

WORK PLAN TO IMPLEMENT POWER PARTNERSSM, CLIMATE VISION MOU

The overall objective of this Work Plan is to support the President's goal in reducing the greenhouse gas (GHG) emissions intensity of the U.S. economy by 18 percent by the end of 2012. Specifically, this Work Plan outlines the proposed implementation actions by the power sector to reduce its greenhouse gas emissions intensity by 2012 (as set forth in the MOU) and time frames for achieving those actions. As such, it is a "living document" subject to future revisions and updating. The Department of Energy (DOE) will work in collaboration with Power PartnersSM to facilitate the activities below designed to accomplish the Power PartnersSM goal.

➤ Element 1: Emissions Measurement and Reporting Protocols

Trade association members and the Tennessee Valley Authority (TVA) currently report the vast majority of their emissions (greater than 99 percent) through the use of continuous emissions monitors and fuel-use estimated data that are transmitted to the Environmental Protection Agency (EPA) and then subsequently published annually at a sector level by both EPA and the Energy Information Administration. Moreover, member companies and TVA currently plan to continue reporting their GHG reduction activities under the 1605(b) program. Reporting under these regimes is the functional equivalent of a monitoring and reporting protocol for the power sector. The Power PartnersSM will assess the need to develop a sector-specific reporting protocol in the future.

As described in the MOU, the Power PartnersSM will prepare an annual report on activities and accomplishments.¹ That report will include the metric for measuring progress in reducing carbon emission intensity for the electric power sector.

➤ Element 2: Identify/Implement near-term cost-effective GHG reduction opportunities

Climate VISION aims to work with industry groups/sectors to identify and implement near-term, cost-effective GHG reduction opportunities. Therefore, the Power PartnersSM and DOE will work together to enhance, facilitate and encourage voluntary efforts and practices for achieving GHG emission intensity reductions.

The Power PartnersSM Resource Guide

One example of how industry "best practices" and energy-efficiency opportunities will be promoted and communicated among members, companies and customers in the sector and

¹ For a more complete list of electric power sector activities, please see the forthcoming Power PartnersSM annual report.

outside stakeholders is through the Power PartnersSM Resource Guide. The Resource Guide is a Web-based resource tool to help companies undertake individual actions to reduce GHGs or emission intensity. The Resource Guide will guide companies to best practices and efficiency/reduction opportunities by helping* users find state-of-the-art information on a variety of topics through the use of links to credible Websites, and by creating a forum for dialog between companies that have successfully implemented projects and companies interested in pursuing similar efforts through the use of a registration section. DOE and the Power PartnersSM posted the Resource Guide on the Climate VISION Website in November 2005. The Power PartnersSM will update information in the Resource Guide on a quarterly basis.

Promotion of Best Practices/Energy Efficiency

The Power PartnersSM will take actions to encourage and facilitate participation in the Climate VISION program by their trade association members and TVA. The important purposes of this effort will be to improve the level and depth of participation, through workshops or other means, of their trade association members and TVA and to enhance performance and reporting.

- **National Action Plan for Energy Efficiency**

Launched in July 2006, the National Action Plan for Energy Efficiency (NAPEE) is designed to help invigorate efforts to conserve and use energy more wisely. NAPEE is facilitated by DOE and EPA, with the participation of utilities, public utility commissions, energy consumers and non-governmental groups. Industry is emphasizing the following actions to help implement NAPEE: helping foster more energy-efficient buildings; promoting the development and deployment of more energy-efficient electric appliances, consumer electronics, and other electric technologies; accelerating the development and use of “smart” or advanced electric meters; supporting development of innovative ratemaking and rate design to promote efficiency and provide customers more control over their electricity bills; helping commercialize plug-in hybrid electric vehicles to improve transportation efficiency, reduce fuel costs, improve the environment and help reduce dependence on foreign oil.

