

USA

Energy Needs, Clean Development and Climate Change



U.S. Department of State
www.state.gov/g/oes/climate

Sustainable Development Partnership
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Asia-Pacific Partnership on Clean Development and Climate
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USA

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Partnerships in Action

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I. Overview

President Bush is firmly committed to taking sensible action on climate change – at home and abroad. Climate change is a serious, long-term challenge that requires an effective, sustainable policy and the United States is implementing a comprehensive strategy to address the challenges of global climate change. It is science-based, promotes innovative scientific and technological breakthroughs, harnesses the power of markets, and encourages global participation. Our approach emphasizes near-term policies and measures to slow the growth of greenhouse gas emissions, longer-term climate change science and technology development initiatives, and international collaboration.

The U.S. approach reflects the view that the most effective way to deal with climate change is as part of a broader agenda. Our inclusive strategy brings all stakeholders to the table and encourages meaningful global participation through actions that will reduce greenhouse gas emissions, improve energy security and cut air pollution that is harmful to human health and natural resources while ensuring continued economic growth and prosperity for our citizens and for citizens throughout the world. These are all complex, long-term challenges that require sustained commitment and focus on the part of all nations, and we are working collaboratively with countries across the globe to find solutions.



The earth rises over the moon.



Source: Courtesy of NASA

Our collaborative efforts include a wide array of action-oriented partnerships. Our partnerships rely on voluntary and practical measures to reduce greenhouse gas intensity, create new investments, build local capacity, and remove barriers to the introduction of cleaner technologies.

The Asia-Pacific Partnership on Clean Development and Climate (APP) exemplifies our action-oriented partnerships. The APP, launched by ministers from the six APP countries in January of 2006, is an innovative public/private initiative that accelerates the development and deployment of clean energy technologies. At the program launch, ministers pledged to “cooperatively promote the deployment of promising technologies that offer greater energy efficiency and lower air pollution and greenhouse gas intensities” and created eight task forces with representatives from the public and private sectors.

The United States is working in partnership with other governments, non-governmental organizations, and the private sector to transform how energy is produced and consumed. These partnerships promise to improve the lives of billions of people in all parts of the world. Our approach draws upon the best scientific research, fosters the creativity of entrepreneurs, and involves developing world partners in order to meet our shared aspirations for our people, our economy, and our environment.

II. Domestic Actions and Public/Private Partnerships to Slow the Near-Term Growth of Greenhouse Gas Emissions



Source: Courtesy of the Department of State

Domestic actions and public/private partnerships are leading to many positive impacts, including the protection of America's natural heritage.

A. Greenhouse Gas Intensity Goal

President Bush has set an ambitious target of cutting our greenhouse gas intensity by 18 percent through the year 2012. Our objective is to significantly slow the growth of greenhouse gas emissions and, as the science justifies, stop it and then reverse it.

While measuring progress in absolute terms is important, the most useful measure for policy management purposes is the relative improvement in greenhouse gas emissions intensity. The intensity measure appropriately recognizes reductions that are achieved through increased investment in efficiency, productivity and economically valuable outcomes that require less energy or otherwise lead to lower emissions. It sharply discounts reductions produced by economic decline, job loss, or policies that simply shift greenhouse gas emitting activity from the United States to another country – in which case the desired emissions reduction did not actually happen.

The Administration estimates that its goal will reduce cumulative emissions of carbon dioxide equivalent by more than 1,833 million metric tons by 2012, and recent Energy Information Administration projections suggest that achieving the 18 percent goal will reduce greenhouse gas emissions by 366 million metric tons of carbon dioxide equivalent in 2012 alone.

To meet help our intensity target, further our understanding of climate science, and help reduce our emissions in the long term, the Administration has committed more than \$29 billion for climate change-related activities since 2001, helping fund numerous programs related to climate change.

B. Climate VISION (Voluntary Innovative Sector Initiatives: Opportunities Now)

In February 2003, President Bush announced that 12 major industrial sectors and The Business Roundtable had committed to work with four of his cabinet agencies (the Departments of Energy,

Transportation, and Agriculture and the Environmental Protection Agency) to contribute to meeting his 18 percent intensity reduction goal by improving the energy efficiency or greenhouse gas emissions intensity of its sector. Today,

business and trade associations representing 14 energy-intensive industry sectors that account for approximately 40 to 45 percent of total U.S. greenhouse gas emissions have issued letters of intent to meet specific targets. Participating sectors include: aluminum, automotive manufacturers, cement, chemical manufacturing, electric power, forest products, iron and steel, lime, magnesium, minerals, mining, oil and gas, railroads, and semiconductors. For more information, please visit www.climatevision.gov.

C. Climate Leaders

Announced in February 2002, Climate Leaders is an Environmental Protection Agency (EPA) partnership encouraging individual companies



Janssen Pharmaceutica, a subsidiary of Johnson & Johnson Inc., installed a 500 KW rooftop solar energy system in 2003 as part of the company's corporate-wide greenhouse gas reduction strategy. Through EPA's Climate Leaders Program, Johnson & Johnson has pledged to reduce its total U.S. greenhouse gas emissions by 14 percent from 2001 to 2010.



ClimateVision logo.

Source: Courtesy of DOE

Source: Courtesy of Powerlight Corporation (2003)

to develop long-term, comprehensive climate change strategies. Under this program, partners set corporate-wide greenhouse gas reduction goals and inventory their emissions to measure progress. Climate Leaders has grown to include more than 90 partners, half of whom have already committed to greenhouse gas reduction goals. The total U.S. greenhouse gas emissions of Climate Leaders partners are more than 8 percent of the total U.S. emissions. For more information and a list of Climate Leaders partners, please visit www.epa.gov/climateleaders.

D. SmartWay Transport Partnership

Launched in February 2004, the SmartWay Transport Partnership is designed to reduce fuel consumption and emissions as well as improve energy security by encouraging truck and rail companies and the shipping companies that hire them to improve the overall environmental performance of the freight delivery system. Currently, over 460 companies and organizations have joined SmartWay to reduce emissions of greenhouse gases and other air pollutants associated with their freight operations. Additionally,

there are over 80 diesel truck and locomotive engine idling reduction projects being implemented around the country. By 2012, this initiative is estimated to reduce emissions by 33 million metric tons of carbon dioxide equivalent. For more information, please visit www.epa.gov/otaq/smartway/index.htm.

