Shedding Light on Reducing Emissions: A Case Study of American Electric Power

WHITE PAPER

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ENERGY INSIGHTS OPINION

With increased attention on climate change, utility and merchant generators are faced with the prospect of reducing their carbon footprints. Amid the changing regulatory landscape, and concerns of customers and shareholders, utilities face a constantly changing set of requirements. Utilities need to maintain flexibility and adapt as they are faced with the prospect of having to pay the cost of carbon under an inevitable cap and trade market.

American Electric Power (AEP) is an example of a utility taking a leadership role in sustainability and the use of information technology (IT) to help manage carbon emissions. The company is implementing a compliance system that provides consistency of reporting, automates the reporting process, documents the compliance process, is accessible to all personnel needing access to information, and keeps up to date the multiple and detailed reporting requirements for compliance across all jurisdictions in which AEP operates. According to one executive, "It is important that all employees of AEP see the overall picture, and that the picture is consistent and allows them to make progress against the goals that the company is committed to."

Power generators seeking to improve their corporate performance with respect to emissions need to assemble technology to support reporting, alerting, collaboration, and business and operational intelligence. Most of the pieces are already installed at the company. The challenge will be to provide operational data, information, and analysis to each employee according to need and job function. This will require utilities to put together their systems in new ways. In addition, the effort will require a corporatewide initiative focused on carbon management, along with reorienting employees to pay attention to and manage carbon emissions. That is no small task.

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IN THIS WHITE PAPER

This white paper examines how information technology can be used to support effective carbon management and emissions reductions. American Electric Power is an example of a utility that is using Microsoft technology, plus compliance software provided by Enviance, delivered in a software as a service (SaaS) model, to manage voluntary and mandatory compliance with emissions reduction goals. This document describes what AEP is doing now, what its next steps are, and how technology can be used to achieve the next level of performance.

METHODOLOGY

Energy Insights conducted onsite interviews with personnel at American Electric Power regarding their use of information technology to support the corporate goals of reducing emissions. The study included interviews with personnel at all levels of the organization, including senior staff (senior vice president of environment and safety, executive vice president of shared services, CIO, vice president environmental services), business unit leadership for compliance (senior engineer environmental services), and plant compliance personnel (air quality engineer, plant environmental coordinator, regional environmental consultant to plant operations). Also included were interviews with IT technical and planning support for environmental compliance.

SITUATION OVERVIEW

With increased attention on climate change, utility and merchant generators are faced with the prospect of reducing their carbon footprints. Companies that own power generation can pursue many strategies, including reducing the carbon output of self-owned generation, investing in carbon reductions in emerging economies or in reforestation, and pursuing financing for solutions through government subsidies, tax breaks, and trading of carbon emissions credits.

Current Industry Dynamics

Climate Change Is the Buzz in Utility Boardrooms

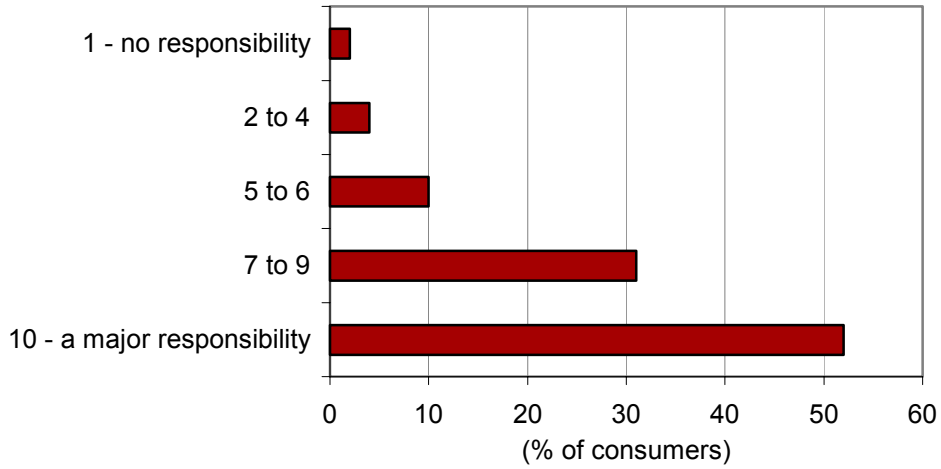
Worldwide attention has been riveted on the prospect of global climate change and the pressure to reduce the emissions of greenhouse gases (GHG) such as carbon dioxide (CO_2), methane, and nitrous oxide (NOx). This concern is manifested in climate-focused energy policies and regulations, consumer and business awareness and concern with climate change, climate change attention by shareholders and credit rating agencies, and increased venture capital investment in clean technologies.

Utility customers care about climate change, and they expect their utilities to take action. Energy Insights' 2007 *National Residential Online Panel Climate Change Survey* shows that 81% of consumers nationwide are concerned about climate change. Consumers believe they share in the responsibility, and most have taken action. The majority are even willing to pay more on their utility bills to help reduce carbon emissions.

Figure 1 shows that the majority of respondents (52%) said that electric and natural gas companies have a major responsibility in combating climate change (giving a rating of 10, on a 1–10 scale, where 10 indicates a major responsibility). Another 32% rated electric and natural gas utilities' responsibility in combating climate change a 7, 8, or 9 on a 10-point scale. And how are utilities doing on meeting that responsibility? *Sixty percent of respondents said their local utility companies are not doing enough to combat climate change.*

FIGURE 1

Consumer Perception of Electric and Natural Gas Utility Companies' Responsibility for Combating Climate Change



Source: Energy Insights' *National Residential Online Panel Climate Change Survey*, June 2007

It is not just utility customers who are concerned. Shareholders and investors are concerned as well. So much so, in fact, that some utilities, such as Iberdrola in Spain, have started to include progress on emissions reductions in their quarterly guidance reports, along with the traditional reports on earnings per share and revenue expectations. Other utilities, such as National Grid and AEP, are producing annual sustainability reports that include reports on progress against emissions reduction goals. Climate change is all the talk in utility boardrooms, and utility CEOs are feeling the pressure.

