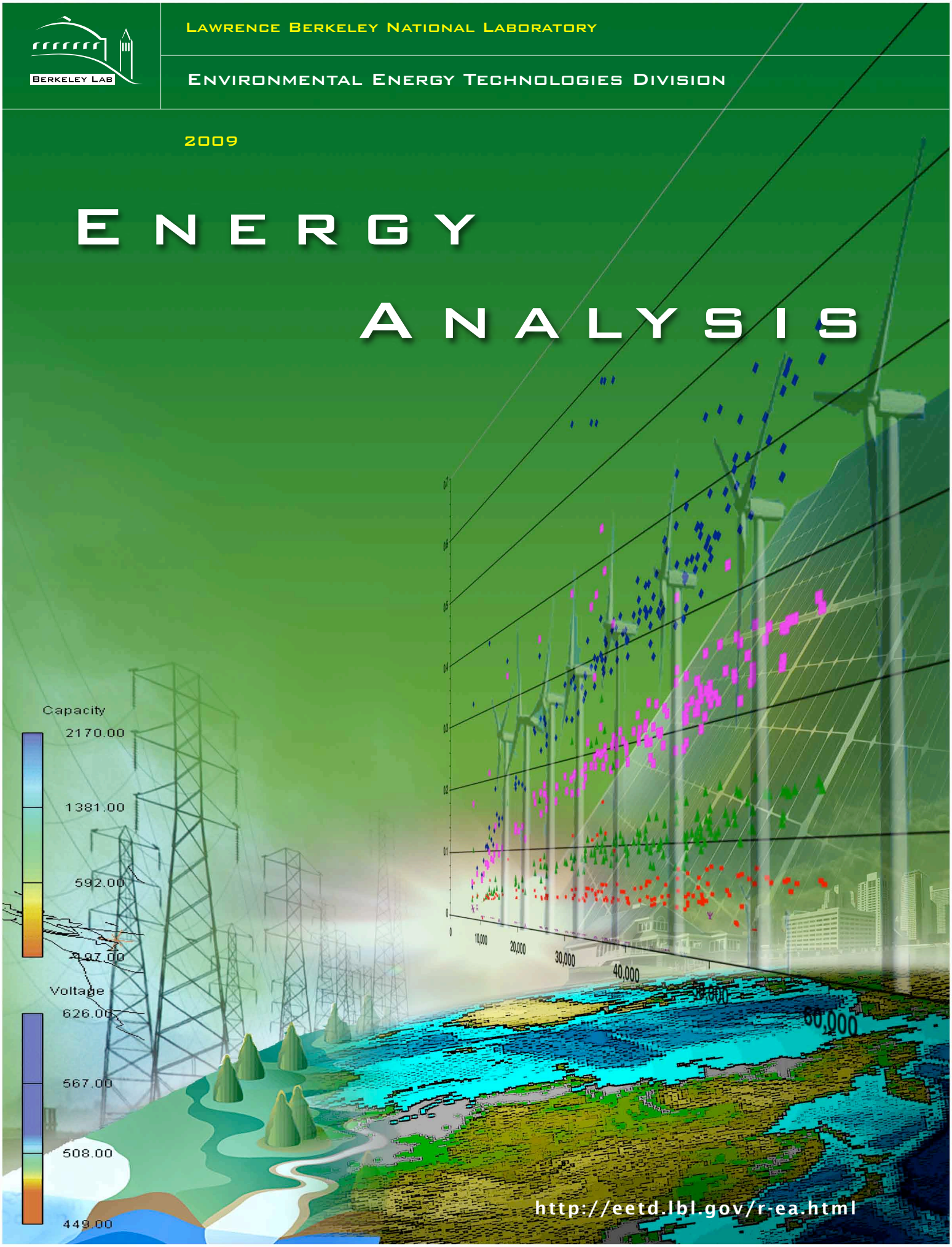
Lawrence Berkeley National Laboratory

Environmental Energy Technologies Division

2009

Energy Analysis



http://eetd.lbl.gov/r-ea.html

Energy Analysis Department *Where Science Meets Society*

EETD's energy analysts collect, analyze, and interpret information about energy consumption and supply, energy technologies (especially efficiency and renewable sources), industrial energy management, land-use change, energy company programs, government policies, and economic and environmental impacts.