E. ENERGY STAR®

Recognizing the importance of energy efficiency, EPA established the voluntary ENERGY STAR® program in 1992, and has partnered with the Department of Energy (DOE) since 1996 to increase the nationwide use of energy-efficient products and practices. Through the ENERGY STAR program, consumers have benefited



Source: Courtesy of EPA

from the purchase of more than 2 billion ENERGY STAR qualified products, including home appliances, heating and cooling equipment, home electronics, office equipment, lighting, and other products and from the energy assessments and im-

provements across thousands of buildings and facilities. In 2005 alone, Americans, with the help of ENERGY STAR, prevented the release of approximately 125 million metric tons of carbon dioxide equivalent — which is roughly the annual emissions from 23 million vehicles — and saved about \$12 billion on their utility bills. Also in 2005, close to 10 percent of new homes were built to ENERGY STAR specifications, meaning they were 30 percent more efficient than model energy codes. For more information, please visit <http://www.energystar.gov/>.



Source: Courtesy of Powerlight Corporation (2003)

The Petro Travel Center in Knoxville, TN provides advanced truck stop electrification, limiting emissions.

F. Targeted Incentives for Greenhouse Gas Sequestration

The Department of Agriculture (USDA) provides targeted incentives through its conservation programs to encourage wider use of land management and production practices that sequester carbon and reduce greenhouse gas emissions. USDA also provides financial and technical assistance to help farmers install renewable energy systems and make improvements in energy efficiency that help reduce greenhouse gas emissions. Through the Conservation Reserve Program (CRP), USDA encourages



Source: Courtesy of USDA/NRCS

USDA programs encourage farmers to expand conservation tillage, plant trees, and restore riparian systems.

farmers to remove environmentally sensitive lands from production, and also encourages installing vegetative covers that sequester carbon. CRP rules also give landowners the right to sell carbon credits generated from lands enrolled in the program. Finally, under CRP, USDA has begun a program to afforest 500,000 acres of bottomland hardwoods.

In the Environmental Quality Incentives Program (EQIP), which encourages adoption of conservation practices on working lands, USDA is rewarding actions that provide greenhouse gas benefits. EQIP also provides financial and technical assistance to farmers for specific technologies and practices with greenhouse gas benefits — including installing anaerobic waste digesters and adopting management systems for residues, irrigation water, nutrients, crops, wetlands, and grazing land that mitigate

greenhouse gas emissions. Finally, USDA provides Conservation Innovation Grants to fund the application and demonstration of innovative technologies and approaches to conservation issues. Many of the awards made under this program have greenhouse gas benefits. For more information, please visit <http://www.fsa.usda.gov/dafp/cepd/crp.htm> and <http://www.nrsc.usda.gov/programs/>.

G. Renewable Energy Systems and Energy Efficiency Improvements

USDA's Renewable Energy Systems and Energy Efficiency Improvements Program provides loan guarantees and grants to agricultural producers and rural small businesses to purchase renewable energy systems and improve energy efficiency. From Fiscal Year 2003 to Fiscal Year 2005, the program provided \$76.8 million in loans or grants, which leveraged an additional \$861 million in outside funding. Over this period, the program helped finance 272 renewable energy systems (including 11 biodiesel and 7 ethanol refineries, 82 anaerobic digesters, 121 wind energy projects, 17 solar projects, and 4 geothermal projects) and 165 energy efficiency improvements. The cumulative benefits of these projects included energy savings equal to 6.62 million barrels of oil and an estimated reduction in greenhouse gas emissions equal to 0.77 million metric tons of carbon dioxide equivalent. From 2003-2005, USDA also helped fund 11 digesters under the Environmental Quality Incentives Program. For more information, please visit <http://www.rurdev.usda.gov/rbs/farmbill/index.html>.



Source: Courtesy of USDA

Low-pressure spray irrigation systems reduce total energy required to deliver irrigation water to fields.

H. Fuel Economy Increase for Light Trucks

On April 1, 2003, the Bush Administration finalized regulations requiring an increase in the fuel economy of light trucks for Model Years 2005 to 2007, the first such increase since 1996. The increase from 20.7 miles per gallon to 22.2 miles per gallon by 2007 more than doubles the increase in the standard that occurred between Model Years 1986 and 1996. The new increased fuel economy standards are expected to save approximately 3.5 billion gallons of gasoline over the lifetime of these trucks, with the corresponding avoidance of more than 30 million metric tons of carbon dioxide equivalent. The Administration also promulgated a new round of standards in March, 2006. The new standards cover model years 2008-2011 for light trucks and raise fuel economy to 24 miles per gallon for model year 2011. The rule is expected to save 10.7 billion gallons of gasoline over the lifetime of these vehicles, thus reducing GHG emissions by 73 million metric tons of carbon dioxide equivalent.

I. Energy Policy Act of 2005 Tax Incentives to Reduce Greenhouse Gas Emissions

The Energy Policy Act of 2005 includes over \$14.5 billion in tax incentives from 2005 to 2015. Many of these tax incentives and credits will have significant greenhouse gas reduction benefits and are designed to spur investments in clean energy infrastructure, enhance domestic energy security, and promote deployment of conservation and energy efficiency technologies, renewable energy and alternative motor vehicles. The Act also grants the Department of Energy the authority to issue loan guarantees for a variety of commercial projects using technologies that avoid, reduce, or sequester greenhouse gas emissions. Further, it provides standby support coverage to indemnify against certain regulatory and litigation delays for the first six new nuclear plants. In addition, the Act mandates an increase in the renewable content of gasoline from 15.1 billion to 28.4 billion liters while establishing 16 new appliance efficiency mandates.



Source: Courtesy of the White House

President George W. Bush holds the signed version H.R. 6, The Energy Policy Act of 2005, at Sandia National Laboratory in Albuquerque, New Mexico on August 8, 2005.

J. Voluntary Greenhouse Gas Emission Registry (1605(b))

The Voluntary Reporting of Greenhouse Gases Program, authorized under Section 1605(b) of the Energy Policy Act of 1992, provides a means for utilities, industries, and other entities to establish a public record of their greenhouse gas emissions and the results of voluntary measures to reduce, avoid, or sequester greenhouse gas emissions. For the 2004 reporting year, 226 U.S. companies and other organizations reported that they had undertaken 2,154 projects and reduced or sequestered 390 million metric tons of carbon dioxide equivalent of greenhouse gases. In April 2006, new guidelines were issued for the program. The new guidelines, which go into effect in 2007, will strengthen the program by encouraging comprehensive, entity-wide reporting of emissions and emission reductions, including sequestration, and by increasing the measurement accuracy, reliability, and verifiability of reports. For more information, please visit <http://www.pi.energy.gov/enhancingGHGregistry/> and <http://www.eia.doe.gov/oiaf/1605/frntvrgg.html>.

