WRITTEN TESTIMONY OF NICHOLAS K. AKINS
PRESIDENT
AMERICAN ELECTRIC POWER
BEFORE THE SUBCOMMITTEE ON ENERGY AND ENVIRONMENT
OCTOBER 13, 2011

Chairman Harris, Ranking Member Miller, and distinguished members of the Subcommittee on Energy and Environment of the House Science, Space and Technology Committee, thank you for inviting me here today. I appreciate this opportunity to offer the views of American Electric Power (AEP) on advancing coal research and development for a secure energy future.

My name is Nick Akins, and I am the President of American Electric Power. Headquartered in Columbus, Ohio, we are one of the nation's largest electricity generators – with more than 38,000 megawatts (MW) of generating capacity – and serve more than five million retail consumers in 11 states in the Midwest and South Central regions of our nation. AEP's generating fleet employs diverse fuel sources – including coal, nuclear, hydroelectric, natural gas, oil, and wind power. But of particular importance for the Committee members here today, AEP is the largest consumer of coal in the United States and, as a result, our company is an industry leader in developing advanced coal-fueled electrical generation and emission reduction technologies, including carbon capture and storage (CCS) and ultra-supercritical pulverized coal (USCPC) technology.

I am here today to discuss AEP's experience with our CCS projects and the development of the USCPC technology through the construction of the J.W. Turk Plant. In addition, I will highlight the near term challenges to new technology development associated with the recently-announced EPA regulations.

AEP'S LEADERSHIP IN TECHNOLOGY DEVELOPMENT

AEP has a long and proud history as a leader in our industry for the development and deployment of new technologies. The first high- and extra-high voltage transmission lines at 345 kilovolt (kV) and 765 kV were developed by AEP and serve as

the framework for our interstate transmission system. AEP was among the first to develop large central station power plants and to deploy more efficient supercritical generating technologies. AEP recently celebrated its centennial by reflecting on its century of firsts.

Most recently, we have built upon this history of innovation by focusing our efforts on new clean coal technologies. These technologies will enable AEP and our industry to meet the challenge of reducing greenhouse gas emissions while optimizing the use of our nation's plentiful indigenous coal resources. As concepts for effective CCS from coal-fueled facilities are being talked about and debated around the globe, AEP has been on the cutting edge with an aggressive plan to commercialize advanced CCS technology. With the announcement of its successful completion in May of this year, AEP demonstrated the world's first integrated CO_2 capture and storage project at an existing coal-fired power plant. Based on Alstom's chilled ammonia process, a 20-MW-scale CCS product validation facility at our 1,300-megawatt Mountaineer Power Plant in New Haven, West Virginia permanently sequestered nearly 40,000 tonnes of CO_2 in deep saline reservoirs located 1.5 miles beneath the surface. Just as we were winding down that enormously successful demonstration, AEP and DOE were in the final stages of a commercial-scale engineering study of the same technologies. As a result, we now have a robust front-end engineering design for a CCS facility that includes extensive geologic characterization and a solid cost estimate.

In addition to CCS technology, construction currently is underway in southwest Arkansas on the 600-megawatt J.W. Turk Plant that will employ new ultra-supercritical coal-fired generating technology. Ultra-supercritical technology uses high steam pressure and temperature to increase operational efficiency. The Turk Plant represents a new generation of power plant design that uses less fuel to produce each megawatt hour of electricity. This means that all emissions, including sulfur dioxide (SO_2), nitrogen oxides (NO_X), mercury, and carbon dioxide (CO_2), will be lower than conventional coal-combustion processes per unit of electricity produced. Once operational, the Turk Plant will be the first commercial scale ultra-supercritical plant to operate in the United States.

AEP also has pursued the development of Integrated Gasification Combined Cycle (IGCC) technology. IGCC represents a major breakthrough in efforts to improve the environmental performance of coal-based electric power generation. IGCC technology integrates two proven processes - coal gasification and combined cycle power generation - to convert coal into electricity more efficiently and cleanly than any existing uncontrolled power plant. IGCC also has the potential to be equipped with carbon capture technology at a lower capital cost and with less of an energy penalty than traditional power plant designs, but only after the carbon capture technology has been proven at a commercial scale. We still strongly endorse the advancement of this technology in the future.