Adoption of these and other untapped energy-efficiency practices could yield more than 20-percent savings in total electricity demand nationwide by 2025, which in turn could help cut load growth by half or more compared to current forecasts. Extrapolating the results from existing programs to the entire country would yield annual energy bill savings of nearly \$20 billion, with net societal benefits of more than \$250 billion over the next 10 to 15 years. Under this scenario, the need for 20,000 MW in new generation (the equivalent of 40 500-MW plants) could be deferred, which would reduce more than 200 million tons of CO₂ annually. To help promote adoption of these types of practices, several tools and resources are being developed, including: a NAPEE report that details key barriers to energy efficiency, and policy and program solutions that have been used to overcome those barriers; an energy-efficiency benefits calculator to help make the business case for energy efficiency; and a number of outreach and resource materials on energy efficiency.

Government Partnerships

The National Rural Electric Cooperative Association (NRECA) and the U.S. Department of Agriculture have signed a Memorandum of Understanding to identify and advance technologies that will help achieve the President's 18 percent goal. Initially, NRECA is working with its members and USDA to eliminate technical and market barriers to the use of low-emission renewable energy, such as agricultural waste-to-electricity through the use of systems approaches and the development of decision-support tools.

Industry-wide Initiatives

The Power PartnersSM will develop and promote power sector initiatives that will allow their member companies and TVA to pool their resources and collaborate collectively on joint, industry-wide programs and activities to reduce GHG emissions intensity.

Since 2002 the Power PartnersSM have been assessing and developing a series of industry-wide initiatives in support of the President's goal and to help the power sector reduce its carbon intensity. The following activities are being pursued to assist in achieving the sector-wide carbon intensity goal:

- **PowerTree Carbon Company**

PowerTree Carbon Company is a new reforestation effort in the lower Mississippi River valley. This project has sponsorship from 25 U.S. power generators – investor-owned utilities, a rural electric cooperative and TVA – which have committed more than \$3 million for six projects that will remove and store more than 1.5 million tons of carbon dioxide (CO₂). PowerTree Carbon Company announced its first project in April 2004.

- **Coal Combustion Products Partnership (C2P2)**

This government partnership and cross-sector initiative – involving the electric utility, highway and building construction industries – has a goal of increasing the use of coal combustion byproducts in lieu of using limited natural resources from approximately 14 million tons to 20 million tons of CO₂ annually by 2011, and to increase the utilization rate from 32 percent (as of 2001) to 50 percent by 2011. To date, 43 utilities have become C2P2 Champions, and 19 utilities have pledged additional funding to help meet the C2P2 goals.

- **International Power Partnerships (IPP)**

This program works with DOE and the State Department to identify GHG reduction opportunities overseas, and is committed to fund projects promoting use of renewable energy and clean coal technologies. In 2006, 10 projects have been selected for funding that will reduce, avoid or sequester more than 35 million metric tons of CO₂.

- EPRI Technology Initiatives

Further reductions in GHG emission intensity in the medium term to long term will depend upon the development and availability of cost-effective technologies that allow for a stable, reliable and affordable supply of energy. Working with EPRI, several initiatives focusing on near-term results and long-term actions are underway.

