SUMMARY OF TESTIMONY OF MARK MCCULLOUGH ON BEHALF OF AMERICAN ELECTRIC POWER

AEP has a long history of proactive involvement in environmental stewardship, particularly with regard to reducing its net carbon emissions. Past experiences include reforestation programs, participation in a greenhouse gas credit trading program and advances in generation technology efficiency, which include many first-in-the-world accomplishments.

Perhaps AEP's most significant contribution to technology solutions for addressing greenhouse gas emissions was the successful completion of a validation-scale demonstration of the world's first fully integrated carbon capture and sequestration (CCS) project at an existing coal-fired electric generating unit. The Mountaineer CCS Project treated a 20-MW portion of flue gas from our 1300-MW Mountaineer Plant, removed the CO_2 and compressed and injected it into two deep underground formations from 2009 to 2011, permanently storing nearly 40,000 tons of CO_2.

AEP has long maintained that the Clean Air Act is not a practical or cost-effective vehicle to limit greenhouse gas emissions and any system to regulate greenhouse gas emissions should be developed by Congress. Global climate change and greenhouse gas emissions present a new set of issues that the existing framework of the Clean Air Act was never intended to address. As such, regulation of greenhouse gases under the existing Clean Air Act authorities is likely to be ill-designed, inflexible, and significantly more costly than a more flexible legislative approach.

The proposed New Source Performance Standard (NSPS) for limiting CO_2 from power plants is a fuel-discriminatory rule that in effect requires nascent, not yet commercially-available CCS technologies to be used on all new coal plants. As such, the NSPS is impractical and not legally justifiable. AEP provided detailed comments to EPA on its concerns with the proposed NSPS and requested that EPA withdraw the rule to address those concerns. AEP's main concerns are the combination of two source categories, coal and natural gas, and setting a single standard based on EPA's estimate of the emission rate achievable at a new natural gas combined cycle unit. This standard will preclude the construction of new coal-fired generation without the addition of CCS. However, based on AEP's experience and EPA's own admission, this technology is neither commercially demonstrated nor economically viable for coal-fired electric generation. Without a viable CCS solution, the NSPS forces reliance on a very volatile commodity, natural gas, for new fossil generation which could burden consumers with additional and unnecessary future energy costs over the long-term.

AEP believes that technological solutions such as CCS are critical to reducing CO_2 emissions. Even with a successful demonstration project, AEP is convinced that CCS is many years from being a commercially viable solution to reducing CO_2 emissions. CCS technology has not yet been proved at a commercial scale on a representative application and cannot be provided with robust guarantees on performance and reliability. Furthermore, the path to CCS commercialization is also filled with significant regulatory and legal barriers regarding ownership of storage space and long-term liability, which will also need to be resolved prior to commercialization.

Given the obvious need for commercially-available and cost-effective CCS in order to meet the EPA proposed NSPS for coal plants, H.R. 6172 introduced by Representative McKinley provides much needed congressional direction in finalizing the NSPS for power plants and ensures a balanced energy portfolio in which coal is in the mix as a fuel for the future. This bill provides for greater fuel and energy diversity, helps promote the commercial development of CCS technology, and lowers the costs of reducing CO_2 emissions.

WRITTEN TESTIMONY OF MARK MCCULLOUGH

EXECUTIVE VICE PRESIDENT

AMERICAN ELECTRIC POWER

BEFORE THE U.S. HOUSE OF REPRESENTATIVES

ENERGY AND COMMERCE COMMITTEE

SUBCOMMITTEE ON ENERGY AND POWER

September 14, 2011

Chairman Whitfield, Ranking Minority Member Rush and distinguished members of the Committee on Energy and Commerce, thank you for inviting me here today. I appreciate this opportunity to offer the views of American Electric Power (AEP) on EPA's Proposed Greenhouse Gas (GHG) New Source Performance Standard (NSPS) for Fossil-Fueled Electric Generating Units (EGUs) and the current state of Carbon Capture and Storage (CCS) Technology. My name is Mark McCullough, and I am the Executive Vice President of Generation at AEP. Headquartered in Columbus, Ohio, AEP is one of the nation's largest generators – with more than 37,000 megawatts (MW) of generating capacity – and serves 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. Due to the location of our service area and the historic importance of coal to the economies of our states, approximately two-thirds of our generating capacity uses coal to generate electricity.