These studies:

- **research the performance of energy-efficient technology in the laboratory and the marketplace;**
- **analyze and quantify the impacts of various international, federal and state energy policies;**
- **assess and compare the feasibility of different approaches to designing energy-efficient standards and building codes; and**
- **scientifically compare technology, program, policy and behavior options for reducing the emissions of greenhouse gases.**

The work provides local, state, national and international governments, as well as individuals, private industry, trade associations, regulatory agencies, and international institutions with information to help them formulate effective energy and environmental approaches.

Research Areas

Standards & Codes Analysis

Energy-Efficiency Standards (Often Called "Appliance Standards")

Energy-efficiency standards for appliances, equipment and lighting, combined with provisions in building codes, save consumers billions of dollars a year in residential and commercial buildings in the United States. Division research provides impartial and scientifically rigorous technical information on the energy use of appliance technologies and economic and environmental implications to the Department of Energy's standards development process.

http://ees.ead.lbl.gov/

Building Codes

EETD provided technical assistance to California beginning in the 1970s on the development of its energy-efficient building code, Title 24. It continues to assist state and local officials throughout the U.S. as they formulate and fine-tune energy-efficiency measures and consider portfolio standards for renewable supply and energy efficiency.

International Assistance

Often inspired by the U.S. experience, dozens of nations have adopted or are currently developing energy efficiency standards and building codes. EETD was instrumental in forming CLASP, the Collaborative for Standards and Labeling Program, now an independent international non-profit assisting many nations in the development of energy efficiency standards and labels.

http://www.clasponline.org/index.php

Energy-Efficient Procurement

Researchers in Berkeley and the Division's Washington D.C. Projects Office help federal, state, and local agencies develop guidelines for procuring energy-efficient products. They look for opportunities to assist federal agencies become more energy-efficient for the Federal Energy Management Program (FEMP) and have worked with the Green the Capitol Office to develop retrofit plans for Congressional office buildings.

The ENERGY STAR© Program

EETD researchers have provided analytical support for the voluntary ENERGY STAR© programs in appliance labeling and new homes, administered jointly by the U.S. Environmental Protection Agency and the U.S. Department of Energy. The government harnesses market forces to promote energy efficiency and pollution prevention by inducing manufacturers to put ENERGY STAR© labels on their products.

Energy Policy

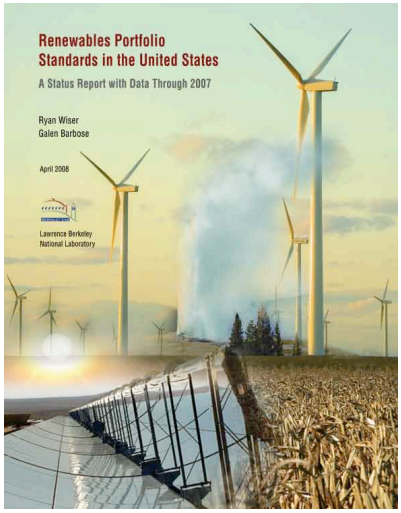
Electricity Markets

The Electricity Markets and Policy Group provides technical assistance to international, federal, state, and local agencies in evaluating and deploying energy efficiency, renewable energy, and demand-response programs and policies.

http://eetd.lbl.gov/EA/EMP/

Industrial Energy

EETD conducts research into industrial energy use, energy saving potential from changes in industrial systems and processes, energy efficiency, life-cycle assessment, and the effectiveness of policy mechanisms, such as voluntary agreements and partnerships, energy management and system standards.