- CoalFleet for Tomorrow: “CoalFleet for Tomorrow” was launched in November 2004 to accelerate the deployment and commercialization of clean, efficient, advanced coal power systems, thereby preserving coal as a vital component in the electric generation mix. The “CoalFleet” initiative has participation by more than 50 organizations including power generators of various types, suppliers, engineering firms, DOE, and other U.S. and international organizations. CoalFleet is tackling the technical and economic/institutional challenges of making advanced coal power plants a prudent investment option both in the short term and in the long term, while taking into account the potential for future CO₂ emissions regulations.
- CO₂ Capture and Storage Test Centers 5-MW Chilled Ammonia Process Capture Pilot: An integrated test center capturing actual power plant flue gas CO₂ and storing it safely deep underground is a crucial step on the way to commercializing technologies that curb CO₂ emissions. This project focuses on the first step leading to a test center. Initially, EPRI proposes to build and operate a CO₂ capture pilot plant, treating approximately 5-MW equivalent flue gas and focused on a variation of solvent scrubbing using chilled ammonia. This process appears to show great promise for significantly lower energy penalties, and therefore costs, than solvent processes being investigated by others. The pilot will be a co-funded effort with ALSTOM, which will fund approximately half of the costs. Later, EPRI plans to pursue other CO₂ capture pilots using other technologies, and eventually a Test Center that will capture, store and monitor the capture and injection of 0.5 million tons CO₂ over a 10-year period (~10-MW equivalent).
- Developing GHG Emissions Offsets by Reducing N₂O Emissions in Agricultural Crop Production: Nitrous Oxide (N₂O) is a significant greenhouse gas. Each ton of N₂O emitted into the atmosphere is equivalent to emitting 296 tons of CO₂ in its global warming potential. This project will investigate the approach of developing large-scale GHG emissions offsets by reducing N₂O emissions in agricultural crop production. The tools and information developed in this project will broaden the GHG emissions offset options available to electric companies and can serve as a mechanism to develop and strengthen partnerships with the agricultural communities that they serve.
- Driving Environmental and Strategic Benefits to Electric Companies with Electric Transportation: EPRI, working collaboratively with the Natural Resources Defense Council, has begun groundbreaking research to better understand CO₂ emissions offsets and air quality impacts of plug-in hybrid electric vehicles (PHEV). As part of this project, EPRI will analyze the impact of PHEV technology on CO₂ emissions by

overlapping expected technology roadmaps for both new electricity generation and electric-drive vehicle technologies.

- Long-term actions include the jointly established DOE-EPRI Center for Nuclear Fuels and Materials Research at INL.

Public Power Initiatives and Actions

Hundreds of public power systems have developed a wide-ranging set of actions and programs to help systems reduce their GHG intensity as well as reduce, avoid and sequester GHG emissions off-system. The following examples are provided to illustrate some of the many accomplishments so far achieved as well as future initiatives and efforts now underway.

American Public Power Association (APPA) and the Large Public Power Council (LPPC) are currently taking concrete steps to maximize the participation of our systems and will provide, in the near future, more complete summary of accomplishments, initiatives and efforts of public power systems.

Public power systems are sequestering substantial GHG emissions through the use and expansion of APPA's TREE POWER program. Currently, more than 250 utilities, serving 50 percent of public power's 19.1 million customers, participate in the TREE POWER program. To help public power utilities calculate the environmental benefits of their tree planting programs, the Sacramento Municipal Utility District and APPA developed the Tree Benefits Estimator. The Estimator, now posted on the APPA Web site, can be used to estimate the amount of energy and capacity a utility can save (or has saved) through its tree-planting program. It also estimates how many pounds of carbon and CO₂ will be sequestered.

Company Actions

Company and TVA actions will be the cornerstone of success for the Power PartnersSM, voluntary initiative. In furtherance of the objectives of this Work Plan, the Power PartnersSM will encourage trade association members and TVA to undertake specific commitments, including achieving a voluntary GHG intensity reduction goal, along with developing a plan to implement such commitments. Trade association members and TVA are encouraged to use the 1605(b) program for reporting and registering GHG emission intensity reductions achieved under their company-specific commitments and this voluntary program.

The following types of activities are being pursued by trade association members and TVA in order to help achieve the sector-wide carbon intensity goal:

- **Nuclear Programs**

The performance of U.S. nuclear power plants improved dramatically during the 1990s. The average capacity factor of U.S. nuclear plants was more than 90 percent in 2005. The increase in output from U.S. nuclear plants in the last 10 years — from 673 billion kilowatt-hours (KWH) in 1995 to 782 billion KWH in 2005 — is roughly equivalent to bringing 14 new 1,000-MW power plants (operating at a 90 percent capacity factor) into service. This improved performance has made a substantial contribution to reducing the

electric sector's greenhouse gas emissions. Clearly, high levels of performance from U.S. nuclear plants must be sustained in order to meet the challenge of reducing the GHG intensity of the U.S. economy. Activities undertaken by individual utilities in this area to improve performance include uprates (more than 2,900 MW since 2000), restarts of existing plants, license renewals and applications for licenses for new plants.