AEP History in Environmental Stewardship and New Technologies

AEP has a long history of proactive involvement in environmental stewardship, particularly with regard to reducing its net carbon emissions. Beginning as early as the 1940's, AEP has been involved in re-forestation

programs, including specific efforts at portions of its large land holdings to return acreage that had been devoted to agricultural and mining activities to potential carbon sinks. These efforts were expanded in 2003 when AEP became a founding member of the Chicago Climate Exchange (CCX), the first voluntary GHG credit trading system in the United States. AEP established and met goals to reduce or offset significantly its annual system-wide GHG emissions, including its goal of achieving a 6% reduction of its annual emissions in 2010 (compared to emission levels during 1998-2001). We have voluntarily established a further goal of reducing or offsetting our GHG emissions by 10% (compared to 2010 levels) by 2020.

AEP's leadership and innovation in our core generation, transmission and distribution services have led to improvements in the efficiency of the delivery of our product. We accomplished these improvements through continual advances in generation technology efficiency, lowering transmission line losses, energy audits, support of improvements in the efficiency of end-use appliances and fixtures, and improved delivery of real-time pricing and usage information of the electric grid.

For over a century, AEP has been a pioneer in the development of advanced coal-fueled generation technologies, which include many first-in-the-world accomplishments that have set the standard for combustion efficiencies, emissions control, and system performance. A few examples include the first reheat generating coal unit (1924); the first heat rate (a measure of efficiency) below 10,000 Btu/kWh at a coal plant (1950); the first natural-draft, hyperbolic cooling tower in the Western Hemisphere (1963); and the first combined-cycle operation of a pressurized, fluidized bed combustion plant in the United States (1990).

While the AEP generation portfolio has shifted over the last decade to include more natural gas-fired generation, we will also, this year, complete construction of the country's first ultra-supercritical coal-fired generating unit, the John W. Turk, Jr. Power Plant in Hempstead County, Arkansas. The Turk Plant has thermal efficiency comparable to the current generation of integrated gasification combined cycle (IGCC) units, and is better suited to low-sulfur western coals than IGCC technology.

Perhaps AEP's most significant contribution to technology solutions for addressing GHG emissions was the successful completion of a validation-scale demonstration of the world's first fully integrated carbon capture and storage project at an existing coal-fired electric generating unit. The Mountaineer CCS Project treated a 20-MW portion of flue gas from our 1300-MW Mountaineer Plant, removed the carbon dioxide (CO_2), and compressed and injected the CO_2 into two deep underground formations more than 7,000 feet below the surface of the plant property. The project successfully operated from 2009 to 2011, and permanently stored nearly 40,000 tons of CO_2 in deep saline reservoirs, with continuing post-closure monitoring. A second phase of that project, which would have advanced the technology to a 235-MW commercial scale, was deferred due to the rejection by our state regulators of our request for cost recovery of the demonstration project costs in customer rates.

EPA REGULATION OF GHG IS THE WRONG APPROACH

Notwithstanding our lengthy history of environmental conservation and support for federal GHG reduction efforts, AEP has long maintained that the Clean Air Act (CAA or Act) is not a practical or cost-effective vehicle to limit GHG emissions and any system to regulate GHG emissions should be developed by Congress. To this end, we have supported over the past decade ambitious federal legislation to reduce GHG emissions on an economy-wide basis through flexible market-based mechanisms. Although not enacted into law, these bills

would have established a declining economy-wide cap on GHG emissions and achieved substantial GHG emissions reductions in an efficient and cost-effective manner through an emissions trading system.