K. American Competitiveness Initiative

President Bush announced the American Competitiveness Initiative (ACI) in his 2006 State of the Union Address. Its goals are to increase federal investments in research and development, strengthen education, and encourage entrepreneurship. Over 10 years, the Initiative commits \$50 billion to increase funding for research and \$86 billion for research and development tax incentives, some of which will be directed toward investments in clean energy technology research including solar, bioenergy, wind, hydropower, and hydrogen and fuel cell technology. This research will generate scientific and technological advances, ultimately helping to reduce greenhouse gas emissions both domestically and internationally. For more information, please visit <http://www.whitehouse.gov/stateoftheunion/2006/aci>.



Source: Courtesy of DOE/NREL.

Researchers at DOE's National Renewable Energy Laboratory are working together on a novel way to use green algae to produce hydrogen directly from water and sunlight, that, when recombined with oxygen in a fuel cell, produces clean energy without pollutants. ACI will provide a cleaner and more secure energy future through research as shown here in the picture.

L. Green Power Partnership

Introduced in 2001 as part of the President's National Energy Policy, the EPA's Green Power Partnership is designed to increase the adoption of clean energy supply technologies across the United States. The program assists organizations in demonstrating environmental leadership by choosing electricity products generated from renewable energy sources. The partnership now has more than 600 partners committed to purchasing more than 5 million megawatt-hours (MWh) of green power. For more information, please visit www.epa.gov/greenpower/.

Source: Courtesy of the Department of State



Through EPA's Green Power Partnership, organizations can purchase green power like that generated from wind turbines (above) as a way to reduce the risk of climate change and the environmental impacts associated with conventional electricity use.

M. Combined Heat and Power (CHP) Partnership

Launched in 2001 in response to the National Energy Policy, EPA's Combined Heat and Power Partnership provides technical assistance to promote CHP projects along each step of the project development cycle in order to make investments in CHP more attractive. EPA also educates industry about

the benefits of CHP, provides networking opportunities, and works with state governments to design air emissions standards and interconnection requirements that recognize the benefits of clean CHP. The partnership now includes over 190 partners and has facilitated over 3,460 megawatts (MW) of operational CHP projects in a variety of sectors, including university campuses, heavy industry, and the hospitality industry, among others. For more information, please visit www.epa.gov/chp/.

N. EPA State Clean Energy-Environment Partnership

In 2005, EPA launched the State Clean Energy-Environment Partnership Program, designed to help states adopt a variety of clean energy policies and deploy clean energy programs, including both energy efficiency and renewable energy initiatives. Through the State Clean Energy-Environment Partnership program, states use comprehensive guidance on successful, cost-effective policies and initiatives; measurement and evaluation tools for co-benefits of the policies; and peer exchange opportunities to explore and advance new policies. The partnership is working with 14 states which represent about 50 percent of the U.S. population and greenhouse

Source: Courtesy of Solar Turbines



EPA's CHP Partnership promotes the use of combined heat and power (CHP) through technical assistance, education, and public recognition. CHP Projects can increase efficiency and reliability while reducing greenhouse gas emissions like at the ethanol refinery above, where 65% of the steam and 12 MW of electric power comes from CHP.

gas emissions. For more information, please visit www.epa.gov/cleanenergy/stateandlocal/.

Source: Courtesy of EPA



EPA State Clean Energy-Environment Partnership logo.

O. EPA Domestic Methane Programs

The U.S. Environmental Protection Agency works in collaboration with the private sector and state and local governments to implement several voluntary programs that promote profitable opportunities for reducing emissions of methane, a potent greenhouse gas and clean energy source, from landfills, coal mines, oil and gas systems, and agricultural operations. EPA's methane programs, including the Landfill Methane Outreach Program, Coalbed Methane Outreach Program, Natural Gas STAR, and AgSTAR, are designed to overcome a wide range of informational, technical, and institutional barriers to reducing emissions, while creating profitable methane recovery and use opportunities. The collective

results of EPA's methane programs have been substantial. U.S methane emissions in 2003 were 10% below 1990 levels, in spite of economic growth over that time period. EPA expects that these programs will maintain emissions below 1990 levels in the future due to expanded industry participation and the continuing commitment of the participating companies to identify and implement cost-effective technologies and practices. For more information, please visit: www.epa.gov/methane/voluntary.html.

P. Presidential Budget

From Fiscal Year 2001 to the end of Fiscal Year 2006, the U.S. Government will have devoted nearly \$29 billion to climate science, technology, international assistance, and incentive programs. President Bush's Fiscal Year 2007 budget calls for \$6.5 billion for climate-related activities, includes nearly \$3 billion for the Climate Change Technology Program, and over \$1.6 billion for the Climate Change Science Program, \$220 million for climate change-related international assistance programs, and nearly \$2 billion for energy tax provisions that may reduce greenhouse gas emissions.

Source: Courtesy of EPA and Capstone Turbine Corporation



The EPA implements voluntary programs that promote profitable opportunities for reducing emissions of methane, while creating profitable activities for the coal, oil and natural gas, landfill, and agricultural industries. Pictured above are three microturbines powered by landfill methane.

III. ADVANCING CLIMATE CHANGE SCIENCE AND ACCELERATING CLIMATE CHANGE TECHNOLOGY



Source: Courtesy of DOE

Wind turbines at Tehachapi, California.

A. Climate Change Science Program (CCSP)

The President established the U.S. Climate Change Science Program (CCSP) in 2002 as part of a new ministerial-level management structure to oversee public investments in climate change science and technology. The CCSP incorporates the U.S. Global Change Research Program, established by the Global Change Research Act of 1990, and the Climate Change Research Initiative, established by the President in 2001. The Program coordinates and integrates scientific research on global change and climate change sponsored by 13 participating departments and agencies of the U.S. Government. It is responsible for facilitating the development of a strategic approach to federally supported climate research, integrated across the participating agencies.

Its principal aims are to investigate natural and human-induced changes in the Earth's global environmental system, monitor important climate parameters, predict global change, and provide a sound scientific basis for national and international decision-making. In 2003, CCSP released its strategic plan for guiding climate research. The plan is organized around five goals: (1) improving our knowledge of climate history and variability; (2) improving our ability to quantify factors that affect climate; (3) reducing uncertainty in climate projections; (4) improving our understanding of the sensitivity and adaptability of ecosystems and human systems to climate change;



Source: Courtesy of DOE-NREL

A single-axis line-focus solar collector, which is an example of how DOE is participating in cost-sharing research to reduce operating and maintenance costs of solar thermal systems.

and (5) exploring options to manage risks.