Industry also is actively participating in the development of next-generation nuclear technologies, including advanced reactor designs, the Global Nuclear Energy Partnership and the Generation IV program—an international initiative to develop six next-generation reactors designed to be safer, more reliable, more cost-effective and more proliferation-resistant than today's current technologies.

- Biologic Sequestration

Domestic and international activities undertaken by individual utilities in this area – which are in addition to the PowerTree Carbon Company effort noted above – include reforestation, species restoration and forest preservation. These activities have the added benefits, in addition to storing CO₂, of: restoring bottomland hardwoods on marginal agricultural lands; preserving, creating and improving wildlife habitats for a variety of species, including migratory birds and waterfowl and threatened and endangered species; improving water and soil quality; reducing flooding; conserving biological diversity in ecosystems, and; providing recreational benefits,

- Renewable Energy Programs

The electric power industry, in cooperation with industrial and governmental stakeholders, has significantly expanded the use of renewable energy sources for generating electricity during the past 12 years. Hydropower is the most prevalent renewable resource, providing about seven to nine percent of total U.S. electricity supply and 80 percent of all renewable energy resources. Total hydropower capacity, including pumped storage facilities, is currently about 95,000 MW. Wind power has become the fastest-growing renewable energy source in the United States. In 2003, wind generating capacity increased by more than 30 percent. Wind farms currently operate in 32 states and produce a total generating capacity of more than 6,300 MW. The use of biomass has achieved widespread acceptance as a power source, with a current combined capacity of approximately 10,300 MW. That translates into 1.4 percent of total U.S. generating capacity. Other renewable power sources being used or developed include solar, geothermal, landfill gas and tidal power.

- Green Power/Pricing Programs

Related to efforts to promote the development and use of renewable energy, a number of utilities offer green power or green pricing programs. Several have also issued requests for proposals for renewable energy to help expand their offerings to customers.

- Energy-efficiency and Demand-side Management Programs

To help promote energy efficiency and better end-use by customers, many utilities participate in and have won awards from the EPA WasteWise and Energy STAR programs, offer energy efficiency and demand-side management programs, and provide Web-based resources to help customers calculate energy savings or estimate costs for energy-efficient practices (installing insulation, buying new appliances, installing energy-efficient windows, etc.). See NAPEE, p. 2 *supra*, for additional actions in this area.

- SF₆ Programs

Currently more than 70 electric utilities participate in the EPA SF₆ Emissions Reduction Partnership for Electric Power Systems program.

- Clean Coal Technology

Developing coal-fueled power plants with zero or near-zero emissions will be one of the keys to addressing the climate issue. Companies are investing their own money and resources in the development of these and other clean coal technologies. See *Element 3* for additional actions in this area.

- Natural Gas Generation

Many PowerPartnersSM member companies have aggressively pursued the development of natural gas generation as a means of decreasing CO₂ emissions intensity. These facilities operate at emissions rates less than 50 percent of the U.S. fossil fuel average. PowerPartnersSM members will continue their efforts to raise the utilization of these units.

- Company-specific Reduction Commitments

A number of PowerPartnersSM companies have announced their own company-specific reduction commitments, whether as part of the EPA Climate Leaders program, the Chicago Climate Exchange, or in conjunction with environmental groups. The commitments, which are both short and medium-term in nature, will contribute to the achievement of the President's and the sector's reduction goals.

➤ **Element 3: Develop *cross-sector projects* for reducing GHG emissions**

Climate VISION aims to encourage cross-sector projects that reduce GHG emission intensity. DOE and the Power PartnersSM will seek to broaden participation in and increase the impact of the Climate VISION program by exploring cross-sector and intergovernmental enabling initiatives to help improve energy efficiency and reduce GHG emission intensity.