In the absence of federal legislation to reduce GHG emissions, and in response to the 2007 Supreme Court decision of *Massachusetts v. EPA*, the EPA has begun to regulate GHG emissions using its existing CAA authorities. The EPA has already established a rule requiring new and modified major stationary sources to obtain pre-construction permits for their GHG emissions under the New Source Review (NSR) provisions of the Act.[1] In April 2012, EPA proposed a New Source Performance Standard (NSPS) for CO_2 emissions from new EGUs under Section 111 of the CAA.

Both of these existing regulatory programs are based on a framework that was never intended to apply to GHG emissions from stationary sources. Both programs impose source-specific emissions control requirements that lack the kind of flexibility that would encourage widespread, cost-effective implementation of a broad suite of emission reduction techniques and technologies. When the CAA was developed over 40 years ago, its primary focus was on reducing emissions of certain air pollutants with recognized, localized health effects. A major part of the Act established ambient air quality standards for criteria pollutants such as NO_x, ozone, SO_2, PM, and lead. These standards were implemented through facility-by-facility emission limits that ensured that health-based standards were met on an airshed-by-airshed, state-by-state basis. In 1990, Congress added specific provisions to address new science that suggested that SO_2 and NO_x emissions also presented other broader regional or interstate concerns that could not be adequately or cost-effectively addressed

[1] The NSR permit requirements include a rigorous technology review requirement to ensure the installation of state-of-the-art air pollution control equipment and extensive public notice and comment procedures.

without giving regulators new tools under the existing CAA. Congress provided that tool with the SO_2 allowance program in Title IV of the 1990 Clean Air Act Amendments.

However, concerns regarding the relationship of global climate change and GHG emissions present a totally different set of issues (*e.g.*, both national and global emissions and ultimately global GHG concentrations are relevant) that the existing framework of the CAA was never intended to address. As such, regulation of GHGs under the existing CAA authorities is likely to be ill-designed, inflexible, and significantly more costly than a more flexible approach, while doing little to address the global issue of climate change. Therefore, if this nation wants to move forward with effective GHG regulatory programs, congressional action is necessary to provide the tools required to ensure flexible, cost-effective regulation of GHG emissions on an economy-wide basis.

AEP does not support EPA's proposed CO_2 NSPS for EGUs and has submitted extensive comments to the Agency about its concerns with the EPA proposal. EPA itself acknowledges that its proposal will not alter current plans for new generating facilities by noting that the proposal merely reinforces what the market currently dictates and what EPA assumes will continue to dictate in the future – that in an era of record-setting low natural gas prices and abundant reserves, the logical fuel of choice is natural gas. But the proposal treats **current** market conditions as if they are reliable constants **in the future**. History tells us a very different story. History tells us that fuel diversity is a critical component of stable energy costs, and that relying on a single fuel creates significant vulnerability to major fluctuations in market prices.

Furthermore, we believe that EPA's proposed rule is unlawful, is based on faulty information, and would hinder the very efforts to develop clean coal

technology that Congress, EPA, and AEP have worked so long and so hard to further. AEP is particularly concerned that the proposed rule will likely impede the development of CCS technology and hinder the progress that will be needed for coal to continue to play a vital role in America's energy policy. A summary of the current state of CCS technology is included later in this testimony, which supports EPA's own conclusion that CCS is neither commercially demonstrated nor economically viable for coal-fueled EGUs. Notably, this is the same conclusion that numerous other public and private efforts have reached, including President Obama's Interagency Task Force on CCS, the Secretary of Energy's National Coal Council, and the Department of Energy's research and development programs.

THE PROPOSED NSPS HAS CONSIDERABLE FLAWS

The specifics of EPA's recently proposed NSPS standards for new EGUs further supports our concerns that the CAA is not the proper vehicle to address GHG emissions. The proposed regulations do not represent a balanced or cost-effective solution. For example, EPA has taken the extraordinary step of combining two separate well-established NSPS source categories that set different standards for different fuels for all other types of emissions, and proposed a single NSPS limit for CO_2 emissions that applies to **all** new fossil-fueled EGUs from those two categories.[2] The proposal requires that both new coal-fueled and natural gas-fueled EGUs meet a CO_2 emissions limit of 1,000 pounds per megawatt-hour (lb/MWh). AEP believes that the proposed regulations are both arbitrary and unlawful because they fail to establish standards that can be achieved regardless of the fuel used (a so-called "fuel neutral" standard). Instead, for the first time, EPA has proposed to set one, **uniform**, performance standard for **all** sources within the combined EGU source category that is potentially achievable only by units burning fuels with the lowest

