Environmental Energy
Technologies Division

EETD Overview

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BERKELEY LAB

EETD Vision and Mission

Vision: *To be a global innovation hub for science, technology, and policy solutions to the world's most critical energy and environment challenges*

Mission: *Perform analysis, research and development leading to better energy technologies and reduction of adverse energy-related environmental impacts*

"To achieve our energy and climate goals, we need a strong and sustained commitment to research and development. These investments are needed for our country's future economic prosperity, energy security, and environmental sustainability"

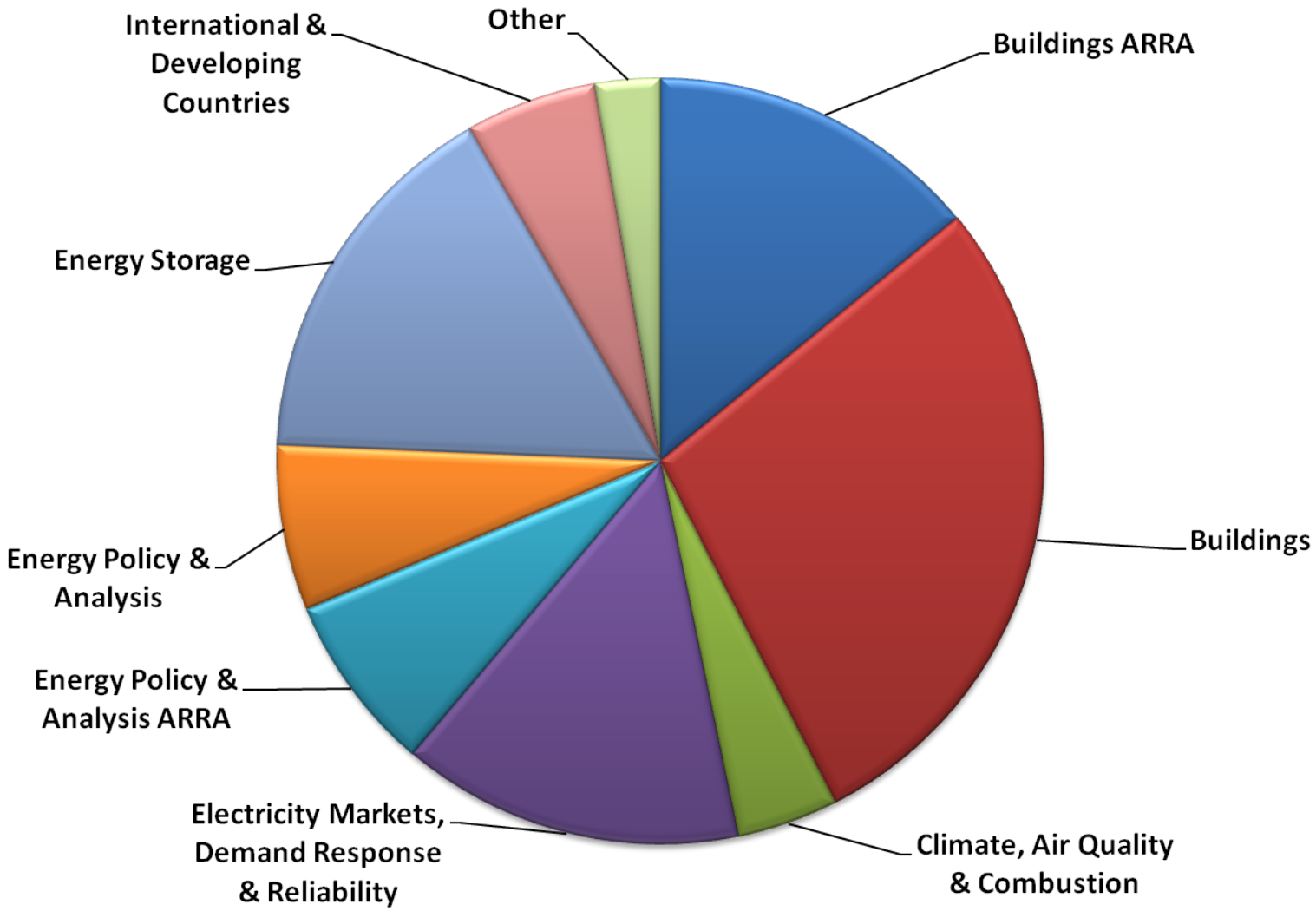
Steven Chu
Secretary of Energy
January 21, 2010