Since CCSP was created in 2002, the program has successfully integrated a wide range of the research and climate science priorities of the 13 CCSP agencies. CCSP has taken on some of the most challenging questions in climate science and is developing products to convey the most advanced state of knowledge to be used by federal, state and local decision makers, resource managers, the science community, the media, and the general public.

Twenty-one Synthesis and Assessment Products are identified in the Strategic Plan to be produced through 2008. The first of these, *Temperature Trends in the Lower Atmosphere: Steps for Understanding and Reconciling Differences*, was released in April 2006 and answers a set of key questions related to ongoing observations of the Earth's temperature. The reports, overall, are designed to address a full range of science questions and evaluate options for responses that are of the greatest relevance to decision and policy makers and planners. The products are intended to provide the best possible state of science information, developed by a diverse group of climate experts, for the decision community.

For more information on the CCSP and a complete list of the Synthesis and Assessment Products, please visit: www.climate-science.gov.



Source: Courtesy of NOAA

A NOAA employee services a buoy providing ocean observing data.

B. Climate Change Technology Program (CCTP)

The United States is leading the development of many advanced technology options that have the potential to reduce, avoid, or sequester greenhouse gas emissions. CCTP was created in 2002, and subsequently authorized in the Energy Policy Act of 2005, to coordinate and prioritize the Federal Government's nearly \$3 billion annual investment in climate-related technology and to further the President's National Climate Change Technology Initiative (NCCTI). Ten Federal agencies support a broad portfolio of activities within this framework.

Basic guidance for the program is provided through CCTP's Vision and Framework for Strategy and Planning and Strategic Plan, the latter of which was released in September 2006. CCTP's strategic vision has six complementary goals: (1) reducing emissions from energy use and infrastructure; (2) reducing emissions from energy supply; (3) capturing and sequestering carbon dioxide; (4) reducing emissions of other greenhouse gases; (5) measuring and monitoring emissions; and (6) bolstering the contributions of basic science.

CCTP's principal aim is to accelerate the development and reduce the cost of new and advanced technologies. It provides strategic direction for the climate-related elements of the overall Federal technology portfolio. CCTP also is assessing different technology options and their potential contributions to reducing greenhouse gas emissions over the short, mid, and long term. CCTP's boasts a diverse R&D portfolio that covers a wide range of technology options in energy efficiency, renewable energy, nuclear power, and highly efficient and clean use of coal.



Source: Courtesy of DOE

Secretary of Energy, Samuel Wright Bodman, stands on top of a large wind turbine during a tour of the National Wind Technology Center near Boulder, Colorado.



Source: DOE/NREL courtesy of SunLine Transit Agency

Prototype Hydrogen Fuel Cell Bus.

Many CCTP activities build on existing work, but the Bush Administration also has expanded and realigned some activities and launched new initiatives in key technology areas to support the CCTP's goals. The President's NCCTI, for example, includes 12 discrete R&D activities that, if successful, could advance technologies to reduce greenhouse gas emissions on a large scale. For more information, please visit www.climatetechnology.gov/.

1. Advanced Energy Initiative

In his 2006 State of the Union Address, President Bush announced plans for the Advanced Energy Initiative (AEI), which will help reduce America's greenhouse gas emissions, pollution, and dependence on foreign sources of energy by accelerating advanced energy technologies. Examples of AEI investment include: the Solar America Initiative, the Biomass/Biofuels Initiative, the Hydrogen Fuel Initiative, the Fu-



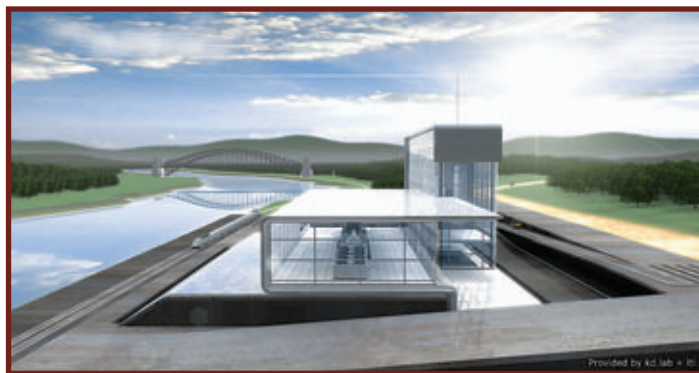
Source: Courtesy of DOE

AEI will change the way we power our homes and automobiles within 20 years by investing in renewable energy technologies like the solar panels above.

tureGen Zero-emissions coal-fired power plant; and Nuclear Power 2010. By investing in these and other advanced energy technologies, AEI will allow us to alter the way we power our homes and automobiles within 20 years. For more information, please visit www.whitehouse.gov/stateoftheunion/2006/energy/energy_booklet.pdf.

2. Coal-Fired, Near-Zero-Emissions Power Generation

The United States has vast reserves of coal, and over half of its electricity is generated from this fuel. Advanced coal-based power and fuels, therefore, is an area of special interest from both an energy security and climate change perspective. The Coal Research Initiative (CRI) consists of research, development, and demonstration of coal-related technolo-



Source: Courtesy of DOE

An artist's rendition of a coal-fired zero-emission power plant.

gies that will improve coal's competitiveness in future energy supply markets. The Clean Coal Power Initiative (CCPI), within the CRI, is a cost-shared program between the government and industry to demonstrate emerging technologies in coal-based power generation and to accelerate their commercialization. The FutureGen project is a 10-year, \$1 billion government-industry cost-shared effort to design, build, and operate the world's first near-zero atmospheric emissions coal-fired power plant. This project, which now includes India and the Republic of Korea as partners, will incorporate the latest technologies in carbon sequestration, oxygen and hydrogen separation membranes, turbines, fuel cells, and coal-to-hydrogen gasification. Through the CRI, clean coal can remain part of a diverse, secure energy portfolio well into the future. For more information, please visit www.fe.doe.gov/programs/powersystems/cleancoal/index.html and www.fe.doe.gov/programs/powersystems/futuregen/index.html.

3. Carbon Sequestration

Carbon capture and sequestration is a central element of CCTP's strategy because for the foreseeable future, fossil fuels will continue to be the world's most reliable and lowest-cost form of energy. A realistic approach is to find ways to capture and store the carbon dioxide produced when these fuels are used. DOE's core Carbon Sequestration Program emphasizes technologies that capture carbon dioxide from large point sources and store it in geologic formations. In 2003, DOE launched a nationwide network of seven Carbon Sequestration Re-

Source Courtesy of: Petroleum Technology Research Centre



Aerial view of the Weyburn carbon sequestration project which is advancing knowledge of carbon sequestration technology.

gional Partnerships involving State agencies, universities and the private sector to determine the best approaches for sequestration in each geographic region and to examine regulatory and infrastructure needs. Today the partnerships include more than 300 organizations in 40 U.S. states, three Indian nations, and four Canadian provinces. The Regional Partnerships have progressed to a validation phase in which they will conduct 25 field tests involving the injection of carbon dioxide into underground formations where it will be stored and monitored. For more information, please visit www.fe.doe.gov/programs/sequestration/index.html.