Renewable Energy Markets

The Division's research on renewable energy policy has generated new reports examining:

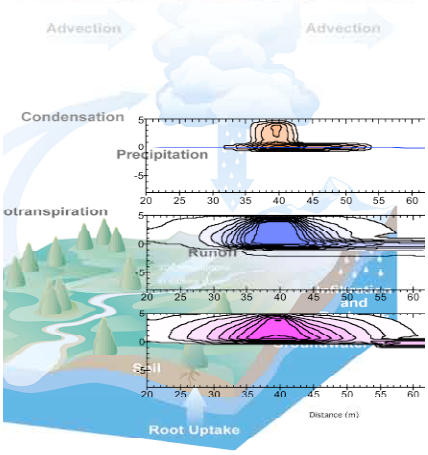
- What policies work in furthering the goals of state renewable portfolio standards (RPS)
- The annual report on U.S. wind power development
- Solar photovoltaic panel installations in the U.S.
- The effect of wind power resource on hedging natural gas prices

http://eetd.lbl.gov/EA/EMP/re.html

Consortium for Electric Reliability Technology Solutions (CERTS)

CERTS is an industry-university-national laboratory consortium to research, develop, and commercialize new methods, tools, and technologies to protect and enhance the reliability of the U.S. electric power system under the emerging competitive electricity market structure.

http://certs.lbl.gov/



Water and Energy

Water and energy technology research focuses on improving the efficiency of energy and water use in both water and energy systems. Only 2.5 percent of earth's water supply is fresh. Clean water requires energy. Globally, perhaps seven percent of energy is used to deliver and treat water and wastewater. Conversely, energy requires water. In the U.S., 39% of freshwater withdrawals are required for cooling by thermal power plants that generate electricity. As population grows, the pressures on water supplies are growing, and new ways of efficiently using water and energy are being developed, including integrated resource management.

http://water-energy.lbl.gov/

Reducing International Greenhouse Gas Emissions

The 2007 Nobel Peace Prize was awarded to Former Vice President Al Gore, and the Inter-governmental Panel on Climate Change (IPCC) "for their efforts to build up and disseminate greater knowledge about man-made climate change, and to lay the foundations for the measures that are needed to counteract such change."

Several EETD researchers contribute to the IPCC's work. EETD has assisted IPCC in reporting the findings published on mitigating and adapting to climate change, as well as on climate studies.

EETD's studies of energy use and greenhouse gas (GHG) emissions have made the Division an important source of information on global climate change for policymakers. Researchers have analyzed the potential of energy-efficient technologies to reduce GHG emissions, and have evaluated the emissions of the world's buildings and industrial sectors, and the forestry sector.

http://eetd.lbl.gov/eetd-awards-nobel.html

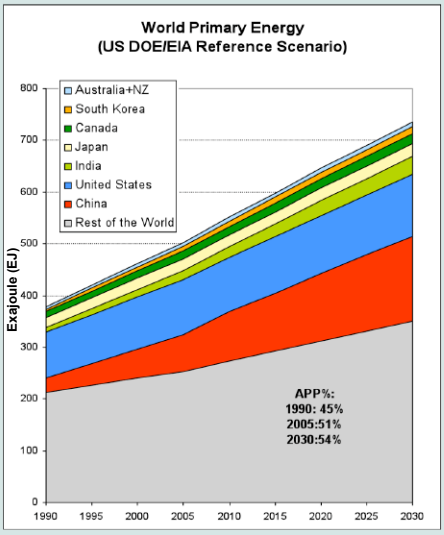
International Energy Studies (IES) Group