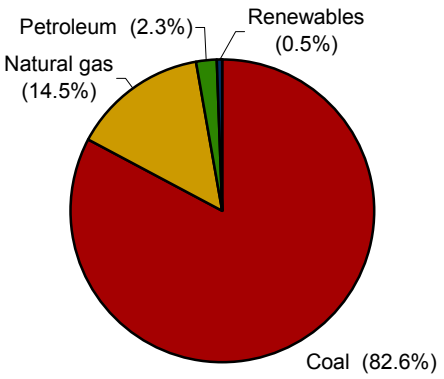
Power Generators Have Large Carbon Footprints

Power generators are among the companies with the largest carbon footprints when it comes to direct emissions of GHG. According to the U.S. Department of Energy's Energy Information Agency (EIA) report *Emissions of Greenhouse Gases in the United States 2006*, power generation made up 39% of the energy-related and industrial process–related carbon dioxide emissions in 2006.

Generation plant emissions vary by fuel type, with coal-fired generation producing on average more than 1 ton of carbon dioxide per MWh. This is particularly problematic in the United States, where coal-fired generation makes up 49.7% of the generation when it comes to feedstock. According to the EIA, coal-fired generation in 2006 accounted for 82.6% of carbon emissions produced by generation (see Figure 2).

FIGURE 2

Contribution of Generation to Carbon Emissions by Fuel Source



Source: Energy Information Agency, *Emissions of Greenhouse Gases in the United States 2006*

While most new power plants under construction are still largely cleaner-running gas-fired plants, they make up only a small portion of generation capacity in the United States. While the Energy Policy Act of 2005 offers incentives to cleaner generation, such as Integrated Gasification Combined Cycle (IGCC) technology, with the scaleback of the FutureGen project and the long development cycle for nuclear, cleaner generation will not come online for years to any substantial degree.

The Trend Is Toward More Regulation of GHG

Laws regulating emissions are not new to the energy industry. For the United States, going back as far as the Energy Policy Act of 1992, the federal government has required utilities to report GHG emissions. The Clean Air Act of 1990 established standards for mercury, NOx, and sulfur dioxide (SO_2), which spawned the following:

- Deployment of auditable, verifiable information systems to accurately measure emissions rather than relying on estimations under Title V of the Clean Air Act of 1990

- Formation of markets for trading sulfur dioxide emissions credits

To address regulatory compliance, generation companies are making significant investments in emissions control. Environmental compliance project spending for U.S. coal-fired power plants was expected to exceed $15 billion in 2007, according to Industrial Info Resources.

As of this writing, only 14 states have set GHG targets. As more states, regions, or countries go from reporting requirements to carbon caps or taxes, compliance costs will increase. These costs will likely have an effect on the credit ratings of the utilities at a time when utility credit ratings have stabilized. According to Denise Furey, senior director, Fitch Ratings:

> Credit rating implications of increased compliance costs will depend on a utility's ability to recover these costs from consumers through higher prices. Utilities will also need financial flexibility to absorb costs that cannot be passed through in a timely manner …. Nonregulated generators with long-term contracts with no mechanisms for price changes in emissions requirements could see significant reduction in margins. Owners of nuclear and renewable generation in disaggregated power markets should enjoy increased profits because of the cost of carbon, which should at least be reflected in wholesale.

Finally, some states are rejecting new coal power plant construction that does not have extensive emissions control. In addition, the rate of cancellations of new coal power plant projects doubled from 2006 to 2007. Moreover, federal legislation has been introduced that would ban construction of coal-fired generation unless it has significant control equipment for carbon emissions.

Cap and Trade: At What Price Carbon?

The initiatives expected to have the greatest impact on actual reductions of GHG are those that set targets and establish a cap and trade market. Basically, a cap and trade market allows market participants to buy or sell emissions credits, based on whether they are long or short on emissions. There are many models of cap and trade markets — some auction initial allocations of credits; others award them for free.

The European Union Emissions Trading Scheme (EU ETS), the largest mandatory market for carbon trading, is modifying rules after three years of operation. In the first period of its operation, the EU ETS was able to achieve an absolute emissions reduction of 6.5% compared with 2005 verified emissions. In March 2007, the European Council endorsed an EU objective of a 30% reduction in GHG by 2020, and the European Commission, in early 2008, announced enhancements to the EU ETS to improve upon its reduction activities, including changing monitoring, reporting, and verification rules.

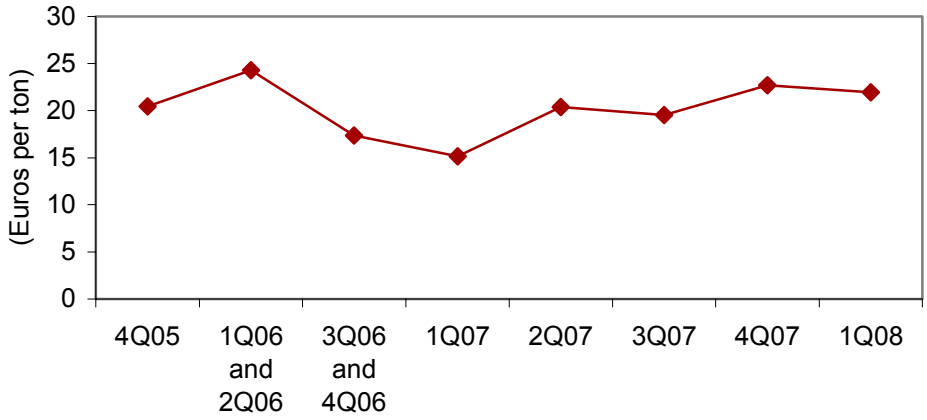
In North America, voluntary markets have gained momentum. With the expected announcement of the Midwest Accord, combined with the Regional Greenhouse Gas Initiative (RGGI) and the Western Climate Initiative (WCI), more than 30 states and several Canadian provinces are or will soon be operating in binding — states that participate set binding caps on emissions for market participants — CO_2 cap and trade allowance markets.

As mandatory carbon cap and trade provisions begin to be more widely adopted, generation margins will feel the impact. Michel Verschuere of Electrabel sets forth a possible example of a gas-fired peaking plant in "Managing Spreads in Power Portfolios" in *WorldPower 2007*. Assuming that operating and maintenance costs are €2/MWh, power prices are €50/MWh, natural gas prices are €19/MWh, and emissions allowances — a new element for most generation companies — cost €10/tonne, the generator would make a profit of €6/MWh contrasted with €10/MWh without emissions caps.