EET Division Profile

- One of the largest research divisions at LBNL
- About 12% of Lab in size of budget; 10% in staffing
- Total staff and visiting researchers
  in 2009: 390; in 2010: 469
- Total funding 2010: $130M
  includes $28M ARRA; 96 research sponsors
- Multidisciplinary research staff includes 94 principal investigators: architects, mechanical engineers, physicists, chemists, chemical engineers, economists, policy analysts
- Draws on students and recent graduates from UC and other academic institutions for research assistants and postdoctoral appointments
- Some joint appointments at UC Berkeley and UC Davis campuses

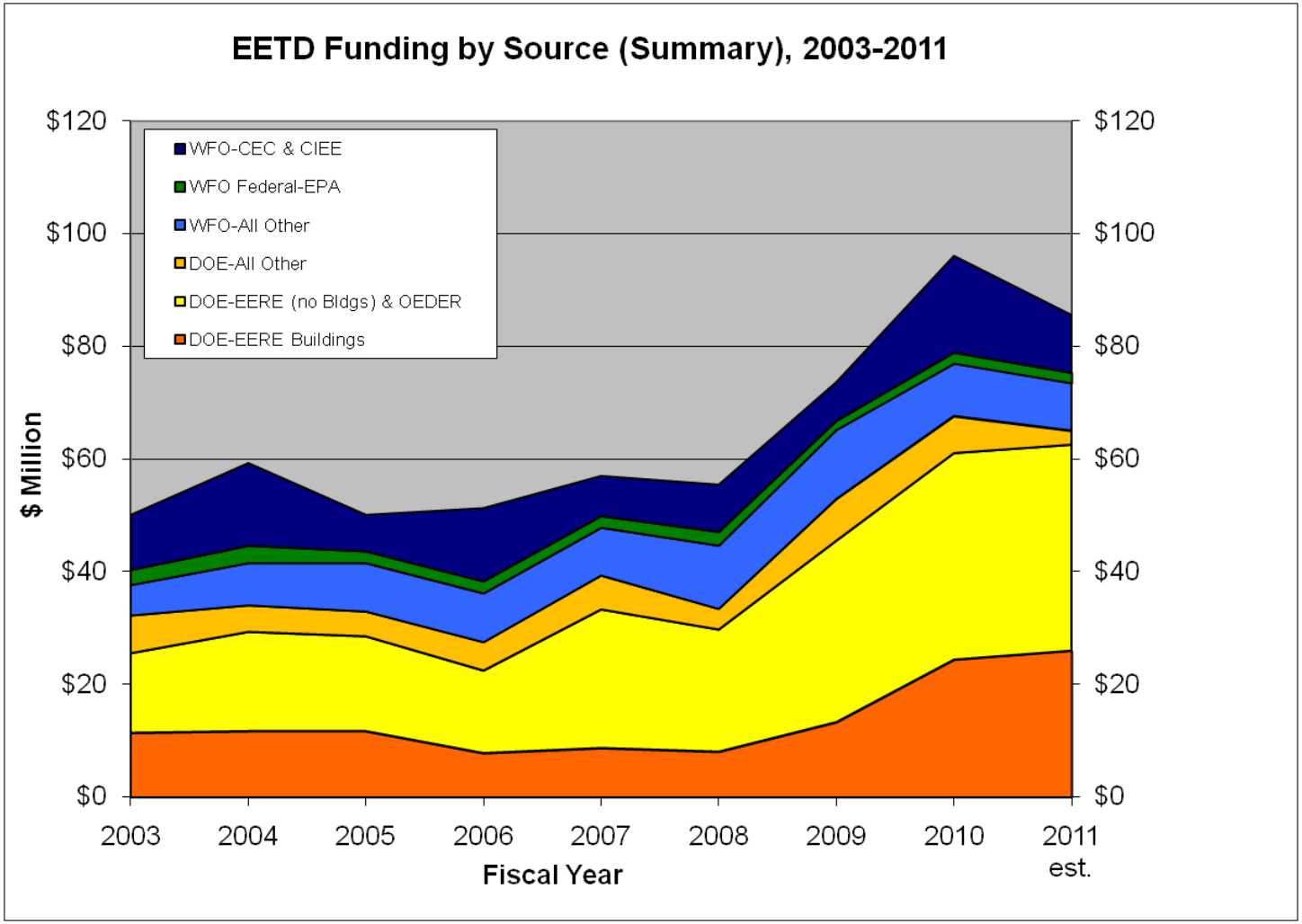
EETD FY10 Funding by Program

Total = $130 million



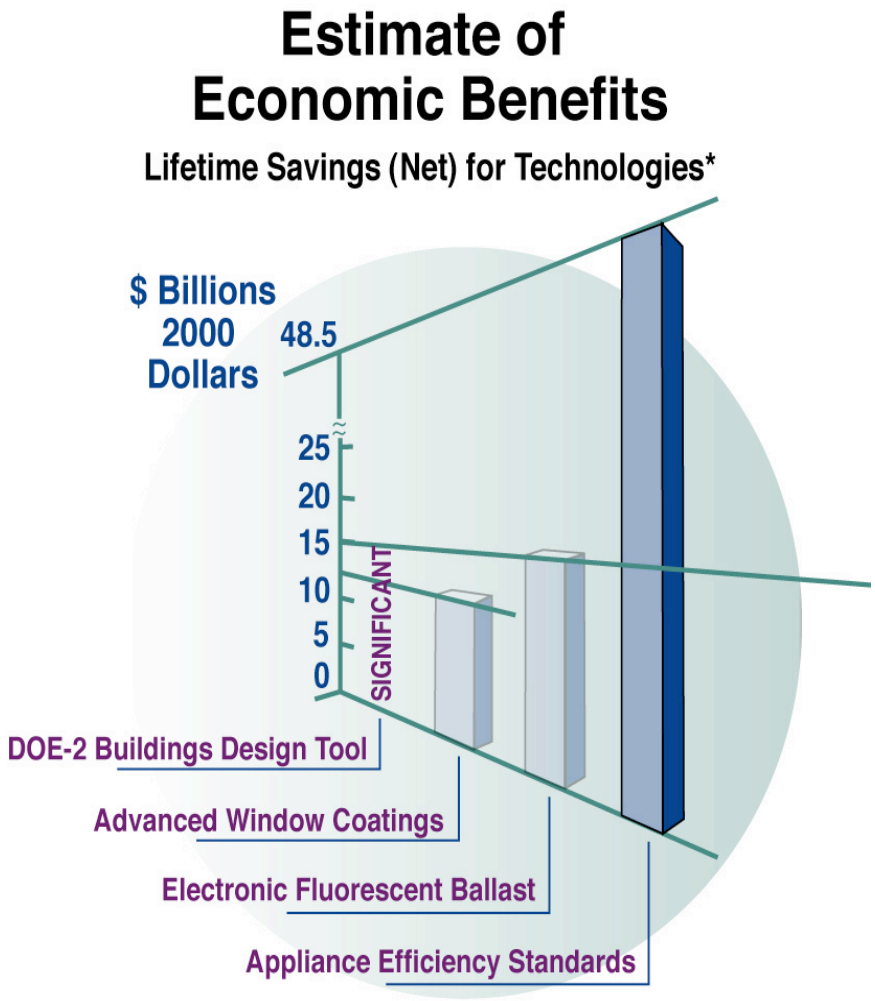
EETD Funding FY03-FY11 by Source

(excluding ARRA funding)