4. Energy Efficiency and Renewable Energy

Energy efficiency is the single largest investment area under CCTP and it provides tremendous short-term potential to reduce energy use and greenhouse gas emissions. Renewable energy includes a range of different technologies that can play an important role in reducing greenhouse gas emissions. The United States invests significant resources in wind, solar photovol-



LED light bulbs such as the one shown above provide a way to use electricity more efficiently.

Source: Courtesy of DOE

taics, geothermal, and biomass, industrial and buildings efficiency and alternative transportation technologies. Many of these technologies have made considerable progress in price competitiveness, but there remain opportunities to reduce manufacturing, operating, and maintenance costs of many of these technologies. For more information, please visit www.eere.energy.gov/.

5. Hydrogen

President Bush launched the Hydrogen Fuel Initiative in his 2003 State of the Union Address. The goal is to work closely with the private sector to accelerate our transition to a hydrogen economy, on both the technology of hydrogen fuel cells and a fueling infrastructure. The President's Hydrogen Fuel Initiative and the FreedomCAR Partnership launched in 2002 will provide \$1.7 billion through 2008 to develop hydrogen-powered fuel cells, hydrogen production and infrastructure technologies, and advanced automotive technologies.



Hydrogen flame.

Source: Courtesy of DOE NREL

Through its International Partnership for the Hydrogen Economy (see international section below), the United States is pursuing international cooperation to affect a more rapid, coordinated advance for this technology that could lead to the reduction of air pollutants and a significant reduction of greenhouse gas emissions in the transportation sector worldwide. For more information on this initiative, please visit www.hydrogen.gov.

6. Nuclear Fission

The benefits of nuclear power as a greenhouse gas emissions-free, reliable, and safe source of energy are an essential element in the Nation's energy and environment future. Nuclear power is the second most abundant source of electric energy in the U.S., and existing plants are among the most economic sources of electricity on the grid today. The Nuclear Power 2010 program is working with industry to finalize advanced light water reactor designs and demonstrate the Nuclear Regulatory Commission's new licensing process, while the Generation IV Nuclear Energy Systems Initiative is investigating the more advanced reactor and fuel cycle systems that represent a significant leap in economic performance, safety, and proliferation-resistance. One promising system being developed under the Nuclear Hydrogen Initiative would pair very-high-temperature reactor technology with advanced hydrogen production capabilities that could produce both electricity and hydrogen on a scale to meet transporta-

tion needs. Complementing these programs to improve nuclear fuel cycles, including enhancing their proliferation resistance, and for the better disposition of spent nuclear fuel is the Global Nuclear Energy Partnership. For more information, please visit <http://np2010.ne.doe.gov/>, <http://gen-iv.ne.doe.gov/>, www.ne.doe.gov/infosheets/hydrogen.pdf, and www.gnep.energy.gov/.

7. Nuclear Fusion

Fusion energy is a potential major new source of energy that, if successfully developed, could be used to produce electricity and possibly hydrogen. Fusion has features that make it an attractive option from both an environmental and safety perspective. However, the technical hurdles of fusion energy are very high, and with a commercialization objective of 2050, its impact would not be felt until the second half of the century, if at all. Nevertheless, the promise of fusion energy is simply too great to ignore. For more information, please visit www.sc.doe.gov/feature/fes.htm.

IV. Clean Development Partnerships



Source: Courtesy of EPA

Urban Community Development Association in Kampala, Uganda selling fuel-efficient stoves which improve indoor air quality in the homes where they are used. The PCIA is bringing fuel-efficient stoves that reduce indoor air pollution to developing countries across the globe.

A. Clean Energy Initiative

At the 2002 World Summit on Sustainable Development (WSSD) held in Johannesburg, South Af-

Source: Courtesy of EPA



Families in Guatemala stand by improved cookstoves being delivered to their village as part of the PCIA pilot project implemented by HELPS International and the Shell Foundation.

rica, the United States launched a “Clean Energy Initiative,” whose mission is to bring together governments, international organizations, industry and civil society in partnerships to alleviate poverty and spur economic growth in the developing world by modernizing energy services. The Initiative consists of four market-oriented, performance-based partnerships. For more information on the Clean Energy Initiative, please visit www.sdp.gov/sdp/initiative/cei/44936.htm.

1. Global Village Energy Partnership (GVEP)

GVEP is an international partnership with over 700 public and private sector partners

Source: Courtesy of Sandia National Laboratory



A home in Veracruz, Mexico, obtains solar power as a result of a decade-long collaboration on energy projects between USAID and the DOE’s Sandia National Laboratory.

including the World Bank, the United Nations Development Programme, and leading energy companies. The U.S. implementation of GVEP, led by the U.S. Agency for International Development, is a 10-year initiative that seeks to increase access to modern energy services for those in developing countries in a manner that enhances economic and social development and reduces poverty. Through U.S. government support for GVEP and other energy access programs, 12.9 million people have received increased access to modern energy services since the 2002 Johannesburg Summit. For more information, please visit www.gvep.org/.

2. Partnership for Clean Indoor Air (PCIA)

Poor air quality caused by indoor and outdoor air pollution is related to approximately 1.6



Source: Courtesy of EPA

A woman in Uganda stands next to her clean cookstove, which reduces harmful indoor air pollution and improves the health of the family.

million deaths annually and more than 3 billion people in the developing world face an increased environmental health risk due to breathing elevated levels of indoor smoke from home cooking and heating practices. The Partnership for Clean Indoor Air (PCIA) currently has over 120 public and private partners working together to increase the use of affordable, reliable, clean, efficient, and safe home cooking and heating practices to reduce the burden of disease. PCIA is focusing on four priority areas:

(1) business models and markets for improved cooking and heating techniques; (2) incorporating social and cultural practices to promote adoption of new technology; (3) meeting design and performance guidelines for affordable, reliable, clean, efficient, and safe home cooking and heating practices; and (4) demonstrating reduced exposure to indoor air contaminants. The partners are contributing their resources and expertise to improve health, livelihood and quality of life by reducing exposure to indoor air pollution, primarily among women and children, from household energy use. Ten U.S.-funded PCIA pilot projects have already resulted in: (1) more than 800,000 households educated about the health impacts of indoor air pollution from household energy use; (2) over 237,000 people with reduced exposure to indoor air pollution from cooking and heating; and (3) in the 58,000 homes in which improved cooking and heating have been adopted, over 440,000 people demonstrated an increased knowledge of indoor air pollution and mitigation solutions. For more information, please visit www.PCIAonline.org.