A concern for utility companies is what their exposure will be in a highly volatile market for carbon. If Europe is any indication, there is bound to be great volatility in carbon prices. Since trading under the EU ETS began in 2005, the price of GHG emissions has ranged from 6 to 31 euros a ton (see Figure 3). It is true that some adjustments needed to be made due to overallocation, but that is no guarantee that volatility will be lessened going forward.

FIGURE 3

Market Price at EU ETS, 2005 to Present



Source: Point Carbon, 2008

In total, Point Carbon reported that global carbon markets were worth US$60 billion (€40 billion) in 2007, up by 80% from 2006.

Generation Companies Are Stepping Up to the Plate

Companies that own or operate power generation are addressing their carbon footprints in several ways. Specifically, they are:

- Reducing emissions at existing plants via fuel switching (substituting natural gas for oil) and making plants more efficient
- Developing or acquiring clean/renewable generation such as nuclear, hydro, wind, and solar
- Investing in development of clean coal generation
- Contributing to research and development for carbon sequestration
- Acquiring carbon emissions credits through bilateral agreements or trading
- Securing carbon offsets through investment in clean plants or forestation

Many utilities have taken a progressive position and joined organizations committed to emissions reduction and/or sustainability. Table 1 provides an overview of registries, exchanges, and organizations and their utility membership. Commitments range from sharing strategies to reporting carbon footprint to committing publicly to emissions reduction goals.

TABLE 1

Utilities Join Registries, Exchanges, and Coalitions

Organization	Level of Commitment	Selected Utility Members
Ceres	Receive advice and strategies	Arizona Public Service, Consolidated Edison, Green Mountain Energy, Green Mountain Power, PG&E, PPL
California Climate Action Registry	Measure, verify, and publicly report GHG emissions	Austin Energy, LADWP, PacifiCorp, PG&E, Salt River Project, San Diego Gas & Electric, Seattle City Light, SMUD, Southern California Edison, Southwest Gas
Business Environmental Leadership Council (BELC)	Public statement of emissions reduction targets	AEP, DTE Energy, Duke Energy, Entergy, Exelon, Ontario Power Generation, PNM Resources, Transalta, Wisconsin Energy
EPA Climate Partners	Public statement of emissions reduction targets	AEP, Calpine, Entergy, Exelon, FPL Group, PSEG Group, WE Energies
EU ETS Climex	Mandatory participation for high-emitting industries	Members of the European Union
Chicago Climate Exchange	Marketplace for trading emissions credits and offsets	AEP, Alliant Energy Corporate Services, DTE Energy, Manitoba Energy, NRG, Puget Sound Energy, TECO Energy

Source: Energy Insights, 2008

As seen in Table 1, AEP is one of the leaders in terms of participation in public bodies that track sustainability and carbon reductions. The following case study provides a look into how AEP has approached tracking carbon and future plans for technology.

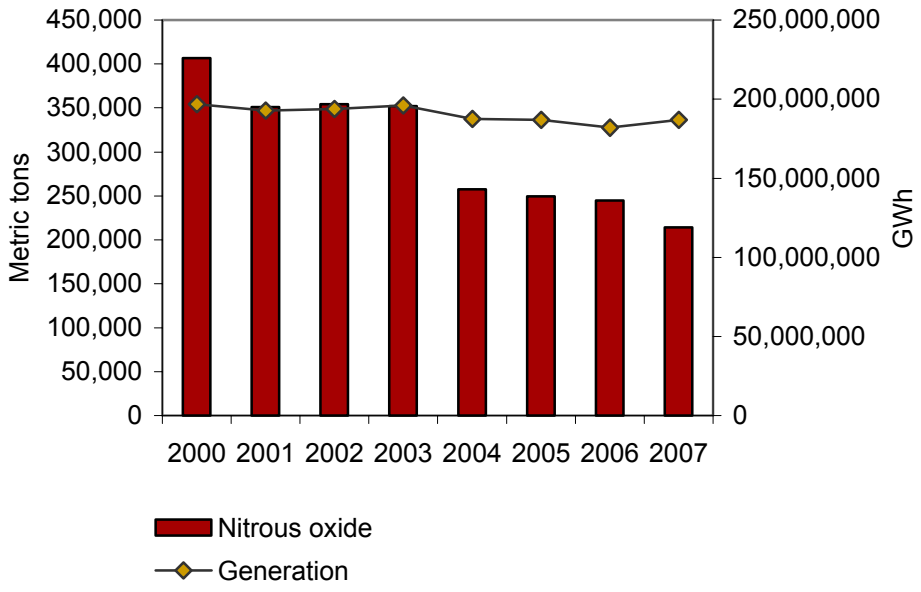
CASE STUDY: AMERICAN ELECTRIC POWER

AEP has taken its commitment to emissions reduction specifically, and sustainability in general, quite seriously. Beginning in 2003, AEP committed to reduce or offset its GHG emissions from an established baseline each year through 2010. The company has pledged to reduce total U.S. GHG emissions by 6% from 2001 to 2010 and has already achieved its initial goal by reducing total U.S. GHG emissions by 4% from 2001 to 2006.

As a participant in the Chicago Climate Exchange, AEP expects to reduce or offset approximately 46 million metric tons of CO_2-equivalent emissions between 2003 and 2010. Just in carbon reductions alone — not including offsets — from 2003 to 2007 AEP has already reduced 8.3 million tons of carbon dioxide. Figures 4, 5, and 6 illustrate the impact of emissions reduction efforts at AEP for NOx, SO_2, and CO_2.