AEP'S EXPERIENCE WITH CCS AT MOUNTAINEER

As noted previously, AEP recently completed a CCS validation project at our Mountaineer Power Plant using Alstom's chilled ammonia process. This recently completed project treated approximately 20 MW, or 1.5 percent, of the total plant flue gas flow. The CCS validation project was privately funded by AEP and partners, started capturing CO_2 in September 2009, and initiated CO_2 injection in October 2009. The project was designed with the capability of capturing and storing approximately 100,000 metric tons of CO_2 annually. Captured CO_2 from the project was injected through two onsite wells into two geologic formations (Rose Run and Copper Ridge) located approximately 1.5 miles below the plant site. The project also included three deep wells for direct monitoring of geologic conditions and assessing the suitability of the geologic formations for future storage. Consistent with the Underground Injection Control (UIC) Class V Permit, AEP continues to monitor these wells. The project supplied data to support the design and engineering of the commercial-scale CCS demonstration at the Mountaineer facility and thereby has laid the technical groundwork to enable commercialization of complex technology. Without these demonstrations, there is no chance that CCS will become robust and commercially viable at a reasonable cost for end users of electric power.

The CO_2 capture system proposed for the Mountaineer commercial-scale demonstration project is similar to the Alstom chilled-ammonia system operated at the

initial validation project, but at approximately 12 times the scale. As with the initial validation project, the process uses an ammonia-based reagent to capture CO_2 and isolate it in a form suitable for geologic storage. The captured CO_2 stream is cooled and compressed to a supercritical (liquid-like) state for pipeline transport to the injection well sites. The process is designed to remove approximately 90 percent of the CO_2 from the 235 MW slipstream of flue gas.

Subsurface geological investigations of the Mountaineer site and surrounding sub-region were conducted during 2010-2011 and built on a large amount of work done at the site over the last eight years under two separate projects. First, from 2002 to 2007, the DOE and others provided funding for Battelle to conduct detailed geologic characterization under the Ohio Valley CO_2 Storage Project, which included a seismic survey and drilling of one well in 2003 followed by reservoir testing, modeling, and conceptual CO_2 injection simulations. Second, AEP hired Battelle in 2007 to construct the geologic sequestration systems for the 20 MW CCS validation project. This included completion of the original well and drilling of four new wells on the Plant site. Extensive evaluation of voluminous data from the projects along with the drilling of an additional characterization well some 2.5 miles south of the validation project site, indicate that the Copper Ridge Formation has significant reservoir storage potential. Additional injection potential has been identified in the Rose Run Sandstone and other zones.

While the success of the Mountaineer Plant validation project proved that CCS is viable at a coal-fired power plant and also demonstrated that CO_2 could be safely injected into deep saline reservoirs in that region, the commercial-scale demonstration has been put on hold. An agreement for DOE funding of the commercial-scale project was finalized in early 2010, allowing for a combination of DOE CCPI Round 3 and American Recovery and Reinvestment Act of 2009 funds to provide 50 percent of the cost of the project up to $334 million. AEP was responsible for securing the other 50 percent of the cost. This seemed very plausible at the time of the grant application due to the House's passage of the Waxman-Markey climate legislation and the Senate's serious consideration of similar legislation at that time. Both bills, as well as other legislative proposals, contemplated significant economic incentives to develop CCS

projects and a regulatory justification for approval by State Commissions. However, during the balance of 2010, as the U.S. economy remained sluggish and prospects for climate legislation dimmed, it became clear to AEP that cost recovery for the expense of a CCS project would not be approved by state regulatory agencies. Therefore, AEP was unable to move forward with the commercial demonstration and has placed the project on hold. The agreement with DOE was terminated following the completion of project Phase 1 and plans to complete the project are on hold.

Even though the Mountaineer commercial-scale project has been postponed, there is still enormous value in the efforts and investment by AEP and DOE. Prior to this project, much of what has been publically discussed and debated regarding performance and cost was based upon crude estimates and extrapolations from petro-chemical processes that, at best, bore no more than a simplistic resemblance to CCS on coal-fired power plants. Because of the work done through Phase 1 of the commercial-scale project, an engineering package has been developed specifically for a retrofit of post-combustion CO_2 capture installation on a coal-fired power plant. Detailed process understanding and performance knowledge was collected from the validation project and applied at full-scale. Optimization of process elements and individual pieces of equipment has yielded a state-of-the-art design. As a result, we now have a robust front-end engineering package that includes extensive geologic characterization and a solid cost estimate. While certain aspects of the information gained through years of technology development at Mountaineer belong to Alstom as intellectual property, a wealth of knowledge has been publically disclosed at conferences and other venues, with even more to come through relationships with DOE, the Global CCS Institute, and others. Hundreds of tours and literally thousands of visitors have come through Mountaineer Plant over the past several years. Clearly this work has been recognized and appreciated on a global scale.