[2] The proposed rule combines the NSPS source categories of Subpart Da (for fossil-fuel fired electric steam generating units) and Subpart KKKK (for stationary combustion turbines) into a common source category for GHG emissions (Subpart TTTT).

inherent emissions (*i.e.*, natural gas).[3]

Under the proposed regulations**, all** new baseload and intermediate demand fossil-fueled EGUs would have to achieve an emission rate equivalent to EPA's estimate of the emission rate achievable at a new natural gas combined cycle unit. However, due to different fuel characteristics, plant designs, and operational considerations between coal and natural gas power plants, a coal-fueled power plant cannot meet a CO_2 emission rate equivalent to natural gas without some form of emissions control. This proposed regulation is instead fuel discriminatory in that it prevents the construction of **any** new coal-fueled units without CCS. However, at this time, CCS is not commercially available or economically viable for the reasons described later.

EPA justifies its proposal to adopt a fuel discriminatory standard by stating that the proposed NSPS would not impose any additional costs on the economy because under current economic conditions, no new coal-fueled units will be built. While AEP agrees that **current** market conditions generally do not support development of new coal-fueled units, this result is driven primarily by current low prices of a very volatile commodity, natural gas. Natural gas prices have fluctuated over the past decade between $2 and $13 per MMBtu on a monthly average basis. Average prices over most of the last decade have been above $6 per MMBtu. In light of the significant historical fluctuation of natural gas prices, it is reasonable to plan for some continued variation in natural gas prices over the long-term even though shale gas reserves appear to be plentiful at this time. If,

[3] In past NSPS rulemakings for power plants, EPA has used one of the following two methodologies. The first is to set different performance standards based on lowest emission rate achievable through application of "best demonstrated technology" for each specific type of fuel burned (*i.e.*, coal, oil, natural gas). The second is to set a single performance standard for all fuels based on the emissions control levels achievable through application of the "best demonstrated technology" at *all* power plants, regardless of the fuels used. Under the latter approach, EPA has set the single performance standard based on the lowest emissions rate achievable by EGUs using coal. However, as noted above, EPA has never adopted a single NSPS for all fossil-fueled power plants based on an emissions rate achievable only by the fuel with the lowest inherent emissions (*i.e.*, natural gas).

for example, natural gas prices were to increase modestly to levels seen only a few years ago, electric generating companies could opt to build new coal units based on economics, absent the proposed CO_2 NSPS requirements. However, with EPA's proposal to adopt a NSPS based on the performance of natural gas combined cycle units, electric generating companies are unable to build coal-fueled units without assuming unreasonable risks, and therefore generally have no choice but to build gas units instead.

AEP believes that it is not prudent for EPA, or any other agency, to adopt federal policies that foreclose the use of coal in the future development of baseload generation. Locking exclusively into new natural gas baseload generation over the long term could increase our reliance on natural gas for power generation to the detriment of the economy. Rather, maintaining fuel diversity through a balanced portfolio of energy resources that includes coal has been a successful strategy in providing abundant, reliable, low-cost electricity to power the nation's economic growth and high standard of living. The continued reliance on a diverse portfolio of fuels is clearly the wisest course of action to safeguard against the risk of market price fluctuations of natural gas or any our energy resource over the long-term.

By contrast, foreclosing the option to use of coal over the long-term could burden U.S. consumers with additional and unnecessary costs as U.S. energy providers replace retiring older generation sources and try to keep up with rising demand over the coming years. Further, as EGUs begin to rely more heavily on natural gas for electric generation, we run the risk that the energy prices will become increasingly volatile over the long term, with implications for the entire economy.