FIGURE 4

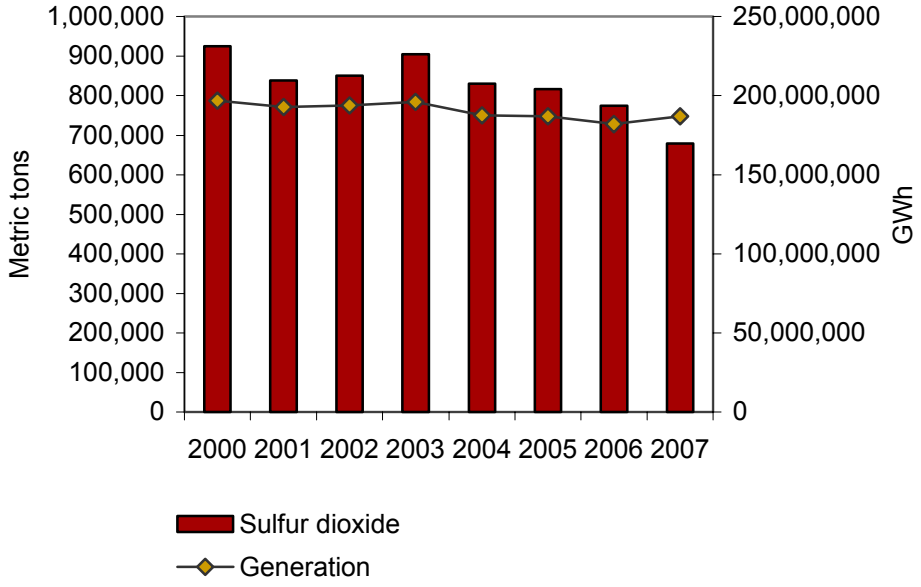
AEP Nitrous Oxide Emissions, 2000–2007



Source: AEP, 2008

FIGURE 5

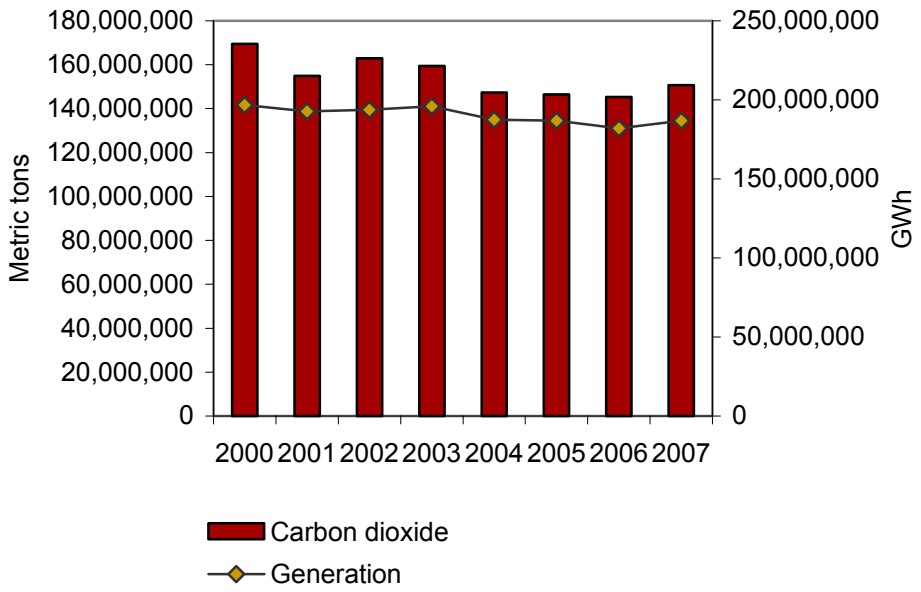
AEP Sulfur Dioxide Emissions, 2000–2007



Source: AEP, 2008

FIGURE 6

AEP Carbon Dioxide Emissions, 2000–2007



Source: AEP, 2008

The Challenge

AEP serves over 5 million customers in the Midwest and Texas and has been in operation for over 100 years. The company operates 38,000MW of generation capacity in the United States, a significant portion of which is coal-fired generation. Headquarters for the company are in Columbus, Ohio.

About 94% to 98% of AEP's carbon emissions can be attributed directly to generation activities. While the company is making strides in developing newer, cleaner generation technologies and also engaging in reforestation activities, existing generation must still be addressed.

AEP has long been reporting to regulatory agencies for compliance related to air quality and emissions, water, health and safety, and toxic release. However, AEP recognized efficiencies were to be gained through better business processes and information technology to support compliance. The specific challenges the company faced included:

- **Complex and changing reporting requirements.** AEP must report to a multitude of regulatory agencies (e.g., local, state, federal) on a variety of measures (e.g., air quality and emissions, water, toxic release, health and safety), which require complex reporting. For example, even though Title V of the Clean Air Act of 1990 — the permitting standard that requires a generator to report, monitor, and annually certify compliance publicly — applies across the United States, each facility has its own permit, which requires a different technology configuration and different reporting requirements for each facility. Another example is the AEP Northeastern plant, which must report to the state of Oklahoma within 24 hours of an exceedance, whereas other states have less stringent requirements.

- **Substantial amount of data to be processed.** As with other power generators, AEP is required to install continuous emissions monitors (CEMs) to track emissions under the Clean Air Act. CEMs produce a steady flow of time series data that must be transmitted, stored, and processed. This requires a system that is capable of handling time series data and hundreds of thousands of records every day.

- **Limited access to data for compliance management.** Much of the reporting was done manually using spreadsheets and log books, which made for a labor-intensive process when the company received inquiries from regulators on compliance data. In addition, it was not easy for environmental coordinators to access information about the status of regularly required (weekly, monthly, quarterly, or annual) tasks.

- **Aging workforce.** Like the workforces of other utilities, AEP's plant engineers and environmental compliance personnel are reaching the age of retirement. While the company has documented practices for compliance, this documentation is not always easily accessible.

- **Variations in business process and technology.** In the late 1990s, AEP acquired a Texas utility company and has since been in the process of integrating systems across the plants.

The Solution

In 2003, AEP embarked on a project to enhance the way it measures and reports environmental compliance, including emissions and subsequently water and waste. The MESH project — Managing Environment, Safety and Health — would have an information technology component, iMESH, and would bring AEP into compliance with ISO 14001 standards. The goal is to have all facilities (including all generation plants) working on the same system by 2010.

The primary objective of the project was to create a standardized approach to compliance management that would:

- Provide consistency of reporting
- Automate the reporting process
- Document the compliance process
- Be accessible to all personnel needing access to information
- Keep up to date the multiple and detailed reporting requirements for compliance across all jurisdictions in which AEP operates

Basic system requirements were the ability to:

- Scale to handle large data sets (50,000 or more records)
- Have adequate levels of security to prevent intrusion into AEP systems as well as theft of emissions data
- Meet company requirements for performance and user responsiveness

In 2003, the company piloted the use of Enviance — compliance software delivered in a SaaS model — in a test site at two plants. After the initial pilot, AEP elected to utilize the solution by Enviance for compliance management and reporting. SaaS provides compliance reporting for multiple jurisdictions and types of compliance, workflow, and compliance task management. Typical reports include:

- Emissions inventories — annual reports sent to state agencies for each plant
- Toxic release inventory (TRI) reports — corporate reports sent to the U.S. Environmental Protection Agency (EPA) annually
- Internal emissions reports — reports for executives, management, public affairs
- Corporate sustainability reports

After initial deployment, the system has been extended to collect plant maintenance information, as well as track calibration of emissions monitoring equipment. AEP's deployment of the system for monitoring, reporting, and managing GHG is in progress. The company plans to enable reporting of GHG inventories to the Chicago Climate Exchange, the U.S. Department of Energy, and EPA.