AEP's work on CCS is a critically vital step, but only the beginning of a long path toward broad deployment of CCS technology. AEP's work has not yet produced a commercial scale demonstration of the technology for capturing and sequestering CO_2 at an affordable cost. AEP's work is merely the first of multiple steps in the maturation of a widely-deployable technology. Much like the power industry's experiences with

sulfur dioxide scrubbers in the 1970's, much optimization remains to be done. With real demonstrations, brilliant minds working together will identify improvements and process optimizations that will eventually simplify designs, drive down costs, reduce energy consumption, and make the technology more affordable. Now is not the time to ease up on CCS development and demonstration efforts. On the contrary, the industry, with government support, must continue to march together down the path of progress. The DOE program of technology development and commercial-scale demonstration is critical to making this happen. DOE's technology roadmap and planned demonstration projects are essential for commercial technology advancement.

AEP'S EXPERIENCE WITH ULTRA-SUPERCRITICAL PULVERIZED COAL TECHNOLOGY

The J.W. Turk Plant is a 600 megawatt (MW) net, ultra-supercritical unit designed to fire subbituminous coal. The Turk Plant cycle is classified as advanced coal generation technology primarily because of the use of an ultra-supercritical steam cycle. The ultra-supercritical cycle is a technology advancement of the supercritical steam cycle. The term "supercritical" steam cycle means that the water/steam pressure used in this technology is above critical pressure of water (3,208.2 psi). Water above the critical pressure does not boil, but makes a transition from the properties of liquid water directly to the properties of superheated steam. Superheated steam provides a higher efficiency heat transfer mechanism and serves to increase the overall efficiency of the steam cycle. While a supercritical plant cycle uses high pressure, it uses steam temperatures only as high as 1,050°F – 1,080°F. The Turk Plant's main steam temperature will be 1,110°F and its reheat steam temperature will be 1,125°F. These very high temperatures, coupled with operation at these high pressures, produce higher cycle efficiency, and thus the term "ultra-supercritical." In addition, Turk uses advanced equipment design features, such as axial flow air and gas fans, pulse jet fabric filters, spray dryer absorber (SDA) technology, and a steam turbine driven boiler feed pump to drive down auxiliary loads (power used by plant equipment) which also improve the overall efficiency of the generating unit.

AEP led the industry in the deployment of supercritical pulverized coal technology. The first commercial supercritical unit in the world was AEP's Philo Unit 6, built in 1957. Since then, AEP has constructed 20 supercritical units and is currently operating 18 supercritical units. These units range in size from 500 MW to 1,300 MW, with a total generating capacity of over 17,000 megawatts.

The advancement to ultra-supercritical has been made possible by recent ASME-approved, cost-effective high temperature chrome and nickel-based alloys in the steam generator, piping, and turbine systems. This development signals a degree of maturity which allows for minimal risk in deployment of this advance technology.

The use of high steam temperatures and pressures at the Turk Plant will result in a steam cycle that is one of the most efficient in the industry. In addition, the use of high efficiency equipment allows the Turk Plant to have one of the lowest heat rates in the world. Turk's full load higher heating value (HHV) net heat rate will be 8,992 Btu/kWh, which converts to an overall net efficiency of 38%, HHV. As reported by the DOE Energy Information Administration in January 2009, for 2007 the industry average full load net heat rate is 10,114 Btu/kWh, HHV, or an average efficiency of 33.7%, HHV. The high efficiency of the Turk Plant results in very low emissions per megawatt hour, in comparison with those generating units with average efficiency rates.

To give some perspective, the following is a comparison of Turk Plant's ultra-supercritical benefits when compared with a same-sized unit using conventional subcritical technology, based on an 85% capacity factor, per year basis:

- 180,000 tons less coal consumed (1,500 fewer coal train cars)
- 1,600 tons less lime consumed
- Reduction of 14,000 tons ash and FGD waste
- 360 million gallons less water consumed
- 320,000 tons less CO_2 emitted
- 150 tons less SO_2 emitted
- 100 tons less NOx emitted

Achieving higher efficiency performance is limited by the available materials to handle extreme temperatures and pressures, and is also limited by approved methods for welding the materials. Simply put, there are no available materials or approved

welding procedures in the U.S. that enable higher temperature steam cycles than those installed today at Turk Plant.

