinum designation — the highest benchmark awarded by the U.S. Green Building Council
- Expected completion: Summer 2010

Research Support Facilities

Research Support Facilities

Facility Features

- 218,000 sq. feet building with 2 wings:
  3 floors in south, 4 floors in north
- DOE-owned work space for up to 800 administrative staff currently in leased space
- Includes a Library, Fitness Center and Commons Area

Research Support Facilities

Energy Features

- Daylighting
  - dramatically reduces energy use to approximately half the average energy used in a building this size to 25kBTU per square foot annually
- PV Roof - Power Purchase Agreement
- Natural ventilation
- Next generation, energy-efficient data center

Research Support Facilities

Projected Schedule

- Contract Awarded
  July 2, 2008
- 50% Preliminary Design Complete
  September 3, 2008
- Construction Begins
  December/January, 2008
- Ready for Occupancy
  Summer 2010

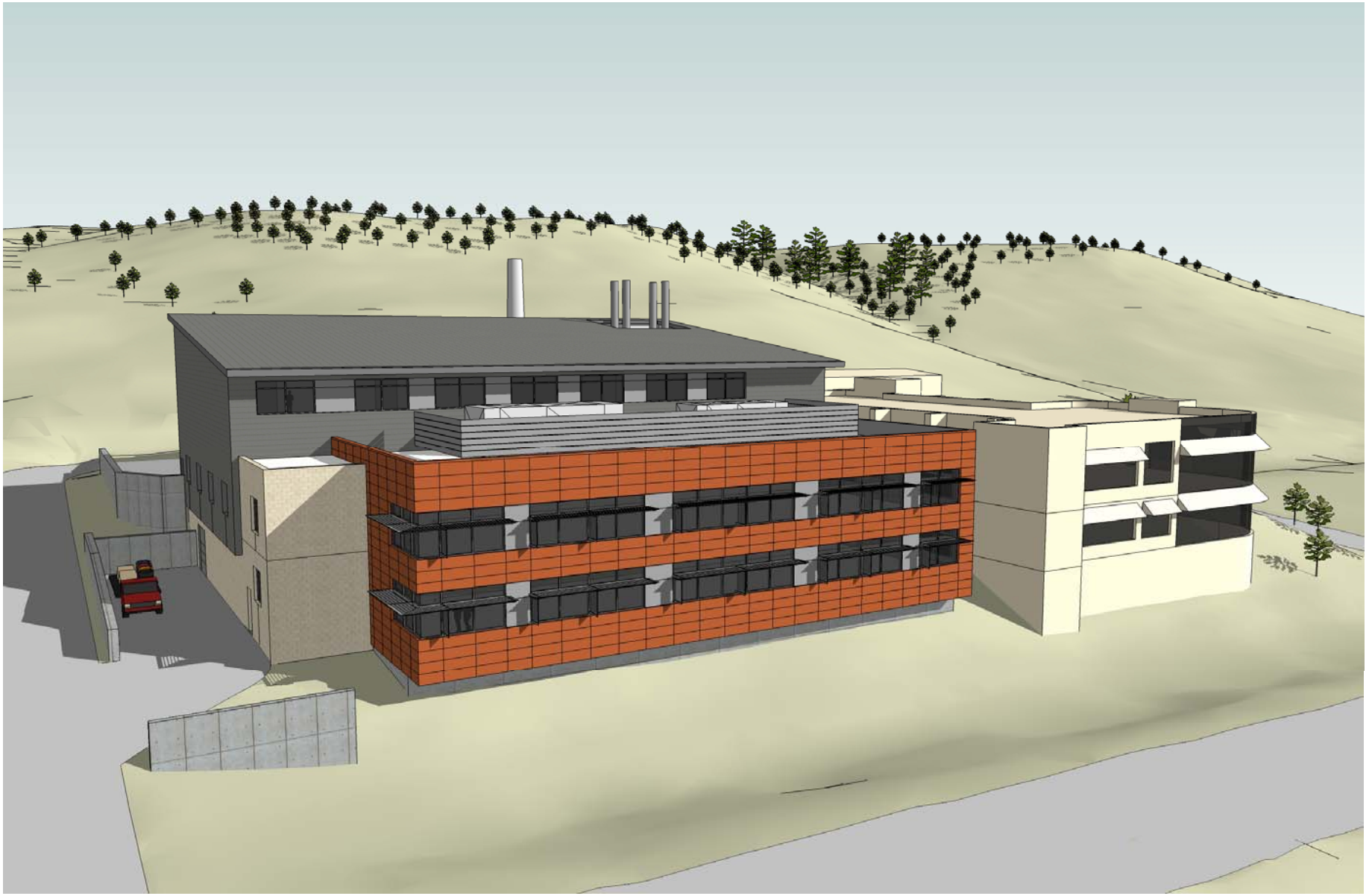
Integrated Biorefinery Research Facility (IBRF)