IMPORTANCE OF FUEL DIVERSITY

Fuel diversity is a concept that cannot be overstated when considering economic and energy security. Too great a reliance upon any one energy source creates a significant risk exposure to electricity price escalation and supply disruptions. As has been proven repeatedly across the globe, such exposure can lead to severe impacts on residential, commercial, and industrial customers.

For example, the recent catastrophe in Japan serves as a sobering reminder of what can happen if a single energy source is abruptly removed from use. In 2011, an earthquake and tsunami devastated shoreline communities and seriously damaged the Fukushima Daiichi nuclear power plant. Resultant radiation leaks and a greatly eroded public faith in safety of nuclear power have led to the shutting down of all of Japan's 54 nuclear reactors for mandatory maintenance and safety checks. Heavily populated areas of the country have faced the realities of rolling blackouts, while manufacturing facilities are reducing output, with some making moves to relocate abroad. Meanwhile, natural gas prices in Japan have nearly tripled as power producers have scrambled to fill the massive void left in their energy infrastructure.

Domestic energy disruptions and their consequences are clearly evident by such disasters as Hurricane Katrina in 2005, where nine oil refineries were shut down for an extended period of time and 30 oil platforms were either damaged or completely destroyed, dramatically hampering oil and gas production. United States natural gas prices spiked following the disaster and for months afterward remained more than double the price over the previous year.

There is another unique feature to coal that must be considered from an energy security perspective. Coal is a solid and physically stable energy

resource that can be safely stockpiled at the power plant site. A typical power plant takes advantage of this property by keeping an inventory of 30 to 60 days' supply of coal at the plant site. This is an incredibly valuable characteristic when considering the risks associated with supply interruptions. If storms, natural disasters, or other forces interrupt major gas pipeline infrastructure, gas-fired power plants immediately cease to produce electricity and cannot resume production until infrastructure repairs are made. Coal plants, on the other hand, can continue to operate if the major fuel supply is compromised. This is a factor of fundamental value to any energy security solution and has national security benefits as well.

CURRENT AND FUTURE STATE OF CCS

AEP believes that technological solutions are critical to reducing emissions or improving the reliability and availability of electricity production. More than a century of technology innovation qualifies AEP as an industry leader and expert in these topics. Nonetheless, as a consequence of our first-hand experience and intimate understanding of CCS technologies, AEP is convinced that CCS is many years from providing a commercially viable solution to reducing CO_2 emissions due to the numerous technical, financial, legal, and regulatory challenges that must first be addressed.

In 2007, AEP partnered with Alstom to design, build, and operate the world's first integrated CCS project on a coal-based electricity generating plant. The validation project began operation on September 1, 2009 and continued through May 31, 2011. Over that period, the installed chilled ammonia process captured more than 50,000 metric tons of CO_2 and injected nearly 40,000 metric tons of that CO_2 into deep saline reservoirs beneath the plant site. Because the system was built as a validation platform, with all the flexibilities necessary for systematic process adjustments, the operators were able to fine-tune and control all process streams and energy inputs to thoroughly evaluate the technology. Once

completed, the AEP/Alstom team possessed a comprehensive understanding of the integrated CCS processes and specifics about the operation of each system within the process. This in-depth knowledge includes a detailed understanding of key process parameters such as energy penalty, reagent loss, CO_2 capture rate, and all aspects of geologic CO_2 sequestration. The success of the validation project positioned the team to receive a grant from the US Department of Energy to move forward with an engineering study and preliminary design of a commercial-scale CCS project at the same facility. The lessons learned from these efforts uniquely position AEP to comment on the current status and future prospects of CCS technology deployment, including operational performance and cost specifics, as well as the significant remaining developmental challenges that must be addressed before CCS can be considered commercially available.