The Turk Plant received regulatory approval in Arkansas, Louisiana, and Texas in 2007-2008. Construction of the plant began after AEP Southwestern Electric Power Company (SWEPCO) received the Clean Air Act construction permit in 2008. Since that time, SWEPCO has encountered some challenges to the various permits and regulatory approvals.

Construction of the Turk Plant continues, with key milestones approaching that include the boiler hydro test, followed by the first combustion of coal to take place in late spring of next year. The first planned synchronization of the generator to the electric grid is planned for mid-2012.

AEP'S PERSPECTIVE ON THE RECENT EPA REGULATIONS

AEP strongly supports the Clean Air Act and continued reduction in emissions from our power plants. However, AEP believes that the current regulatory track being pursued by the Environmental Protection Agency (EPA) will have damaging impacts on the reliability of our nation's electric system, as well as broader negative employment and economic implications. Together, the federal Cross-State Air Pollution Rule (CSAPR) – formerly known as the Transport Rule, the Utility Maximum Achievable Control Technology Rule (Utility MACT), the Clean Air Visibility Rule, the Coal Combustion Residuals Rule (CCR) as well as the Cooling Water Intake Structures Rule under section 316(b) of The Clean Water Act (316(b) rule) will require very large utility capital investments on a timeline that can only be described as unrealistic. CSAPR and the Utility MACT alone, according to EPA's own estimates, will impose massive costs within the next 3 to 4 years, the vast majority of which will be borne by coal-fired generators and their customers.

This follows two decades during which generators within these same areas have invested billions of dollars to achieve reductions of over 70 percent in emissions of both SO_2 and NOx. Electricity rates in states where these investments have been made have already risen. For most coal-reliant states, the CSAPR will require additional substantial emission reductions starting in January of 2012. In several of these states,

these represent reductions of more than 30 percent below actual emissions in 2010. Further even more substantial reductions are required in 2014, with Ohio, Pennsylvania, Indiana, Kentucky and Virginia required to make 60-76 percent reductions below 2010 actual levels. This is also the same year EPA proposes to make the Utility MACT effective for sources nationwide. There is simply not enough time to get regulatory approvals, design, permit, and construct scrubbers, SCRs or other major pollution control investments to achieve those levels of reductions. As a result, they will force a large number of premature power plant retirements where investments are uneconomical given the remaining useful life of the plants. Where such investments are the most cost-effective compliance option, plants may have to be idled or significantly curtail production for two or more years in order to complete installation of the necessary controls. These power plant operational outcomes raise significant policy, economic, and energy issues that Congress should carefully examine.

AEP has achieved very substantial SO_2 and NOx reductions over the past two decades. Our efforts began with a series of cost-effective measures to cut SO_2 and NOx emissions in the 1990's under the Acid Rain program, including installing SO_2 scrubbers and NOx combustion controls, as well as blending lower sulfur coals into the fuel mix at plants that could accommodate such coals. The past decade has seen a continuation of AEP's program to transform our fleet of coal-fired generating units. This transformation included the installation of state-of-the-art control technologies at many of our generating stations in order to meet the steep NOx reduction requirements of the NOx SIP Call in the early part of the decade. It has continued with a third wave of emissions controls being installed to achieve additional NOx and SO_2 reductions required under the Clean Air Interstate Rule (CAIR), which CSAPR would replace. As a result of these efforts, over the last 20 years, our annual SO_2 emissions have declined by ~1.1 million tons (a 73 percent reduction) and our annual NOx emissions have been reduced by ~450 thousand tons (an 80 percent reduction).