Second construction project

- State of the art R&D facility providing flexibility, fostering industry partnerships and allowing for future expansion
- Designed to support the Nation's ambitious "20 in 10" energy initiative:
  - Cost competitive cellulosic ethanol
  - Reduce US gasoline use by 20% in 2017
  - Ramp up the production of biofuels to 60 billion gallons
- Doubles size of existing Alternative Fuels Users Facility
  - 6,000 sq. ft. office space for approximately 35 staff
  - 2,000 sq. ft. of new laboratories
  - 4,000 sq. ft. of remodeled laboratories
  - 10,000+ sq. ft. of process demonstration (high bay)
- Expected completion: August 2010

Alternative Fuel Users Facility (AFUF)

AFUF with IBRF Addition



AFUF with IBRF Addition

Projected Schedule

- Contract Award

  December 2008
- Construction Begins (2 phases)

  Spring 2009
- Ready for Occupancy

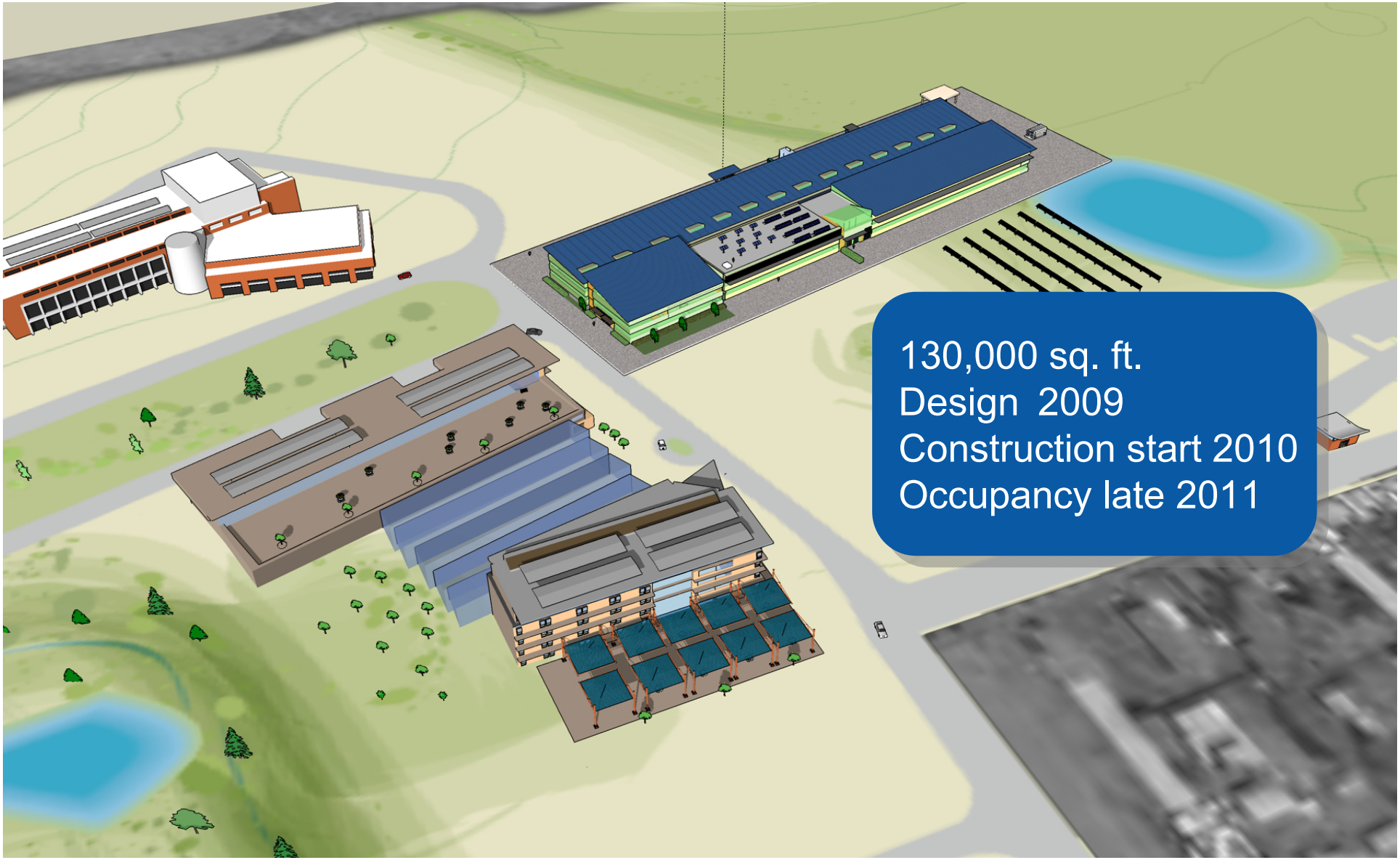
  4th Quarter FY 2010

Energy Systems Integration Facility (ESIF)