The compliance software can be accessed via laptop, desktop, or mobile device. Most employees access the system via an Internet connection through the corporate LAN. The system automatically generates faxable forms to send to regulators, but electronic reporting is not currently in use at AEP.

AEP's Decision

AEP decided to use Enviance primarily because the software met its requirements for compliance reporting. AEP saw secondary benefits in the SaaS delivery model based on:

- **Lower internal hardware cost.** No new hardware or Web hosting was required.
- **Less internal IT involvement reduces overall cost.** AEP has a rigid structure for development and production release that would have made a project like this extremely costly.
- **Reduced time for in-house development.** The IT department did not have resources available for in-house development, but it could supply the lower level of resources required for integration.
- **Simple configuration.** Business users are able to configure the compliance objects without IT involvement.

Architecture: A Key Ingredient

The Enviance compliance software is built on Microsoft technology, including .NET and SQL Server. Enviance uses a single installation to manage data points from each of its utility clients. More importantly, the architecture is geared toward being able to support constant data feeds and constant calculations. The goal is to have real-time reporting

against live data, as well as real-live transactions and calculations. Typically, millions of data points in memory are used in calculations. Hundreds of systems are sharing central processing units (CPUs) on the same resources and running on the same network infrastructure.

Integration Required

Compliance reporting requires many sources of data, and integrating the Enviance application with internal data sources was a major part of the implementation. The source data for emissions management is described in Table 2.

TABLE 2

Emissions Management Source Data

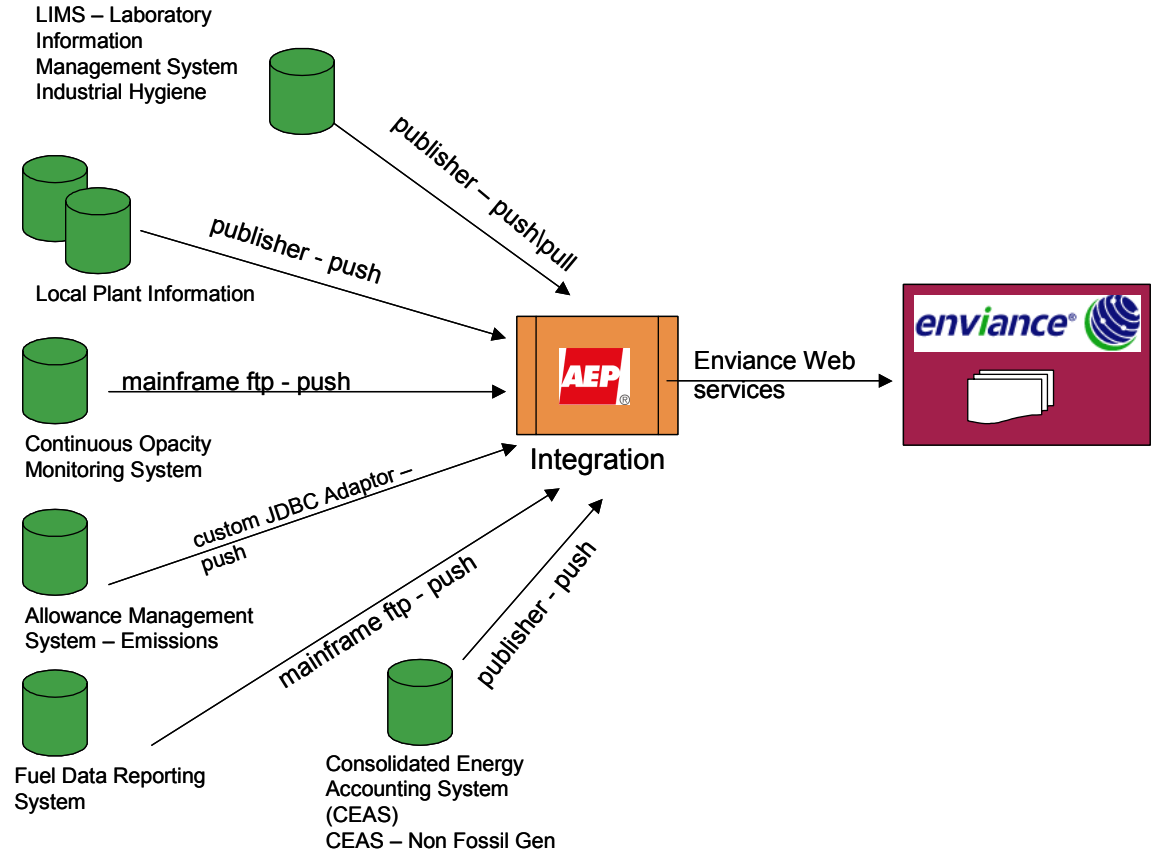
Data Type	Example of Sources	Example of Uses
Chemical	Laboratory information management system (LIMS)	Effluent composition
Plant information (PI)	Tags from various fossil applications and control systems	Estimation of emissions (e.g., operating capacity)
Coal consumption	Fuel management system	For estimation
Opacity monitoring	Continuous opacity monitoring system (COMS) (six minute with QA flags)	Measurement for emissions reporting and compliance
Unit emissions data (net and gross generation, heat input, NOx, SO2, CO2)	Continuous emissions monitoring system (CEMS), various applications storing plant data	Measurement for emissions compliance

Source: Energy Insights, 2008

The implementation of iMESH involved development and coding of integration architecture using enterprise application integration with the proper levels of security. Figure 7 displays integration between data sources and Enviance.

FIGURE 7

Internal Applications Integrated with Compliance Application



Source: Energy Insights, 2008

Data is delivered from AEP to the compliance software using Web services via a secure connection (HTTPS). Data is pushed to Enviance in batches of 200 or fewer records. Enviance has a Web service for submitting numerical data batches (unit emissions data, stack CEMS data, coal consumption data, and plant information real-time data) using this generic interface. A more specific interface is used for opacity and laboratory data.

