

# Preparing for a Carbon-Constrained World

AEP's programs continue to evolve

by Bruce Braine and Greg McCall

Responding appropriately to challenges separates successful companies from those who don't survive. As one of the nation's largest generators of electricity, American Electric Power (AEP) recognized more than a decade ago that the emissions of its coal-fueled fleet of power plants, including greenhouse gas emissions (GHG), would have a significant impact on the future of the company.

Instead of waiting for regulations to force it to respond, the company did what it has done continually throughout its more than a century of existence: it faced the challenge early with innovative, first-of-a-kind approaches designed to allow the continued use of coal to generate electricity in a carbon-constrained world.

"AEP has been quietly but actively engaged in the debate about how to successfully address global climate change since the early 1990s," said Mike Morris, AEP's chairman, president and chief executive officer. "We've long believed it is important to go beyond simply talking about what should be done and move forward with real reductions in our current greenhouse gas emissions and investments in technology that will reduce future emissions from coal-fueled generation."

Some of AEP's earliest actions began more than a decade ago. In the late 1990s, AEP developed carbon offset programs to protect and restore more than 4 million acres of tropical rainforest in Bolivia and Brazil. Since that time, the company has invested nearly \$27 million in terrestrial sequestration projects, in both the U.S. and South America, designed to conserve and reforest sensitive areas and offset more than 20 million metric tons of carbon dioxide (CO<sub>2</sub>) over the next 40 years.

Additionally, the company invested in wind generation to supplement its emissions-free nuclear and hydro generation. Since building the first utility-scale, 6 MW wind farm in the Southwest in 1995, AEP has become one of the larger generators and distributors of wind energy in the United States, operating 310 megawatts of wind generation and purchasing an additional 476 megawatts. The company recently announced plans to purchase an additional 1,000 megawatts of wind generation output.

In 2003, AEP was the first and largest U.S. utility to join the Chicago Climate Exchange, CCX is the world's first, and North America's only, voluntary, legally binding GHG emissions reduction and trading program. As a founding

member of CCX, AEP committed to gradually reduce, avoid or sequester its GHG emissions by 6 percent below the average of its 1998 to 2001 emission levels by 2010. Already, from 2003 through 2006, AEP has achieved approximately 39.2 million metric tons of GHG reductions.

AEP has reduced CO<sub>2</sub> emissions from its current fleet of more than 35,000 megawatts of fossil-fuel generation through efficiency improvements. Routine maintenance and investments in turbine blade enhancements and steam path replacements have helped maintain and improve the heat rates of AEP's generating units, ultimately leading to lower CO<sub>2</sub> emissions. A 1 percent improvement in AEP's overall fleet efficiency can reduce the company's CO<sub>2</sub> emissions by almost 2 million metric tons a year.

The company also has retired inefficient gas-fired generation and older coal-fueled generation and enhanced the performance of its D.C. Cook nuclear plant in Michigan. In 2005, Cook set plant records for generation and achieved a capacity factor (energy generated as compared to the maximum possible) of 96.8 percent.

Going forward, AEP is deploying new technology that will reduce the CO<sub>2</sub> emissions of current and future coal-fueled plants. In August 2004, AEP was the first company to announce plans to scale up Integrated Gasification Combined Cycle (IGCC) technology to build baseload, coal-fueled power plants with less environmental impact. AEP is seeking regulatory approval in Ohio and West Virginia to build the first two commercial-scale (629 MW) IGCC plants. Both plants would be designed to accommodate retrofit of CO<sub>2</sub> capture technology. AEP is also planning two ultra-supercritical pulverized coal plants in Oklahoma and Arkansas that offer enhanced efficiency and lower emissions. The plants will be the first commercial-scale ultra-supercritical plants in the United States.

In addition to developing new, lower-emissions generating technology, in March 2007, AEP announced plans to install carbon capture technology on two existing coal-fired power plants, the first commercial use of pre- and post-combustion technologies to significantly reduce carbon dioxide emissions from existing units.

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**CARBON** continued on 38

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**CARBON** continued from 36

2008. The 30 MW (thermal) product validation will capture up to 100,000 metric tons of CO<sub>2</sub> per year that will be stored in deep saline aquifers at the site.

Following the validation at Mountaineer, AEP plans to install Alstom's system on one of the 450 MW (electric) coal-fired units at its Northeastern Station in Oologah, Okla., in late 2011. The system is expected to capture about 1.5 million metric tons of CO<sub>2</sub> a year that will be used for enhanced oil recovery.

AEP also signed an agreement with The Babcock & Wilcox Co. (B&W) for a feasibility study of oxy-coal combustion technology. The oxy-coal technology involves a pre-combustion boiler conversion for existing plants that creates a pure CO<sub>2</sub> stream in the flue gas. Following a pilot demonstration, AEP and B&W will select an

documentation of the environmental obligations of its generating fleet. Powered by the Enviance System's Software as a Service (SaaS), iMESH is linked to key emissions and fuel databases maintained by AEP, including the company's Continuous Emissions Monitoring Systems, Opacity Monitoring Systems, and AEP's custom application for fuel-loading management. The integrated system and its task management and calendaring functions allow AEP to monitor, report and analyze emissions, including CO<sub>2</sub> emissions, from its 36 plants. The Enviance System's on-demand delivery method gives AEP the flexibility to grow its programs and operations while centrally managing compliance in real-time.

Before the implementation of iMESH, plants generally managed compliance tasks using spreadsheets for data analysis, paper forms for data collection and an e-mail/calendar program to track when



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existing AEP plant site for commercial-scale installation. The oxy-coal combustion technology is expected to be in service on an AEP plant in the 2012 to 2015 time frame.

Additionally, AEP is a member of the FutureGen Alliance, which will build the world's first nearly emission-free plant to produce electricity and hydrogen from coal while capturing and permanently storing CO<sub>2</sub> in geologic formations.

Part of AEP's actions to address its emissions includes demonstrating a viable program for verifying, reporting and tracking those emissions. "The amount spent on accounting, verification, auditing and reporting emissions can be quite significant in relation to actual pollution control costs," said Greg McCall, senior engineer, environmental services, at AEP.

AEP uses a software system called Information for Managing Environment, Safety & Health (iMESH), to assure compliance and

tasks needed to be completed. iMESH eliminates or significantly reduces the time spent searching for data for reporting and keeping track of deadlines, which is important as the company sees additional reporting requirements in the future.

"The politics are clear. Our future will involve operating under a carbon constraint," Morris said. "The actions we have taken for more than a decade constitute a solid foundation for our continued success in addressing the intersection between environmental policy and business opportunities. The challenge is to continue building on this foundation in a way that makes economic sense as U.S. policymakers wrestle with how to address this global issue. Proactive leadership in technology development, serious advocacy of highly efficient control programs, openness to partnerships and continued transparency of action are, we believe, the essential elements of the path ahead." ■