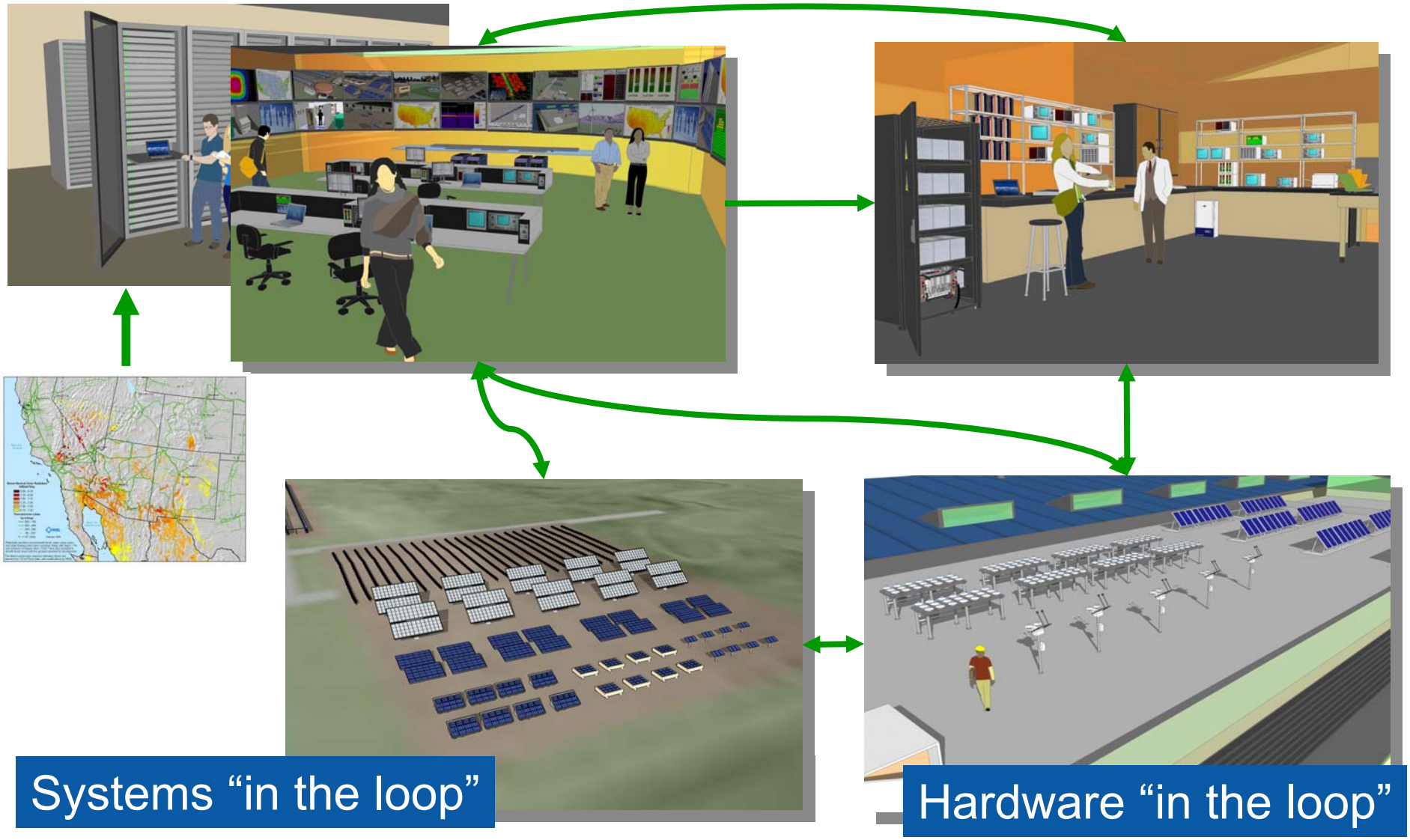
Third construction project

- Designed to house a variety of research that aims to overcome technical barriers to adding new renewable energy generation systems to the electrical grid
- 130,000 sq. ft. building located southeast of the existing Science & Technology Facility
- Multi-story building providing laboratory and office space for approximately 150 NREL researchers and support staff
- Designed to achieve a LEED® (Leadership in Environmental and Energy Design) Gold designation
- Employees could occupy the ESIF as early as 2012

Energy Systems Integration Facility



Energy Systems Integration Facility



ESIF System Integration Capabilities

System Testing, Data Analysis, Modeling, and Visualization Across Technologies

High-Performance Computing, Data Storage, and Networking

- Solar

- Interconnection
- Power electronics
- Building integration
- Thermal and PV system optimization

- Buildings

- Sensors and controls
- PV design and integration
- Modeling and simulation
- System integration

- Hydrogen

- H_2/electric interfaces