Implementation Challenges

As AEP proceeded with implementation of the iMESH system, the implementation team found a great deal more variation in compliance practices from plant to plant. This required the implementation group to take a step back and embark on a standardization exercise across the plants. At the same time, the team realized that several areas did not agree on the interpretation of the regulations and the tasks required for compliance, especially at the detailed level. Achieving agreement involved conversations with compliance officers within AEP.

Periodic slow performance was also an issue in the early stages of implementation. After the use of a load monitor to measure performance in four areas — workstation, internal network to firewall, firewall to host, and transaction time — several sources of bottlenecks, both internal and external, were identified and resolved.

Benefits

Increased Efficiency Frees Time for Compliance Activities

Now that the system has been rolled out to 24 plants with the objective of having it operational at a total of 36 plants, AEP is reporting an increase in the accuracy and efficiency of compliance reporting. With the combination of iMESH and new business processes, AEP's 125 employees dedicated to day-to-day compliance support have increased their capacity for work. For example, toxic release reporting was typically done every five months through a manual process of collecting data and reporting via multiple spreadsheets; now one staff person is able to generate monthly toxic release reports.

Documented Processes to Mitigate Aging Workforce

Another significant benefit of the iMESH installation was obtained through the implementation process. Not only did the deployment exercise yield common business practices, but the company was able to implement more precise and well-documented procedures. The steps for meeting certain regulatory requirements are clearly documented. This is especially helpful for those tasks that are not required to be completed every day, but only every two or three years. Then, too, as employees retire or change roles, a system that contains full documentation of compliance procedure eases the transition to new staff.

Improved Visibility and Collaboration Speed Resolution

Under the previous system, an environmental engineer in Dallas would enter compliance tasks into a log book that stayed in the plant. Now appropriate Columbus-based employees with approved access can log onto iMESH and view the task and know whether it has been completed. At the same time, collaboration between personnel has been made easier. An engineer based in the Columbus headquarters can communicate with the plant engineering staff while looking at the same data and thus more quickly come to a resolution and a plan of action. The fact that the compliance software is based on a Microsoft platform and is engineered to work with Microsoft desktop applications has contributed to collaboration. Staff can easily draw data into a spreadsheet, manipulate and analyze that data, and make adjustments where necessary.

Reduced Notices of Violation

Although AEP has not done any formal studies of whether there have been reduced notices of violation as a result of implementation of the iMESH system, there is anecdotal evidence that iMESH has had an impact. In one instance, an exceedance was identified and corrected immediately, resulting in a lower fine. In other cases, potential exceedances have been identified and prevented.

Lessons Learned

There is a trade-off when it comes to easy configuration. The software allows business users to do their own configuration. However, with an application that is so flexible, numerous configuration possibilities can prove to be overwhelming for some users. Enviance and the IT department have worked closely with environmental coordinators to develop templates and instructions so that novice business users have a place to start when configuring the application for their particular needs.

As with most implementations, buy-in by all the users who will be using the application and any new business process is essential to the success of the project. There is not much new in that statement. However, one aspect of the implementation eased the transition to the new system. The application architecture is compatible with standard office tools. In particular, Excel — plant engineers and environmental coordinators have a high degree of comfort with Excel — is an integral part of the application for uploads into the Enviance System and report template for outputs.

Beyond Compliance

Ultimately, AEP's goal with iMESH is to increase operational awareness throughout the organization. According to one executive, "The objective is to develop awareness in the operations staff of environmental health and safety [EH&S] obligations. While we are not out to make everyone EH&S experts, we should be able to improve performance by raising employees' awareness of events that could be potential risks and providing the analytical tools and a communication path for preventive action."

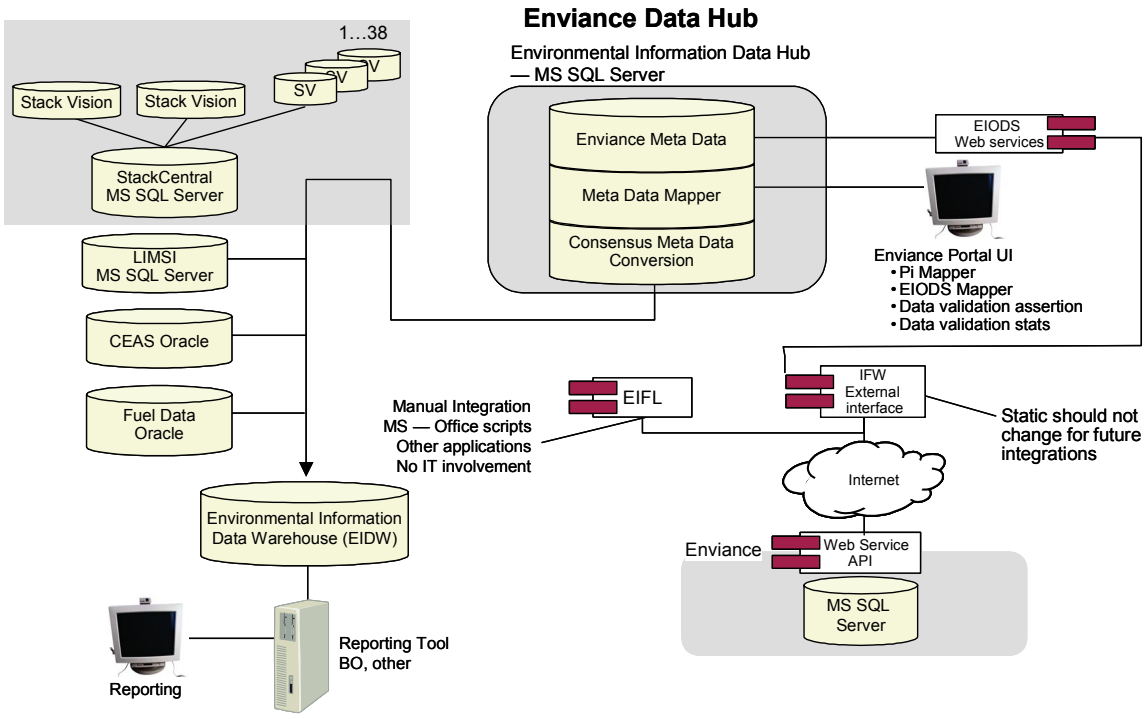
AEP plans to complement its use of the SaaS delivery model and compliance reporting provided by Enviance with an internal data hub. As a first step, to improve efficiency of the system, AEP will be consolidating 38 databases onto a Microsoft SQL Server database. Next, AEP will be building the data hub. Not all data elements are needed to meet compliance and reporting or even management requirements, but many more data elements are needed to trade and optimize to reduce the carbon footprint. AEP is seeking to enhance business and operational intelligence by applying sophisticated and, sometimes, proprietary analytics to meet the following requirements:

- Predicting potential emissions limit–exceeding events and alerting appropriate personnel
- Identifying opportunities for speeding achievement of emissions goals through better understanding of the generation process
- Displaying key performance indicators and measuring against performance objectives

Figure 8 displays the data hub that AEP is building. This hub will allow the company to do sophisticated analysis of hourly trends in emissions data. Besides the compliance division, numerous other business units need different breakdowns of emissions data — by operating company, percent ownership, stack, and other areas — or what some term business or operational intelligence.