Clean Coal Technologies

New clean coal technologies offer a number of advantages, but certain factors inhibit more widespread commercial use. U.S. coal and utility industries are working with DOE to develop clean coal power plants through the FutureGen project, the Clean Coal Power Initiative (CPPI), and advanced research and development. All projects are designed to move promising technology along the research and development path to commercialization.

- **Clean Coal Power Initiative (CPPI)**

CPPI is a federal cost-share program to conduct demonstrations of cutting-edge, commercial-scale, advanced clean coal technologies. To date, two rounds of demonstrations have been funded, with a third solicitation requiring additional federal funding. While several projects have made significant progress thus far, more work needs to be done to move these technologies from the demonstration phase to full-scale implementation. It should be noted that many of the projects in the CCPI program are essential to the construction of FutureGen.

- **Integrated Gasification Combined Cycle (IGCC)**

This technology offers promise as a means of reconciling environmental concerns with a robust coal future. Power PartnersSM member companies are participating in a variety of efforts to advance this technology.

- **FutureGen**

FutureGen is an initiative under which industry and DOE plan to build and operate a 275-megawatt (MW) coal plant that produces both electricity and hydrogen with essentially zero emissions. The initiative is a response to President Bush's directive to draw upon the best scientific research to address the issue of global climate change and help ensure America's energy security by developing technologies that utilize a plentiful domestic resource. Power PartnersSM member companies are participating in this effort.

Geologic Sequestration/Carbon Capture and Storage

A key challenge in developing coal-fueled power plants with zero or near-zero emissions—whether using IGCC or advanced pulverized coal technologies—will be the ability to capture, compress, transport and sequester CO₂ (a process referred to as carbon capture and storage, or CCS). In addition to the potential carbon capture technologies related to electricity generation, industry is actively participating in seven Regional Carbon Sequestration Partnerships to explore opportunities and methods for CO₂ storage.

- **Regional Carbon Sequestration Partnerships**

The Regional Carbon Sequestration Partnerships are a government-industry effort to determine the most suitable technologies and infrastructure needs for carbon capture,

storage and sequestration across the country, recognizing that regional approaches will be required to address the geologic sequestration of CO₂. This initiative directly supports the President's GHG intensity reduction goal. Power PartnersSM member companies are actively involved in each of the regional partnerships.

- In the Midwest, efforts are underway to examine the technical feasibility and costs of storage in deep geologic formations, agricultural forests and degraded land systems, as well as existing regulations and policies to determine if they hinder cost-effective CO₂ sequestration and ways of overcoming these barriers.
 - In the Southeast, partnership members are working together to pinpoint CO₂ sources and sinks as well as transport requirements for 11 states, enter this data into a geographical information system data base, and develop an outreach plan so that stakeholders can help identify and implement regional CO₂ sequestration measures.
 - In the Southwest partnership, electric utilities are contributing to an effort to assess the most appropriate sequestration strategies and technologies, including development of a website network to share information, store data, and help with decision-making and future management of carbon sequestration in the region.
 - As part of The Plains CO₂ Reduction Partnership, power providers are developing an approach that involves: 1) characterizing technical issues and the public's understanding regarding CO₂ sequestration, 2) identifying regional opportunities for sequestration, and 3) detailing an action plan to be carried out during Phase II of the partnership.
 - In the Illinois Basin Initiative, electric utilities are partnering with others to look at the feasibility and ways of storing CO₂ within deep, uneconomic coal seams, numerous mature oil fields and saline reservoirs. An action plan will be developed for possible technology validation field tests involving CO₂ injection.
- Carbon Sequestration Leadership Forum (CSLF)

A number of industries and stakeholders, including several electric utilities, also are participating in the Carbon Sequestration Leadership Forum (CSLF), a multilateral initiative involving 22 countries (see below for additional information).

Energy Efficiency

See NAPEE, p. 2 *supra*.