- RE electrolyzers
- Storage systems
- Standards
- Fuel cell integration
- Fueling systems

- Wind

- Models, methods for wind-grid integration
- Transmission
- Operations modeling

- Advanced Vehicles

- Plug-in-hybrids and vehicle-to-grid
- Battery thermal management
- Power electronics

- Storage

- CSP Thermal Storage
- Utility scale batteries
- Distributed storage.

Full systems interface evaluation for integration of electricity, fuels, thermal, storage, and end-use technologies

Energy Systems Integration Facility

Energy Systems Integration Facility

Projected Schedule

- Contract Award

  August 2009

- Construction Begins

  Spring 2010

- Ready for Occupancy

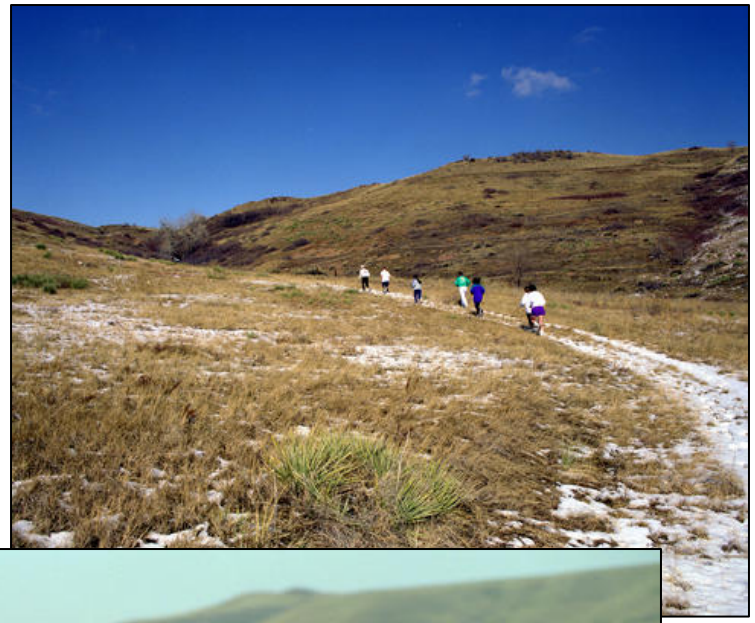
  Fall 2011

What to Expect During Construction

- Construction projects will begin this December/January
- Construction activities will take place primarily during daylight hours
- No weekend construction planned
- An access road will divert construction traffic away from the Visitor's Center and entry gate
- Expect typical construction activities