Over that same period, AEP has invested more than $7 billion in emissions control equipment on our coal units to reduce SO_2 and NOx emissions and to comply with the NOx SIP Call and CAIR programs. AEP has spent several additional billions of dollars on low sulfur fuel, chemical reagents, and other pollution control operations and

maintenance costs. Most of these investments and the emission reductions have occurred in the Eastern portion of the AEP system. About 80 percent of AEP coal-fired capacity is located in AEP's Eastern footprint, which includes coal-fired plants in Virginia, West Virginia, Ohio, Kentucky, and Indiana. Annual SO_2 and NOx emissions have been reduced at AEP plants in these states by 64 percent and 84 percent, respectively, in the last decade alone. About two-thirds of the AEP Eastern coal-fired fleet is now equipped with the most advanced SO_2 controls – Flue Gas Desulfurization (FGD) which reduces SO_2 emissions by about 95 percent. Similarly, about three-quarters of the AEP Eastern coal-fired fleet is equipped with the most advanced NOx controls – Selective Catalytic Reduction (SCR) which reduces NOx emissions by about 90 percent. Two projects were completed in the last 18 months at our Amos Plant, and we are preparing to submit applications for regulatory approvals to install additional controls in Indiana. All of these efforts have also been consistent with an agreement we signed in 2007 with EPA and other plaintiffs to settle an enforcement action under the New Source Review Provisions of the Clean Air Act. But EPA's new rules impose more obligations, sooner than required under that Consent Decree.

We expect this transformation of our coal fleet to continue in the coming decade. Two of our newer coal plants in our Western states were originally constructed with FGD controls, and we expect to reduce SO_2 and NOx emissions further at units that are regulated under the Clean Air Visibility Rule in Arkansas and Oklahoma. CSAPR will impose additional obligations on our units in Texas, Arkansas, Oklahoma and Louisiana as well.

The EPA Rules Threaten Electric Grid Reliability, Create Higher Unemployment, and Result in Much Higher Electricity Rates for States Reliant on Coal Fired Generation.

Although AEP is committed to working with EPA in the development of future control requirements under its proposed Utility MACT, CCR and 316(b) rules, the final Clean Air Visibility Rule, and the final Cross-State Air Pollution Rule, we nonetheless have major concerns with these new EPA rules, including the following:

1. **Infeasible Compliance Deadlines.** EPA is simply not providing sufficient time to design, permit, and install major emissions control technologies on large amounts of existing coal-fired capacity that are necessary to comply with EPA's Cross-State Air Pollution Rule (beginning in 2012, with more stringent limits in 2014), the proposed Utility MACT Rule (by the end of 2014 or by end of 2015) and the proposed Federal Visibility Rule in Oklahoma (end of 2014).
2. **Multiple Major Regulatory Programs Resulting in Unprecedented Capital Expenditures, Mostly Before 2015.** There would be two to three times as much capital spent in the U.S. to comply with these new EPA rules by 2020, compared with the amounts that were spent cumulatively on all utility air pollution controls during the previous 20 years.
3. **Abrupt and Significant Power Plant Retirements due to the Combination of the High Costs of Compliance and the Infeasible Deadlines.** Recent studies have suggested that between 50 and 110 gigawatts of coal-fired capacity will be forced to prematurely retire due to proposed EPA rules, impacting the reliability of the grid, jobs, taxes, and utility rates. The un-depreciated balances associated with these retirements will place greater pressures on utility rates.
4. **Unanticipated Electric Grid Reliability Problems Particularly during 2014-2016.** Because many generating units provide system security and reliability to the grid (e.g., black start, voltage support, etc.), this impact will be exacerbated by the large number of premature retirements; substantial idled capacity arising from insufficient time to design, permit, and install major emissions controls; and the necessarily wide-scale unit outages required to "tie-in" these major new emission controls. The greatest capacity reductions will occur in the PJM (i.e., Pennsylvania New Jersey Maryland Interconnection) region, a very large power pool which serves the Mid-Atlantic states (NJ, PA, DE, MD), plus several states just to the west (including WV, OH, IN, MI and parts of IL) as well as in the SERC (i.e., Southeast Reliability Coordinating Council) region, which includes

most of the Southeastern U.S., with additional localized reliability issues in these regions and ERCOT and SPP (the Electric Reliability Council of Texas and Southwest Power Pool, respectively).

5. **Very High Electricity Rate Increases Due to High Capital Costs of Compliance and New Replacement Capacity.** These rate increases will hit electricity-intensive manufacturing in the Appalachian Region as well as other parts of the Midwest and Southeast particularly hard, leading to industrial plant shutdowns and substantial job losses. They will also be disproportionately borne by consumers in some of the poorest rural counties in these same states where there are many customers who are unemployed or on fixed incomes.