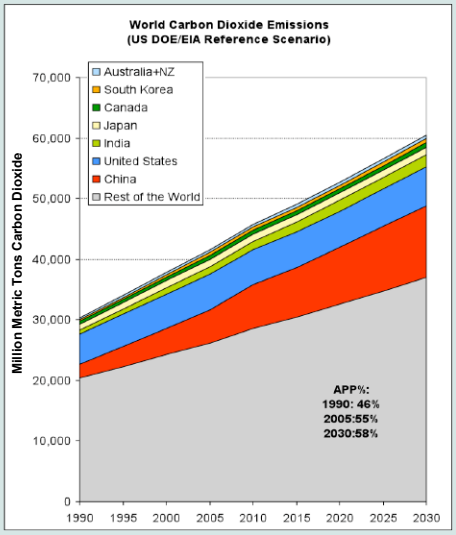
Global energy use and land-use change particularly in the developing countries have significant implications for greenhouse gas emissions. The IES Group created research networks in the above fields that have stretched to as many as 35 developed and developing countries. It works collaboratively with research institutions, local, state, and national governments, industry, utility companies and regulatory commissions international organizations such as the World Bank, and international and oil company foundations. It currently focuses on:

- Power sector including demand-side-management (DSM) programs in seven Asia Pacific Partnership countries
- Industrial energy use, particularly life-cycle assessments, in California, U.S., China, and India.
- Global land-use change and forestry emissions and mitigation options, and evaluation of impacts of climate change
- Project and program evaluation tools
- Supporting IPCC in its mitigation assessments

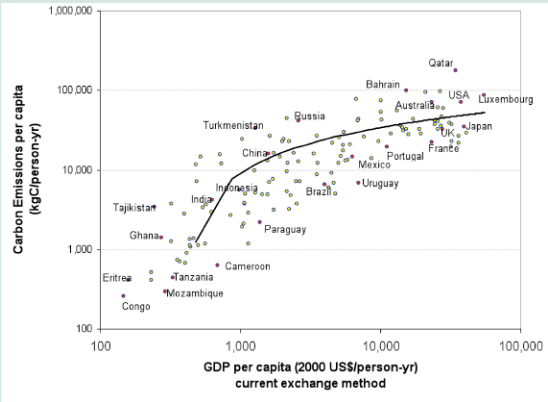
http://ies.lbl.gov

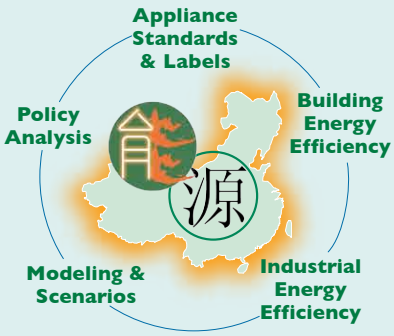
Primary Energy Consumption and Carbon Dioxide Emissions:
Selected Large Emitters (APP Countries) and World





CO_2 Emission Per Capita In Some Countries





China Energy Group

China is fueling its phenomenal economic growth with huge quantities of coal. The environmental consequences reach far beyond its borders—China's greenhouse gas emissions match those of the United States. The China Energy Group is committed to understanding efficient energy opportunities, and to exploring their implications for policy and business. We work collaboratively with energy researchers, suppliers, regulators, and consumers in China and elsewhere:

- to better understand the dynamics of energy use in China,
- to develop and enhance the capabilities of Chinese institutions that promote energy efficiency, and
- to create links between Chinese and international institutions.

http://china.lbl.gov/

BIJLEE

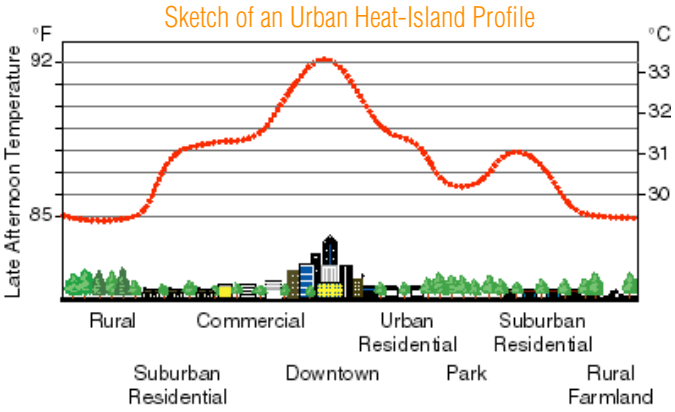
BERKELEY • INDIA JOINT LEADERSHIP ON ENERGY & ENVIRONMENT

Berkeley India Joint Leadership on Energy and Environment (BIJLEE)