Prior Impacts of EETD's Efficiency R&D

From National Academy of Sciences Report (2001)*



NAS estimate of economic benefits of EE R&D assigns $23 of $30 billion in savings to LBNL - derived technologies

Additional $48 billion in savings from energy efficiency standards for 9 residential products

- *Primary Energy* Savings
  - = 9% of 2025 residential energy use
- *Carbon Reductions in 2025*
  - = 132 million metric tons CO_2/ year

*"*Energy Research at DOE: Was it worth it? (Energy Efficiency and Fossil Energy Research 1978-2000)", National Academies Press, 2001. ISBN-10: 0-309-07448-7*

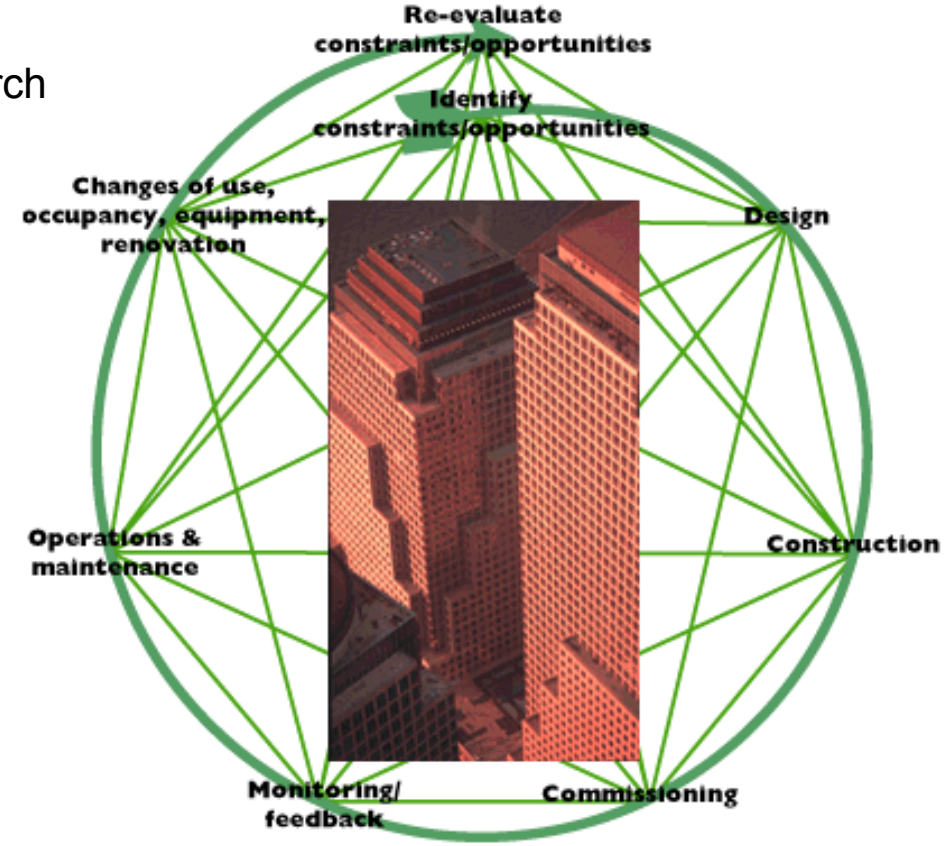
LBNL Carbon Cycle 2.0 Initiative

Energy Efficient Building Systems

Enable energy efficient buildings with comfortable, healthy and productive environment

Major Program Areas:

- Integrated commercial and residential research
  - Smart controls
  - Technologies (windows, HVAC, lighting, etc.)
  - Software tools
  - Deep energy retrofits
- Indoor air quality
  - Ventilation
  - Indoor chemistry – reactions and significance
  - Sensor data analysis
  - Impact analyses for energy technologies
- Human behavior's impact on performance
- Collaboration with overseas partners
- Technical assistance, education and training



Major New Initiatives:

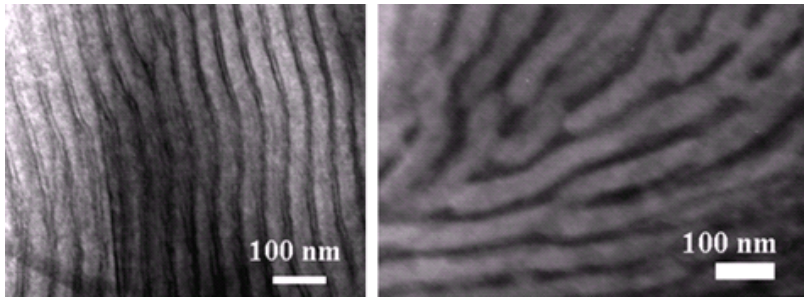
- Building User Test Facility- *Awarded FY2010*
  - Test integration of building components and control systems
  - Cooperation with public/private sector
  - Jointly staffed with LBNL and visiting scientists from industry

Electric Energy Storage and Conversion Systems

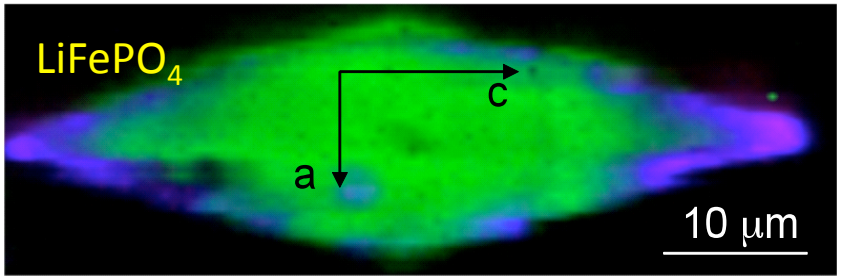
Enable a paradigm shift in energy generation and use

Major Program Areas:

- Batteries for Advanced Transportation Technologies
  - Cutting edge long-term research
  - Remedy life and performance limitations
- Advanced Battery Research Program
  - Overcome barriers for high power Li-ion batteries
  - Technical assistance to battery developers
- Energy Frontier Research Centers
  - Understand principles that govern EES devices
  - Enable breakthroughs in fundamental sciences
- Fuel cells
  - Development a new class of non-Pt catalysts
  - Theoretical modeling and systems engineering



New materials: co-block polymer electrolytes



State-of-the-art diagnostics

Major New Initiatives:

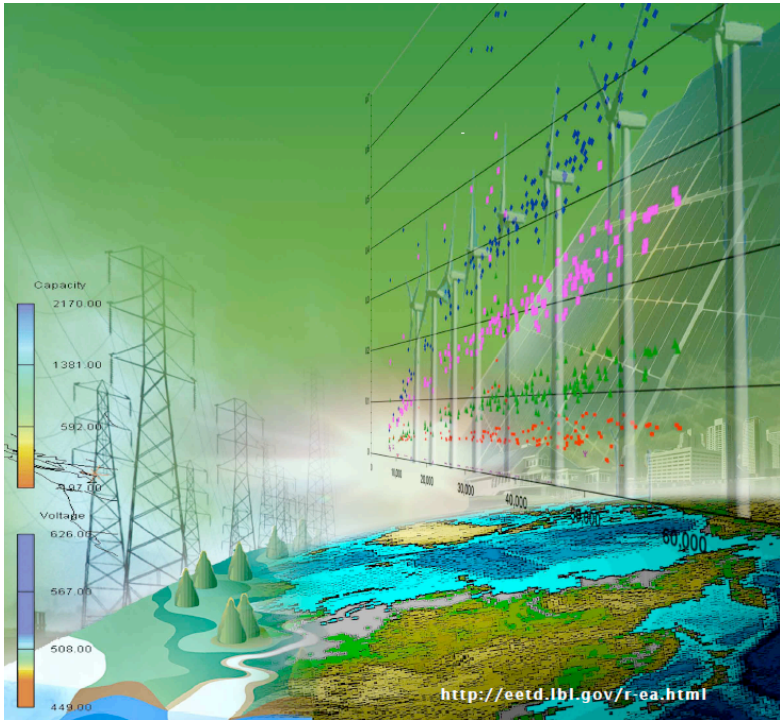
- Integrated Laboratory/Industry Research Program (collaboration with ANL)
  - Expand vehicle batteries research into high-energy systems
  - Stationary energy storage program for grid & renewable applications
  - Cooperation with industry
- Energy Storage Hub in collaboration with ANL *(coming)*