There is Not Enough Time to Comply with EPA's New Rules for Controlling SO_2, NOx, and HAP Emissions from Power Plants.

EPA's Cross-State Air Pollution Rule and Utility MACT Rule will require installation of a large amount of SO_2 scrubbers and other capital intensive air emission controls. In particular, under the Cross-State Air Pollution Rule, the SO_2 caps become significantly more stringent in 2014 for more than two-thirds of the States covered under the SO_2 portion of the rule.[1] These States are those most reliant on coal and they will bear the major portion of the compliance burden for limiting SO_2 emissions. The SO_2 budget limits in Eastern states, specifically states in the Appalachian Region, are equivalent to an average emission rate of approximately 0.20 to 0.30 lbs SO_2 per million Btu. Such very low emission rates can only be achieved at power plants burning Eastern bituminous coals by adding scrubbers. As such, these limits would require most all of AEP's coal-fired power plant units in these states to either install FGD, switch to natural gas or significantly curtail operations in order to comply.

In addition to the massive SO_2 emission reductions required in 2014, the emission reductions slated for 2012 are very significant as well. These new emission requirements will be enforced less than 3 months from now, with little advanced notice,

[1] Specifically, 16 states, out of the 23 states covered under the Cross-State Air Pollution Control Rule program for SO_2, would be subject to more stringent SO_2 reduction requirements starting in 2014.

as the final requirements of the Cross-State Air Pollution Rule are significantly more stringent than those of the proposed Transport Rule. EPA's proposed revisions just announced last week do not result in appreciable changes in allowance allocations. For example, Ohio, Pennsylvania and Indiana are required respectively to make 46 percent, 33 percent and 31 percent reductions in SO_2 emissions from 2010 levels by next year. Other states outside of the Appalachian and Midwest Regions are also hit hard with stringent SO_2 reduction requirements. For example, Texas, even after EPA's proposed revisions to the budgets, is still required to reduce 2012 SO_2 emissions by 21 percent, as compared to actual 2010 levels.

These "new" reduction requirements in just three months (first known with the issuance of the final rule just two months ago) are particularly problematic because utilities are largely unable to make modifications to existing power plants in this time frame to substantially reduce emissions. Also, as most utilities procure most of their coal on a contractual basis well in advance, a major switch to lower sulfur coals is often not a realistic option. As a result, coal-fired power plants will likely have to be significantly curtailed. Replacement electricity is likely to come in the form of more expensive gas-fired generation. Additionally, the replacement capacity might not be located in areas critical to transmission reliability, or able to provide voltage support or black start capability, creating further risks to reliability and increasing the costs of maintaining the electric grid.

In addition to the Cross-State Air Pollution Rule, the proposed Utility MACT Rule requires compliance on a plant by plant basis with three separate emission limits (1) a very low mercury limit, (2) a PM limit (as a surrogate for non-mercury metals), and (3) a hydrogen chloride limit (as a surrogate for acid gases, or an optional stringent SO_2 limit as a surrogate at certain units). These limits will have to be met by the end of 2014 with a possible one-year extension allowed to the end of 2015. Based on a thorough review of these limits (when combined with the requirements of CSAPR), we believe AEP will be required to retrofit SO_2 scrubbers on most of the remaining Eastern fleet, and at a minimum, install a combination of baghouses, carbon injection and DSI (dry sorbent injection) at our plants in Texas, Arkansas and Oklahoma. For our Western fleet, some

of these same units are affected by EPA's Clean Air Visibility Rule (CAVR), and thus could be required to retrofit scrubbers on the same or a slightly longer schedule.

Compliance with the final Cross-State Air Pollution Rule and proposed Utility MACT Rule, plus the existing Clean Air Visibility Rule, will effectively require AEP to install scrubbers at almost all of its unscrubbed units or retire the plants altogether, and to do so for virtually all of these plants by the end of 2014 (or perhaps the end of 2015 if a one year extension is granted). This allows between 2 ½ and 3 ½ years for compliance with at most 4 ½ years in a few cases. This time frame is completely infeasible to get regulatory approvals, design, permit, fabricate, and install a retrofit scrubber as shown in Figure 1 below:

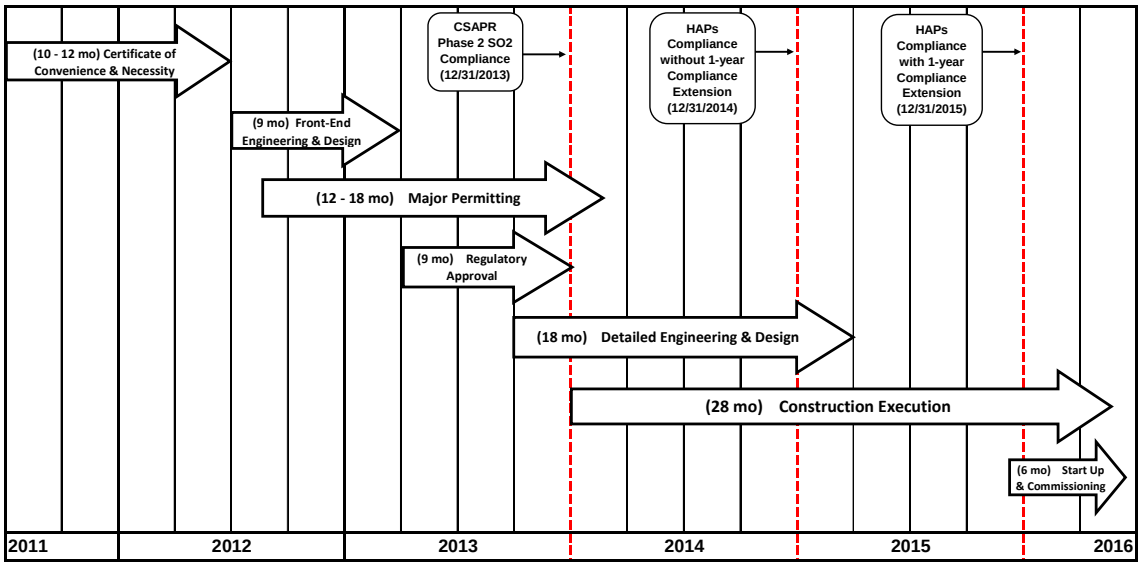

Figure 1

Figure 1 shows that the average time needed from project commencement to completion for a retrofit scrubber is five years for a regulated electric utility. (The time frame is similar if a unit is retired and replaced on site with a new combined cycle gas plant). This figure is based on the actual average time period needed during 2003-10 when AEP added scrubbers at 7,800 MW of capacity or -- more installations than anyone else in the industry. Given that the EPA rules will require a greater number of retrofit projects and/or plant replacements and other related environmental investments across our industry within the same three to five year window, compliance with the

Utility MACT Rule and Cross-State Air Pollution Rule is simply infeasible within this very short compliance period.

High Costs and Infeasible Deadlines Will Lead to Substantial Coal Plant Retirements and Significantly Compromise Electric Grid Reliability.

Due to the high costs of compliance and infeasible time deadlines, a large amount of coal unit retirements at AEP and across the industry is expected in the 2014-15 time period. In addition, a large number of units that are complying by retrofitting will have to be taken out of service, mothballed, or significantly curtailed during the 2014-16 time period as well.

AEP estimates that in its own coal fleet ~6 GW of its coal fired capacity (or about 25 percent of the company's coal-fired generating capacity) would retire by the 2014-15 time period under the EPA rules. We recognize that certain of our units are also subject to the requirements of our New Source Consent Decree, but only 615 MW is required to comply with those requirements before 2015. Other major coal-fired utilities such as Southern Company and DTE Energy Company have estimated that a similar 20 to 30 percent of their coal-fired capacity would retire in the period before 2015. AEP also estimates that 1.5 – 5 GW of coal-fired capacity would be temporarily out of service or severely curtailed during 2014-16 as retrofit pollution controls are being completed.

There is A Better Way

The combination of EPA's new rules for power plants will result in a series of relatively inflexible and stringent air pollution and other environmental regulations with infeasible timelines and unnecessarily high compliance costs. In addition to high costs borne by our electricity customers, these new rules could also result in many premature plant retirements and over 1 million net jobs lost in the U.S[2].

We believe that a more reasonable approach to energy and environmental policy is needed. AEP has been working on these issues with the International Brotherhood of Electrical Workers (IBEW); the United Mine Workers of America (UMWA); and the

[2] NERA (2011). A loss of one job-year is equivalent to a loss of one job for a period of one year. Job-years are commonly used by economists, CBO, OMB and others in reporting employment statistics.