FIGURE 8

Future Plans for Data Hub at AEP



Source: AEP, 2008

Sustainability

AEP has gone beyond compliance to be one of the first utilities to produce a corporate sustainability report. It is one thing to state general intentions; it is quite another to set specific targets and timelines. AEP has committed publicly to the following targets when it comes to emissions. In addition, AEP is reporting publicly through its affiliation with organizations such as the Business Environmental Leadership Council.

The metrics that AEP uses to judge progress against goals are widely recognized standards developed by the Global Reporting Initiative (GRI), sponsored by the World Resources Institute. AEP measures not only emissions reductions but also other indicators related to social and economic issues, as well as other environmental standards. According to the company's 2006 corporate sustainability report, "American Electric Power does not yet have a formal information collection system for the GRI process. Each business unit collected and verified data for which it was responsible."

Making It Stick

Senior leadership at AEP has expressed a commitment to achieve the greatest level of transparency so that all levels of the organization, especially executive-level management, can see how well the company is doing against goals, based on data that is accessible and verifiable. According to one executive, "It is important that all employees of AEP see the overall picture and that the picture is consistent and allows them to make progress against the goals that the company is committed to."

FUTURE OUTLOOK

AEP is an example of how information technology can be applied to carbon management. The company has laid the foundation for improving performance. Information technology will also provide the means for getting to the next level.

Improving Performance

For all utilities, actively managing emissions means not only managing the tasks of compliance and reporting but also improving performance against the emissions reduction goals. The most advanced utility company will want to optimize emissions in relation to both economics and corporate responsibility. The idea is not only to report but also, more importantly, to continually adjust operations so that the right trade-offs are made. For example, corporate engineers could analyze emissions/operation data and cross-reference data sets to assess the use of coal of a certain quality and its impact on emissions in order to make adjustments in the dispatch order.

Optimization applies not only to operational decision making but also to long-term portfolio planning. A power plant is a major capital investment. Decisions about changing the mix of generation in the portfolio used to be made on a number of factors, including location, market value, fuel type, generator set type, market price of electricity, and age of the plant. Now emissions will be a part of simulations done in support of the long-term planning process.

Optimization is based on information, analysis, automation, and collaboration. Personnel within the utility need to be able to see how they are performing relative to the specific objectives of their business unit in relation to emissions reduction and economic performance. For example, some vice presidents of generation are set up to see individual plant capacity, current production levels, market price, and emissions on their smartphones.

Conclusions are best drawn by seeing information in context. Better yet, collaboration may be required. Oftentimes collaboration involves individuals within the organization who may not be available for meetings in the same location but are able to access the same information. Then, too, executing on a new approach to emissions reduction will also require collaboration among employees.

Must-Have IT Capabilities

Industry learned long ago that measurement is required to improve an enterprise's ability to meet an objective. Information technology provides the capabilities to set a baseline, measure progress, and indicate opportunities for adjusting approaches to accelerate reduction in carbon emissions within the context of business objectives.

Reporting

Most compliance reporting, whether voluntary or mandatory, involves periodic reporting. The data may be time series data, but it is assembled and aggregated over time to produce reports. An EH&S application can assemble data, calculate estimates where continuous monitoring is not available, manage compliance tasks, and produce reports for regulators or climate change registries. These applications receive data via integration with internal applications or through external data sources. Companies choose a single application to maintain consistency of reporting. Maintaining an application is costly, especially when a utility operates across several regulatory jurisdictions. Some companies have opted to choose SaaS to support compliance and corporate responsibility reporting.

Role-Based Access

Changing work assignments/responsibilities and the aging workforce necessitate role-based access — sometimes referred to as role-based automation — to data and analytics for managing emissions. Employees change roles, roles change, and tasks associated with those roles change as well, especially in an environment of continuous improvement. The IT infrastructure must be flexible enough to create new roles, add new tasks to those roles, modify workflows and approval processes, and make changes in task assignments. Of course, role-based access must also include provisions for security.

Alerting

Maintaining compliance and improving performance require that data be available at the right level of detail to the individuals who need it. For example, regulations may require a utility to report exceedance within a certain time period. This requires pushing information to the individual(s) responsible for reporting. A more sophisticated approach is to notify plant operators of potential trouble so that preventive

action can be taken. This may be either an event or a series of events that are analyzed in order to produce an alert to the plant operator and compliance operators. Workflow in this case is not just managing documents and reports but also kicking off messaging to the mobile device(s) of the appropriate individual(s) to take action.

The Collaborative Workspace

A collaborative workspace provides the platform for employees to work together on the same data, using the same tools and, most importantly, sharing methodologies. A regional environmental coordinator needs to see that the compliance tasks are being accomplished on time, according to regulatory requirements. Each plant within the coordinator's jurisdiction can be monitored. When inconsistencies arise, that coordinator can work with local plant personnel and IT support to determine the source of the inconsistencies — the programming of a task, a malfunction of equipment, poor quality fuel — and make adjustments and/or mandatory reports to regulators where necessary.