3. Partnership for Clean Fuels and Vehicles (PCFV)

The Partnership for Clean Fuels and Vehicles (PCFV) is working with developing countries to reduce vehicular air pollution by promoting the elimination of lead from gasoline, reducing sul-

fur from fuels, and introducing clean technologies into new and existing vehicle fleets. The U.S. EPA is a founding member and leading supporter of the PCFV, which has over 80 members from governments, industry, and civil society, representing more than 30 countries. Since the 2002 World Summit on Sustainable Development, PCFV has assisted in the elimination of lead in gasoline in the 49 countries of Sub-Saharan Africa, providing health benefits for over 733 million people. The Partnership's future targets include the global elimination of lead in gasoline by 2008, and the global reduction of sulfur in fuel to 50 parts per million or below globally. For more information, please visit www.unep.org/pcfV/main/main.htm.

4. Efficient Energy for Sustainable Development (EESD)

The Efficient Energy for Sustainable Development initiative aims to improve the productivity



With the help of the U.S. Government, a 200 kw fuel cell is inaugurated in Curitiba, Brazil.



Workers in Mexico City apply a banner to a retrofitted bus, stressing public health benefits of vehicle emissions control.

and efficiency of energy systems in developing countries, while reducing waste and pollution, saving money and improving reliability through energy-efficient and clean processes and technologies and production modernization. With more than 80 organizations committed to furthering the objectives of the EESD, this partnership has focused on project development, public leadership by example, building local commercial infrastructure for self-sustaining financing and developing sustainable integrated energy

community systems. In particular, the EESD has undertaken capacity-building activities with its partners in rapidly industrializing areas of Asia, South America, and Central and Eastern Europe. It strives to scale up best practices, innovative financing and energy-smart community planning and development through increased synergies with other international and regional networks and partnerships such as Asia-Pacific Economic Cooperation (APEC), Association of Southeast Asian Nations (ASEAN), Renewable Energy and Energy Efficiency Partnership (REEEP), the United Nations Economic Commission for Europe (UNECE), the World Energy Council and the North American Energy Working Group. For more information, please visit www.sdp.gov/sdp/initiative/cei/44936.htm.

B. Renewable Energy and Energy Efficiency Partnership (REEEP)

The goal of this multi-stakeholder partnership is to accelerate and expand the global market for renewable energy and energy-efficiency technologies by structuring policy and regulatory initiatives for clean energy and facilitating financing for energy projects. To date, REEEP has funded over 50 projects in 44 countries that address market barriers to clean energy in the developing world and economies in transition. These projects provide new business models, poli-



In line with REEEP's efforts to accelerate the global demand of renewable electricity, the Alliance for Mindanao Off-Grid Renewable Energy (AMORE) Program, a seven-year USAID project, supports social and economic development in remote, conflict-affected communities in the Philippines through renewable energy-based electrification.

cy recommendations, risk mitigation instruments, handbooks, and databases for advancing renewable energy and energy efficiency, in addition to delivering measurable greenhouse gas reductions. To further REEEP's agenda, the U.S. has been especially active in developing best practices for financing energy efficiency and renewable energy projects and an open network of affiliated organizations for distributed peer production of models and tools for energy smart community planning and development. For more information, please visit www.reeep.org/.

C. Renewable Energy Policy Network for the 21st Century (REN21)

REN21 is a global policy network, which connects governments, international institutions and organizations, partnerships and initiatives, and other stakeholders on the political level with those "on the ground," and is aimed at providing a forum for international leadership on renewable energy. Its goal is to allow the rapid expansion of renewable energies in developing and industrial countries by bolstering policy development and decision-making on sub-national, national and international levels. To date, REN21 has produced several notable renewable energy analyses, the most noteworthy being its comprehensive "REN21 Global Status Report." The United States serves as

one of the 13 national government entities on REN21's Steering Committee. For more information, please visit www.ren21.net/.



Wind turbines like the ones above are an important way to meet REN21's goal of expanding supplies of renewable energy.

V. U.S. Global Climate Change Partnerships



Source: Courtesy of NASA

The world at night.

A. Asia-Pacific Partnership for Clean Development and Climate (APP)

The Asia-Pacific Partnership for Clean Development and Climate (APP), launched in January 2006 by ministers from Australia, China, India, Japan, Republic of Korea, and the United States, is a multi-stakeholder partnership working to generate practical and innovative projects promoting clean development and the mitigation of greenhouse gases. Through engaging private industry as well as government officials, the APP is using public-private partnerships to build local capacity, improve efficiency and reduce greenhouse gas emissions, create new investment opportunities, and remove barriers to the introduction of clean energy technologies in the Asia-Pacific region. What makes the approach unique is that APP activities are identified and supported using an innovative “bottom up” approach. Together, APP partner countries account for about half of the world’s economic output, energy use, and greenhouse gas emissions.

The Asia-Pacific Partnership has created eight task forces to achieve the initiative’s goals: (1) cleaner fossil energy; (2) renewable energy and distributed generation; (3) power generation and transmission; (4) steel; (5) aluminum; (6) cement; (7) coal mining; and (8) buildings and appliances. Each Task Force is preparing an Action Plan to serve as their blueprint for cooperation and provide a strategic framework for identifying and implementing priority actions. While each of the task forces are expected to finalize their action plans during the Fall of 2006, several initiatives have already begun, including:



The Pacific Rim at daybreak.

Source: Courtesy of NASA

- The aluminum associations of the six APP countries are cooperating to reduce emissions of perfluorocarbons — extremely potent greenhouse gases — as well as to decrease energy consumption per unit of aluminum production, and to utilize advanced recycling methods;
- U.S. power companies are hosting Chinese and Indian power plant operators at U.S. state-of-the-art facilities to share lessons learned on improving energy efficiency; and
- Indian business and government representatives visited the United States in mid-August to lay the groundwork for deals to purchase and utilize more renewable energy technologies. For more information, please visit www.asiapacificpartnership.org.