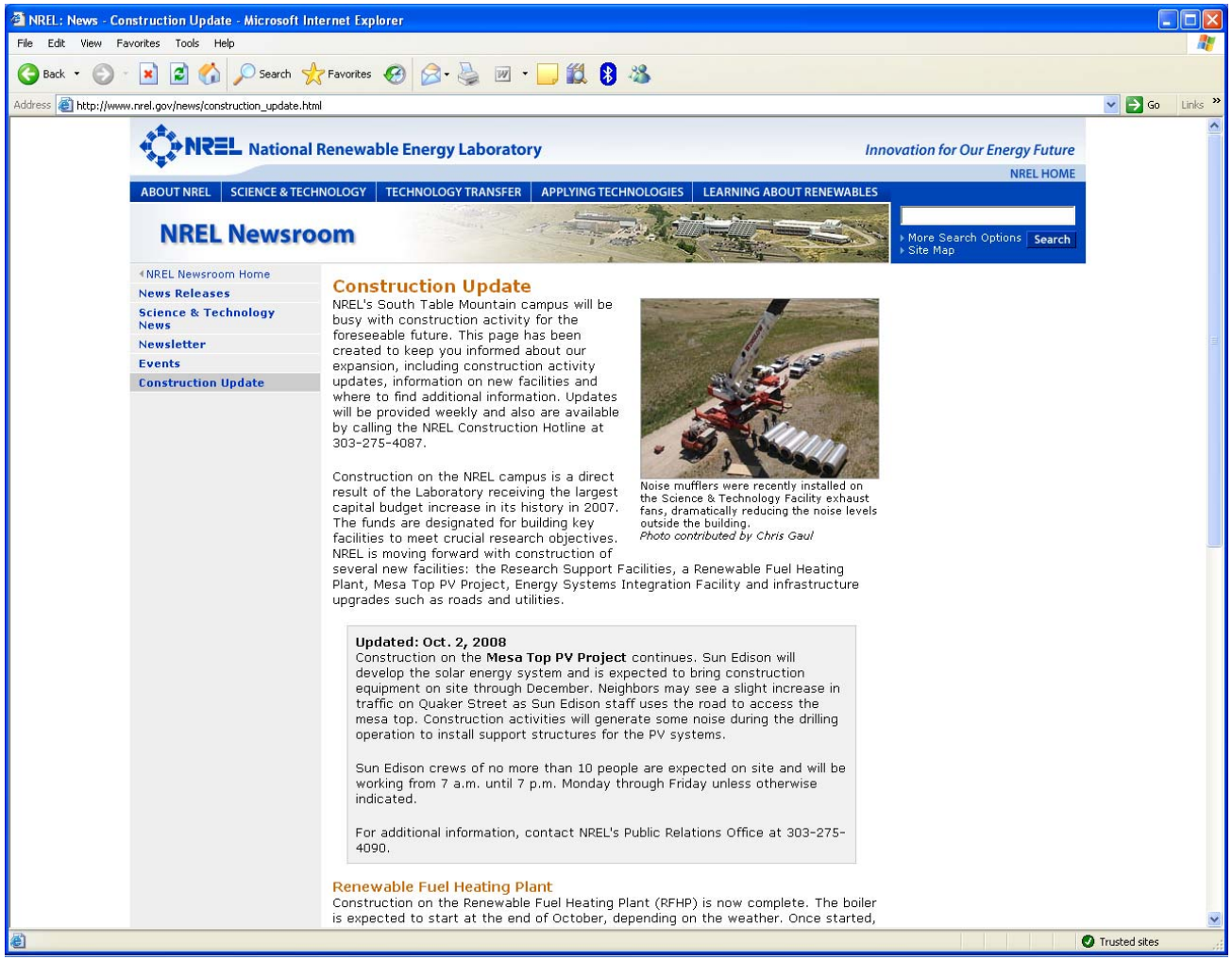
Environmental & Traffic Impacts

- Environmental Assessment complete and available to the public on *Environmental Protection* page: www.nrel.gov
- Public policy, air quality, noise, soils, and sustainability issues and concerns addressed
- Traffic study completed, and mitigation strategies identified



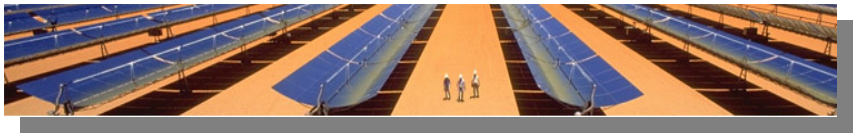
Construction Updates Available

Online: www.nrel.gov/news/construction_update.html
By Phone: NREL Construction Hotline 303-275-4087



NREL's Campus of the Future

- The leading efficiency and renewables research center in the world
- Sustainable energy showcase
- Designed to meet the nation's crucial research objectives for clean energy technologies
- Creating a sustainable energy future for not only our nation but the world



Questions?