Energy Markets, Policy and Analysis

Analyze and design effective energy and environmental approaches

Major Program Areas:

- Appliance Energy Standards
- Demand Response Research
- Energy markets and policy
  - Electricity markets
  - Consortium for Electric Reliability Technology Solutions (CERTS)
  - Renewable energy markets
  - Industrial energy
  - Water and energy
- Next generation analysis tools
  - Web-based tools for consumers
  - Non-technology factors in markets
  - Databases, statistical analysis, agent-based models



Major New Initiatives:

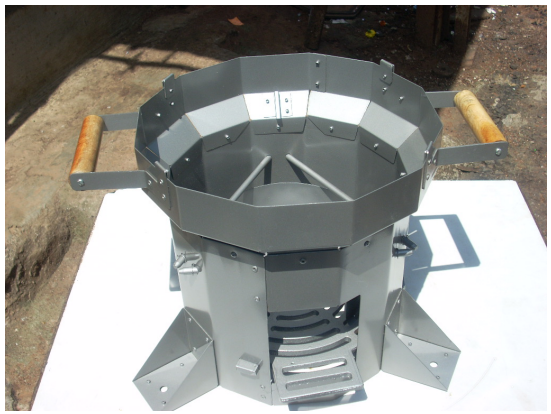
- CC2.0 LDRD strategic proposal
- Utilize exascale computing to build integrated models of energy technologies, markets and climate impacts
- Life cycle assessments for energy and health

International/Developing Countries

Berkeley Lab projects bringing solutions to the developing world

Major Program Areas:

- China Group's work on energy efficiency, industrial best practices, buildings energy standards, technical assistance
- International Energy Group - informs and helps formulate and implement in-country energy and environmental policies
- The Berkeley-Darfur stove, and other stoves projects



Major New Initiatives:

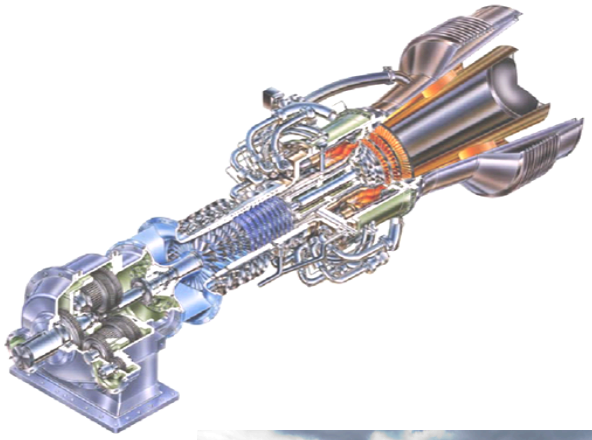
- Energy efficient stoves for Haiti earthquake survivors
- Mongolia air quality and appliance standards
- China/US Energy Center - Buildings
- Substantial engagement with India on electricity market regulation and energy efficiency policy

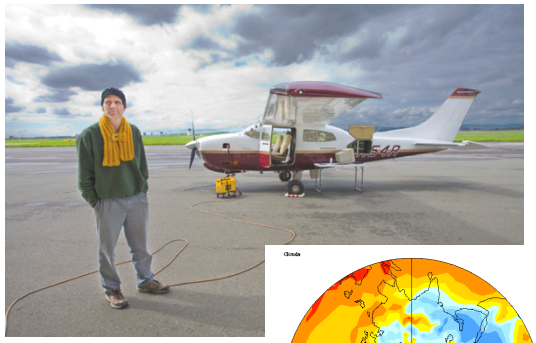
Combustion and Atmospheric Science

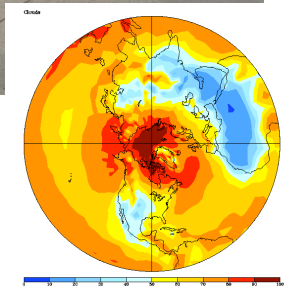
Scientific Evaluations of Combustion Processes and Atmospheric Environment