B. Methane to Markets Partnership

Announced by the EPA in July 2004 and launched in November of that year, the Methane to Markets Partnership is a multilateral initiative that promotes



Source: Courtesy of EPA

The Methane to Markets Partnership promotes landfill gas projects which use wells like the one shown here to capture methane, generate electricity, and produce alternative fuels while reducing greenhouse gas emissions.

energy security, improves environmental quality, and reduces greenhouse gas emissions throughout the world. The Partnership consists of 18 Partner countries: Argentina, Australia, Brazil, Canada, China, Colombia, Ecuador, Germany, India, Italy, Japan, Mexico, Nigeria, Russia, Republic of Korea, Ukraine, the United Kingdom and the United States. In addition, over 350 private sector and other government and non-governmental organizations participate in the Partnership through a Project Network.

Under the Partnership, member countries work closely with private sector development banks, and other governmental and non-governmental organizations to promote and implement methane recovery and use opportunities in four sectors: oil and gas systems, underground coal mines, and landfills and animal waste

management systems.

Capturing and using “waste” methane not only provides an additional energy source that stimulates economic growth but also reduces global emissions of this powerful greenhouse gas. The United States has committed up to \$53 million for the first five years of the Partnership. EPA estimates that this Partnership could recover up to 500 billion cubic feet of natural gas (50 million metric tons of carbon equivalent) annually by 2015.

Private sector and other non-governmental organizations are encouraged to participate in the Partnership through becoming a member of the Project Network. For more information, please visit www.methanetomarkets.org and www.epa.gov/methane/international.html.

C. International Partnership for the Hydrogen Economy (IPHE)

In April 2003, the Secretary of Energy announced the creation of the International Partnership for the Hydrogen Economy — designed to efficiently organize, evaluate and coordinate multinational



Source: Courtesy of the White House

President Bush gets a hands-on demonstration of the hydrogen fueling station. IPHE works to establish projects like this in support of its goal of organizing and implementing effective international research, development and implementation activities.

research, development and deployment of technologies that advance the transition to a global hydrogen economy. The United States hosted the first Ministerial meeting of the IPHE in Washington, D.C., in November 2003. The Partnership's 16 countries and the European Commission (EC) are working together to advance research, development, and deployment of hydrogen and fuel-cell technologies, and develop common codes and standards for hydrogen use. The IPHE Steering Committee has officially recognized 10 collaborative projects to advance the group's goals. In addition, IPHE is working on common goals for hydrogen and fuel cell technologies and the technical objectives that support these objectives. For more information, please visit www.iphe.net/.

D. Carbon Sequestration Leadership Forum (CSLF)

The United States hosted the first meeting of the Carbon Sequestration Leadership Forum (CSLF) in Virginia, in June 2003. CSLF is focused on the development of improved cost-effective technologies for the separation and capture of carbon

dioxide for its transport and long-term storage. Its purpose is to make these technologies broadly available internationally, and to identify and address wider issues relating to carbon capture and storage. CSLF, which now

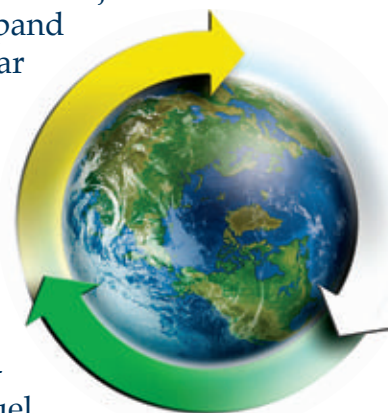
includes 21 countries and the EC, has approved 17 capture and storage projects as well as a technology roadmap to provide future directions for international cooperation. For more information, please visit www.cslforum.org/ and www.fe.doe.gov/programs/sequestration/cslf/.

E. Generation IV International Forum (GEN IV)

The United States has led the development of the Generation IV International Forum, a multilateral partnership with nine other countries and Euratom, fostering international cooperation in research and development for the next generation of safer, more affordable, and more proliferation-resistant nuclear energy systems. This new generation of nuclear power plants could produce electricity and hydrogen with substantially less waste and without emitting any air pollutants or greenhouse-gas emissions. Since the Forum was formally established in July 2001, the United States has led the development of a technology roadmap, and increased support for R&D projects that advance the forum's goals. For more information, please visit <http://gen-iv.ne.doe.gov/GENIVintl-gif.asp>.

F. Global Nuclear Energy Partnership (GNEP)

GNEP is a groundbreaking new effort that seeks to develop a worldwide consensus on enabling expanded use of economical, carbon-free nuclear energy to meet growing electricity demand. The Partnership has two major goals: (1) to expand carbon-free nuclear energy to meet growing electricity demand worldwide; and (2) to promote non-proliferation objectives through the leasing of nuclear fuel to countries that agree



Global Nuclear Energy Partnership Logo.



Source: Courtesy of Petroleum Technology Research Centre

Carbon dioxide enters the Weyburn field from the Great Plains Synfuels Plant near Beulah, North Dakota. The gas travels 205 miles through a carbon steel pipeline and will be sequestered in an underground storage facility. Projects like this will comprise the Carbon Sequestration Leadership Forum.

to forgo enrichment and reprocessing. GNEP Partner countries will consist of both “fuel supplier nations” and “reactor nations.” Fuel supplier nations will provide reliable nuclear fuel services to reactor nations through an independent nuclear fuel broker, such as the International Atomic Energy Agency. For more information, please visit <http://www.gnep.energy.gov/>

G. ITER

In January 2003, President Bush committed the United States to participate in ITER, the largest and most technologically sophisticated research project in the world to harness the promise of fusion energy, the same form of energy that powers the sun. If successful, this \$5 billion (2002 levels), international research project will advance progress toward producing clean, renewable, commercially available fusion energy by the middle of the century. Other participants include China, the European Union, India, Japan, the Republic of Korea, and Russia. An agreement to construct ITER was initiated in May 2006, and is expected to be signed in November 2006. For more information in ITER, please visit: <http://www.iter.org>.

H. Global Bioenergy Partnership (GBEP)

Ten national government and four international stakeholder organizations signed the Terms of Reference for the GBEP on May 11, 2006 in New York City. GBEP is designed to power a cleaner future by supporting wider, cost-effective biomass and biofuels deployment, particularly in developing countries where biomass use is prevalent. In addition to the United States, GBEP partners include Canada, China, France, Germany, Italy, Japan, Mexico, Russia, the United Kingdom, the Food and Agriculture Organization of the United Nations (FAO), the International Energy Agency, the United Nations Foundation, and the European



The Pacific International Center for High Technology Research operates this biomass gasification demonstration project located in Hawaii. This gasification plant will initially process bagasse from the neighboring sugarcane refineries, but is designed to receive a wide variety of biomass.

Source: Courtesy of DOE

Biomass Industry Association. The GBEP Secretariat will be managed by the FAO.