International Brotherhood of Boilermakers, Iron Ship Builders, Blacksmiths, Forgers, and Helpers.

A comprehensive analysis of the economic impacts of the proposed regulations as well as the feasibility and timing of their implementation is needed. While we continue to support sound policy aimed at improving air quality and public health, numerous economic studies and modeling analyses have demonstrated that the implementation of these major EPA requirements occurring in the same narrow time period will have major adverse economic repercussions. More time for phasing in the new control requirements is required to smooth the impacts associated with power plant closures and electricity rate increases, as well as to allow for the construction and installation of major environmental retrofit controls. Longer time frames also would enable better planning, ensure electricity grid reliability and avoid many premature plant shutdowns or excessively high costs for pollution controls due to supply constraints.

Given the multi-dimensional nature of major environmental policy initiatives and the immediacy of the compliance deadlines, we believe that Congress must intervene and assure that a sensible multi-pollutant environmental program is developed on a rational schedule and that this schedule is coordinated with the other new EPA rules. We believe that a legislative approach can continue to promote the air quality and public health goals set forth in EPA's regulatory initiatives while ensuring that adequate emphasis is focused on the employment, economic and reliability impacts of the program.

The challenge of EPA's current regulatory approach is not a technology issue requiring the Department of Energy to venture down the path of R&D or major demonstrations. On the contrary, there is simply no time to develop new technologies, demonstrate their viability, and engineer these systems. We believe the technologies exist today to enable AEP and the larger US fleet to comply with increasingly stringent environmental requirements while maintaining a robust and reliable electric power infrastructure. However, timing is the limiting factor in enabling a viable path toward compliance. The role we see for DOE, and it is a vital role indeed, would be to become engaged in a thorough analysis of EPA rules impacts and deployment timelines. In short, DOE should serve as a trusted advisor to the EPA in the rulemaking process.

DOE has expertise in all the areas of power generation and electricity transmission and distribution. They have the well-informed authority to evaluate the electric power generation system and grid stability/security risks and can make a non-biased assessment of the timelines needed to deploy technology at the broad scale required under EPA's program. It is AEP's preference that DOE be engaged in this process.

CONCLUSION

In summary, American Electric Power has an established history as an industry leader in technology development and deployment. We were the first in high voltage transmission of electricity and have blazed trails in the development of smart grid technologies. Supercritical steam generation was first put into utility power production by AEP more than a half-century ago, and many of our units operating today represent new benchmarks in performance and efficiency at the time they were commissioned. We carry forward that proud tradition even today with deployment of the nation's first ultra-supercritical unit, which will come on line less than one year from now. We embrace technology as the means to produce and deliver clean and affordable electricity to our customers. We share much of our knowledge with the industry because we believe everybody benefits when technology is allowed to flourish. This philosophy of living on the cutting edge of technology advancement has its risks and uncertainties, as is most evidenced with our extensive work on CCS. While many were hoping and waiting for others to deliver a solution to CO_2 emissions, AEP boldly pursued the path of developing and demonstrating CCS technology. Our shareholders have shown the vision to support this approach by shouldering the burden of extraordinarily-expensive demonstration projects when other means have not been available.

We believe DOE should be bolstered in their efforts to develop viable and affordable technology solutions. While legislative activity on CCS has diminished and some key government-funded demonstration projects, like AEP's, have been cancelled or are currently at risk of being cancelled, now is not the time to divert DOE's attention from further advancement of CCS technology. Robust and affordable choices for CCS will in fact NOT be available in the market for installation on coal-fired power plants if

the technology is not demonstrated in the meantime. AEP is ready and eager to reenter the demonstration phase of our CCS program at such a time when adequate funding of demonstrations enables successful completion of projects.

In this same spirit of ingenuity, AEP urges the new EPA rules be structured in a way to allow for cost-effective implementation on a reasonable schedule so as to minimize the impacts on our residential customers, local businesses, and the reliability of the electricity grid. It is also critical that the emissions reduction levels of the program be set at levels that are technically feasible to achieve over the given time frame and are in fact necessary to fulfill the air quality goals and requirements of the Clean Air Act. As a nation, we must ensure our future energy security and reliability by using domestic resources such as coal, while continuing to advance technology.

AEP would like to thank the Committee for the opportunity to present our views on the issues of advanced coal research and a secure energy future.