Major Program Areas:

- Applied and basic studies of combustion processes
  - Gas turbines in clean coal power plants
  - Low-emissions combustion of fossil and renewable fuels
- Air quality prediction
  - Advanced chemistry for air quality prediction
- Climate modeling of clouds and aerosols
  - Next-gen cloud microphysics
  - Cloud-climate feedbacks
- Greenhouse Gas Emissions Verification
- Cool Roofs and Surfaces







Major New Initiatives:

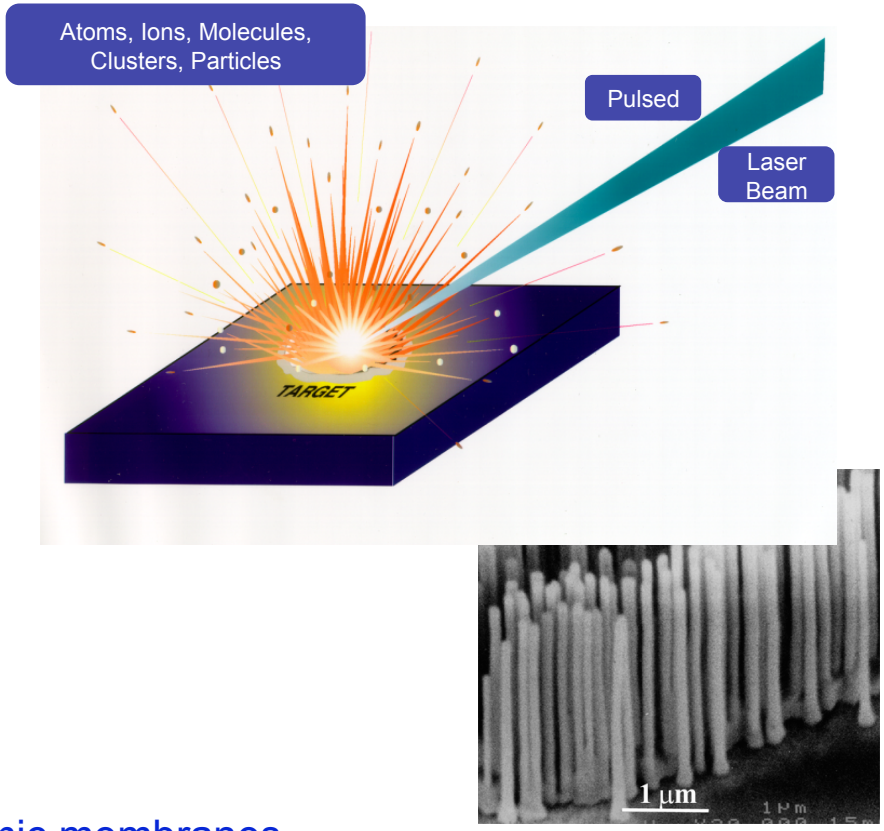
- Global greenhouse gas information system (GHGIS)
- Advanced low-NOx gas turbines
- Combustion research for hydrogen and bio-fuel flames

Advanced Energy Technologies

Physical science research in support of energy technologies

Major Program Areas:

- Advanced laser spectroscopy and imaging diagnostic tools
  - Photovoltaics
  - Energy storage
  - Fuel Cells
  - Biology
- Nano-engineering new materials and architectures for clean energy systems



Major New Initiatives:

- CO_2 capture with engineered ceramic membranes
- Long life radiation-enabled power source
- Networked sensors

Looking Ahead

EETD Vision:

Global innovation hub for science, technology, economics, and policy focused on energy and environment