I. Bilateral and Regional Partnerships

The United States has negotiated agreements with major international partners to pursue research on global climate change and deploy climate observation systems, collaborate on energy and sequestration technologies, and explore methodologies for monitoring and measuring greenhouse gas emissions. Since June 2001, the United States has launched 15 bilateral and regional partnerships with Australia, Brazil, Canada, China, Central America (Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama), the European Union, Germany, India, Italy, Japan, Mexico, New Zealand, Republic of Korea, Russia, and South Africa on issues ranging from climate-change science to energy and sequestration technologies to policy approaches. The countries covered by these bilateral partnerships account for about 80 percent of global greenhouse gas emissions.



World map with locations of U.S. Climate Bilateral agreements.

J. USAID's Global Climate Change Program

As the foreign assistance arm of the U.S. Government, the U.S. Agency for International Development (USAID) plays a key role in delivering climate change-related international assistance to develop-

ing and transition countries through the Agency's Global Climate Change Program. Active in over 40 developing and transition countries, USAID has dedicated nearly \$1.1 billion since 2001 to promote economic development without sacrificing environmental protection. USAID's development programs work in partnership with national and local governments, non-governmental organizations, intergovernmental organizations, and the private sector. Through new mechanisms, including the Global Development Alliance, Development Credit Authority, and cooperative agreements, USAID is sharing risk and leveraging resources in innovative partnerships. Projects promote clean energy technologies, sustainable land use and forestry, adaptation to climate change, and climate change science for decision making, providing multiple benefits for development and addressing climate change. For more information, please visit: http://www.usaid.gov/our_work/environment/climate/index.html and http://www.usaid.gov/our_work/global_partnerships/gda.



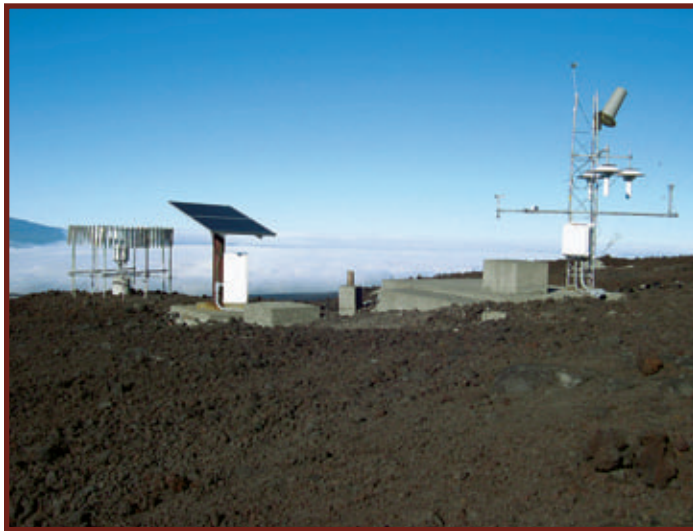
A local official in the Durban area of South Africa found low-cost solar water heating simple enough that he installed it on his own.

Source: Courtesy of Will Caswood, Solar Engineering Services

Source: Courtesy of the Department of State

K. Group on Earth Observations (GEO)

Of particular importance is the need for a broad



Source: Courtesy of NOAA

A Climate Reference Network monitoring station operated by NOAA collects climate data at the top of Mauna Loa, an active volcano in Hawaii.

global observation system to support measurements of climate variables. On July 31, 2003, the United States hosted 33 nations — including many developing nations — at the inaugural Earth Observation Summit, out of which came a commitment to establish an intergovernmental, comprehensive, coordinated, and sustained Earth observation system of systems. While the use and benefits of these observations are extensive, the climate applications of the data collected by the system include the use of the data to create better climate models, to improve our knowledge of the behavior of carbon dioxide and aerosols in the atmosphere, and to develop strategies for carbon sequestration. The United States was instrumental in drafting a ten-year implementation plan for a Global Earth Observation System of Systems, which was approved by

nearly 60 nations and the European Commission at the 3rd Earth Observation Summit in Brussels in February 2005. The United States also released its contribution through the Strategic Plan for the U.S. Integrated Earth Observing System in April 2005. The plan will help coordinate a wide range of environmental monitoring platforms, resources, and networks. For more information, please visit <http://earthobservations.org>.

L. Tropical Forest Conservation Act (TFCA)

Tropical Forest Conservation Act (TFCA) agreements are offered to eligible developing countries to relieve certain official debt owed to the United States government while at the same time generating funds to support grants to local non-governmental organizations and community groups for forest conservation activities. As of September 2006, 12 TFCA agreements have been signed, which are generating more than \$135 million plus additional investment funding and potential counterpart funding, for tropical forest conservation in 11 countries over the next 10 to 25 years: Bangladesh, Belize, Botswana, Colombia, El Sal-



Source: Courtesy of Yuyititsirca Rosales, 2005 FIAES Public Relations Officer

Through the TFCA, Partner countries such as El Salvador are able to provide small grants for forest conservation activities including outreach and education to local communities.

vador, Guatemala, Jamaica, Panama (two agreements), Paraguay, Peru, and the Philippines. The three most recent agreements — with Botswana, Guatemala and Paraguay — were signed in 2006. The U.S. expects to conclude additional agreements in the future as this successful program continues. For more information, please visit www.usaid.gov/our_work/environment/forestry/intro_tfca.html.

M. President's Initiative Against Illegal Logging (PIAIL)

On July 28, 2003, the U.S. Department of State launched the President's Initiative Against Illegal Logging (PIAIL), developed with the objective of assisting developing countries in their efforts to combat illegal logging, including the sale and export of illegally harvested timber, and in fighting corruption in the forest sector. PIAIL actions include the U.S.-led Liberia Forest Initiative and a number of targeted programs through a four-year, \$54 million investment in the Congo Basin Forest Partnership. The

PIAIL is one of several U.S. strategies to address the clean development challenge, and reinforces the U.S. leadership role in taking action to counter the problem and preserve forest resources that store carbon. In the next two years, PIAIL will continue to increase political commitment and develop strategies in partnership with various external partners that promote good governance, empower communities, transfer technology and harness market forces to reduce illegal logging threats. For more information, please visit www.state.gov/r/pa/prs/ps/2003/22843.htm.

N. Global Environment Facility (GEF)

The Global Environment Facility (GEF) is the financial mechanism under the UN Framework Convention on Climate Change (UNFCCC) which the United States is a leading financial supporter. The U.S. has made a commitment of \$320 million over the next four years resulting in \$80 million per year contribution. This commitment will fund technology transfer and capacity building in developing countries. For more information, please visit www.getweb.org/.



The U.S. Government is assisting developing countries in combating illegal logging through PIAIL.

Source: Courtesy of the Department of State

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