The Berkeley India Joint Leadership on Energy and Environment (BIJLEE) is a joint research and development program in which researchers work with the government and private sector of India to assist both countries adopt pathways and approaches for reducing the emissions of greenhouse gases while pursuing sustainable economic development. BIJLEE brings together researchers to develop energy-efficient and renewable energy technologies, and policy mechanisms to transfer these technologies to the marketplace with the goal of combating climate change and promoting economic growth.

http://bijlee.lbl.gov

Cool Roofing Materials and Urban Heat Islands



Cities are urban heat islands, zones of higher temperature relative to the surrounding countryside. The heat island effect intensifies the use of expensive air conditioning. Higher outdoor air temperatures also increase smog formation. Division researchers have pioneered an effective, simple approach to keeping cities cooler—the use of shade trees and solar reflective roofing and paving materials. EETD studies have found that the cooling effect from wide application of these measures could save billions of dollars and reduce smog in large cities nationwide.

A program to develop cool-colored roofing materials in cooperation with the roofing industry has resulted in an entire class of new products now in the marketplace: cool, solar-reflective metal, clay, concrete tiles, and asphalt shingles that reduce air conditioning energy use by up to 20 percent by reflecting more of the sun's heat back to space.

http://coolcolors.lbl.gov/
http://eetd.lbl.gov/HeatIsland/

Examples of Achievement

Energy-Efficient Appliance Standards

Residential consumers spent $215 billion and commercial consumers spend $154 billion in 2005 on energy for appliances, heating and cooling equipment and lighting, which consumption resulted in 2305 million metric tons of carbon dioxide emissions. Berkeley Lab researchers provide technical analysis used by the Department of Energy as it establishes energy efficiency standards for energy-using products mandated by law. Berkeley Lab's energy policy work includes analyzing the effects on energy use and costs to consumers and the nation of using different technologies to meet the energy performance standards' requirements.

These regulations have been remarkably successful in their goal of achieving maximum energy efficiency that is both technologically feasible and economically justified. Thanks in part to a series of refrigerator standards researched by Berkeley Lab, the average energy consumption of a U.S. refrigerator dropped 70% between 1974 and 2006. The requirements of the legislation, and Berkeley Lab's work providing a basis for updates, have helped the U.S. become a worldwide leader in energy-efficient appliance standards. The sequential updates demonstrate that energy efficiency is a renewable resource. The standards on residential and commercial products currently save U.S. consumers $9 billion per year, which will increase to over $20 billion per year (undiscounted) by 2030. Cumulative energy savings through 2008 are 14 Exajoules, resulting in a reduction of 220 million tons of carbon dioxide emissions. Standards already in place are projected to save an additional 37 EJ through 2025, with an additional cumulative reduction in carbon dioxide emissions of 580 million tons.

Contacts:

James E. McMahon
Telelphone: 510-486-6996
Email: JEMcMahon@lbl.gov

Charles Goldman
Telelphone: 510-486-4637
Email: CAGoldman@lbl.gov

Anita Estner
Telelphone: 510-486-4270
Email: ACEstner@lbl.gov

Visit the Lab: www.lbl.gov

Visit the Energy Analysis Department, Environmental Energy Tehcnologies Division:
http://eetd.lbl.gov/r-ea.html

The mission of Berkeley Lab's Environmental Energy Technologies Division is to perform research and development leading to better energy technologies that reduce adverse energy-related environmental impacts. Our work increases the efficiency of energy use, reduces its environmental effects, provides the nation with environmental benefits, and helps developing nations achieve similar goals through technical advice.