Business and Operational Intelligence

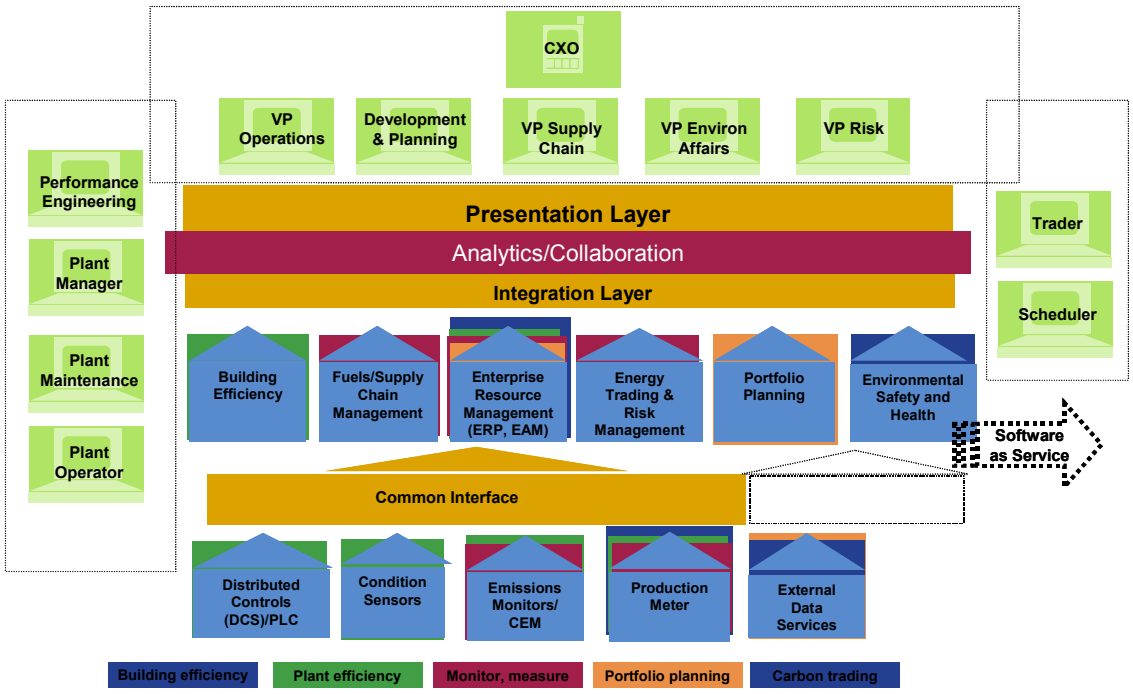
For management purposes and for corporate visibility, especially if bonus or incentive plans are tied to corporate objectives for emissions reduction and/or business performance, an enterprisewide view is required. This can be accomplished with access to data for analysis and/or integration of applications, along with the ability to present data to employees at all levels within the organization, keeping everyone on track to accomplish corporate goals.

As a start, role-based access provides employees with visibility into the information and metrics they need to perform their jobs. For example, a generation executive may want to look at a snapshot of the generation fleet for current production, revenue potential, and emissions profile, along with drill-down capabilities to individual plants to investigate trouble areas. At times, the executive may want to access a visual representation of emissions trending for the fleet over time — something that a business analyst can assemble with the right analytical tools.

Figure 9 displays an assembly of technology that supports reporting, alerting, collaboration, and business intelligence both internal and external to the enterprise. Traders, schedulers, power plant operators, plant engineers, plant maintenance personnel, performance engineers, compliance officers, and executives responsible for risk, operations, trading, and environmental compliance can be provided with access to information in context to make the appropriate and best decisions.

FIGURE 9

Assembly of Technology for Carbon Management



Source: Energy Insights, 2008

Moving into the future, companies will use more services from the outside through "cloud computing" to aid with complex issues such as climate change and compliance. Specialized services such as emissions monitoring and reporting from companies such as Enviance alleviate the need for companies such as AEP to use precious resources to manage the complexities of emissions and climate change regulations. But as AEP has realized, issues such as climate change have grown well beyond compliance reporting and monitoring. In order to comply with the standards developed by the Global Reporting Initiative, shareholders, or governments, companies will likely combine services from the "cloud" with internal information — either structured or unstructured — residing in many different places.

The task becomes even more complicated — and in some cases more global — as utilities become engaged with increasingly complex networks of partners and suppliers. As a result, there is an increased need for collaboration and communication across functional units, geographically dispersed operations, and their external networks.

Microsoft Offerings

Microsoft and its partners have offered familiar tools and technologies that serve to support corporate compliance and reporting through desktop productivity applications (Office), communications (Exchange and Office Communications Server), portals and dashboards (SharePoint, PerformancePoint) and integration technologies (BizTalk, .NET), built on widely used platforms (Windows, SQL):

- **Microsoft Office.** The 2007 release provides components such as document and records management, versioning control, workflow processes, and auditing capabilities. It is also a development platform that can be used to build collaboration, workflow, knowledge management, and business process automation.

  For information security, Microsoft provides rights management services and identity management software as part of Office 2007 to prevent sensitive information from being printed, forwarded, or copied by unauthorized people.

- **Microsoft SharePoint.** This technology serves as a portal to cloud computing services and unstructured compliance information. SharePoint has a new server technology called Excel Services with capabilities for loading, calculating, and displaying Excel workbooks on Office SharePoint Server for portals and dashboards.

- **Microsoft Office PerformancePoint.** This technology supports the development of dashboards that display business and operational intelligence for role-based access.

- **SQL Server.** This database and server platform has capabilities for reporting, analytics, and data extraction that can be supplied to the Microsoft Office System for end-user access via mobile devices, ultramobile PCs, and laptops.

CONCLUSION

Challenges/Opportunities

Utilities would be well advised to begin to review their existing information technology infrastructure and applications to determine whether they are sufficient to support carbon management in the context of rapid changes in regulations and business. Information technology is available to support a utility that wants to manage carbon. However, with AEP as a notable exception, most power generators have not moved forward to deploy information technology in service of carbon management.

The pieces are present. Most power generators already use continuous emissions monitoring to capture emissions defined in the Clean Air Act. The move toward enterprise application integration in early 2000 equipped utilities with the integration platforms and extract, transform, and load (ETL) technology required to make data available for reporting and analysis. Many companies are on the way to making information available through various presentation means and media. Finally, utilities have recently focused efforts on using business intelligence to improve corporate performance. In many ways, carbon management adds another layer of performance.

There are challenges to be faced, however. The next step is to enable operational intelligence. Providing operational data, information, and analysis to each employee according to need and job function will require utilities to put together their systems in new ways. In addition, the effort will require a corporatewide initiative focused on carbon management, along with reorienting employees to pay attention to and manage carbon emissions. That is no small task.