Utility Hybrid Truck Initiative

Significant opportunities exist to improve fuel economy and reduce GHG emissions through the development of an electric utility hybrid “bucket” truck, which will ultimately have significantly broader market potential. The core chassis, once hybridized, is ideal for not only cable and telecommunications operations but also for hundreds of thousands of urban work trucks, such as

cargo, delivery, dump and other truck applications. The goal is to develop a commercial hybrid work truck and meet 2010 emissions standards three years ahead of the federal goal, while improving fuel economy 50 percent (and thereby reducing emissions). To help meet this challenge, more than 25 utilities are taking part in the Utility Hybrid Truck Working Group to establish user requirements and performance specifications. By the end of 2004 several electric utilities had purchased and phased-in the first pre-production vehicles for national assessment. In 2006, those utilities and a number of others ordered additional vehicles during the second phase of this initiative.

Initiative for New Homes

The building sector is responsible for a significant portion of U.S. GHG emissions. Upgrading the energy performance of U.S. homes can help meet the President's emissions intensity goal by 2012. The Power PartnersSM and DOE are working together and with other interested parties to explore partnerships to achieve greater market penetration of energy-efficient new homes. This effort involves a wide range of stakeholders in the private and public sectors across the new homes transactional chain. Several multi-sector meetings have been held with DOE to discuss this initiative, and the power sector helped sponsor a workshop in 2004 that brought together a number of stakeholders to discuss opportunities and obstacles. In July 2005, DOE launched the Partnership for Home Energy Efficiency (PHEE) and held a meeting with interested stakeholders to discuss how to advance the initiative.

International Efforts

The U.S. government has concluded a number of bilateral and multilateral agreements that address climate change issues through research and technology transfer, including four important international initiatives: Asia-Pacific Partnership on Clean Development and Climate (APP), CSLF, International Partnership for a Hydrogen Economy and Methane to Markets. Industry is actively participating in many of these activities. Such an approach is vital because the combined CO₂ emissions of China and India already exceed those of the United States, and in only eight years the combined CO₂ emissions of developing economies (*e.g.*, China, India, Brazil, *etc.*) will exceed those produced by all developed countries.

- **Asia-Pacific Partnership on Clean Development and Climate (APP)**

The APP involves governments working with the private sector to expand investment and trade in cleaner energy technologies to address the challenges of reducing poverty and promoting economic development while reducing GHG emissions. Together, the partner countries—Australia, China, India, Japan, Korea and the United States—produce half of the world's CO₂ emissions. They have agreed to work together to meet goals for climate change, energy security and air emissions in ways that promote sustainable economic growth and poverty reduction.

The APP has established eight task forces covering: (1) cleaner use of 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. U.S.

industry representatives are participating in each of these task forces, which are developing action plans that will outline how the task forces will meet their goals. For example, improving the generation efficiency of the coal-fueled power plants in APP member nations by just one percent would yield significant reductions in GHGs.

- Carbon Sequestration Leadership Forum (CSLF)

Established in June 2003, the CSLF is an international climate change initiative focused on the development of improved cost-effective technologies for the separation and capture of CO₂ for its transport and long-term safe storage. The purposes of the CSLF are to make these technologies broadly available internationally, and to identify and address wider issues relating to CCS. To date, 17 projects have been undertaken.

➤ **Element 4: Develop bridges to accelerate investment in *advanced, cutting-edge Breakthrough Technology through R&D***

The Power PartnersSM and DOE view the development and use of more advanced energy technologies as critical to the achievement of the President's GHG intensity reduction goal. As described in the MOU, the Power PartnersSM and DOE agree to work collectively to develop a process, subject to available funds and applicable provisions of law, for (i) identifying high-priority areas for power sector research, development, demonstration and deployment ("RDD&D") associated with technologies that would contribute to the achievement of the President's goal and ultimately would contribute to surpassing this goal, and (ii) recommending steps to carry out power sector RDD&D in the identified, high-priority areas.

EPRI will serve as the Power PartnersSM, consultant in connection with the RDD&D process.

DOE will provide recognition to the Power PartnersSM and their members that make financial contributions to GHG emission reduction research, development and commercial use of advanced technologies and practices that help achieve the 18 percent national emissions intensity reduction goal and look toward future time frames.