"Commercially available" technologies are those that can be purchased from a vendor, have been proven at commercial scale on a representative application, and are offered with robust guarantees on performance and reliability. Vendors cannot provide meaningful guarantees without extensive testing at representative scale. Based on this point of reference, no commercially available technologies for the capture of CO_2 from coal-based power plants exist today. The Department of Energy's Major CCS Demonstration program currently includes twelve projects that propose to demonstrate CO_2 capture along with some form of storage and/or utilization of the captured CO_2. If this were a list of twelve successfully completed projects, then it could certainly be argued that the technologies are ready for commercial deployment. However, not one of the projects has been completed, and in fact, none have even commenced operation. Most are no more developed than the work on paper required for conception of the project. Moreover, some that had previously been included on DOE's list have been cancelled or delayed indefinitely. From a global perspective, the United States leads all others in work completed and proposed for future CCS projects. But today, the technologies to

capture and sequester CO_2 are not commercially available, domestically or otherwise.

While several promising CO_2 capture technologies are under development, none are ready for commercial deployment. They must be advanced in a systematic and step-wise manner to ensure their technological and economic feasibility. AEP had begun the process of moving the technology to commercial scale with the Mountaineer CCS Project, but the lack of an adequate funding mechanism resulted in the company placing the project on hold. Even if AEP's project had remained on schedule, the CCS technology, like other first-of-a-kind projects, would have been installed without any commercial guarantees from vendors and would have run the risk of not continuously or reliably achieving high CO_2 capture levels. AEP's expectation was that a commercial-scale CCS demonstration project was essential *now*, so that in 2020 or later, a reliable commercial-scale CO_2 capture system *might* be commercially available and ready for deployment.

With the suspension of the AEP project and as similar DOE projects are delayed or discontinued, the date for commercial readiness of CCS technology continues to move further out on the horizon. A reasonable estimate for commercial availability, based on the current state of technology development, is at least ten years away, and this is assuming that current financial and regulatory barriers to demonstration projects are expeditiously removed. Without a clear path forward, we will remain, perhaps indefinitely, or at best ten years or more from commercialization of CO_2 capture technology. Numerous studies and projects by public and private organizations also have concluded that the availability of commercially available CCS is at least a decade away, even if a much more ambitious research, development, and demonstration program were implemented. The attached table in Appendix A summarizes the results of some of the studies.

Furthermore, the path to CCS commercialization is filled with significant regulatory and legal barriers. These include issues related to the ownership of, acquisition of, and/or access to geologic pore space, as well as issues surrounding long-term liability and stewardship of geologically stored CO_2. The removal of these barriers in many cases will be through the development of state legislation and regulatory programs. Efforts at the state and federal level are underway and in various stages of development, but significant challenges remain before these and other legal and regulatory issues will be sufficiently resolved to support the commercialization of CCS on coal-based generation.

Finally, EPA has proposed an alternative compliance option that will not help coal-fueled EGUs achieve the CO_2 performance standard.[4] EPA's averaging approach will not work without much greater certainty pertaining to CCS cost and technology. In fact, this alternative compliance option does nothing to ensure the demonstration and deployment of CCS technologies. As just discussed, CCS is not yet commercially demonstrated for large-scale commercial applications and the high cost of the CCS technology effectively precludes its commercial deployment, even if the technology was ready. As a result, there are many technical, economic, and legal risks with CCS technology that must be addressed **before** an EGU developer would consider investing in a new multi-billion dollar plant. These risks will not be taken if the new plant might have to cease operation after ten years given that no real-world data exists to assure CCS can achieve the CO_2 performance standard. Without much greater certainty on the timing and success of CCS commercialization efforts, such risk

[4] Under this approach, a new coal-fueled EGU could be built without CCS, provided that the developer of the new power plant commits to achieve the following two requirements. The first is that the new coal plant achieves a CO_2 emissions limit of a highly efficient ultra-supercritical coal-fueled EGU (set at 1,800 pounds per MWh) during the first ten years of operation. The second is that the developer commits to install and operate CCS on the new plant by the 11th year of operation and achieve a CO_2 emissions limit of 600 pounds per MWh during the next 20 years so that the weighted average CO_2 emissions rate during the 30-year period would comply with the 1,000 lb/MWh CO_2 performance standard.

simply will not be acceptable and will effectively preclude the development of any new generation technology that must rely on CCS to operate. Similarly, it is unlikely that the developer could ever obtain the necessary funding for building the plant until these matters are satisfactorily addressed. Lending institutions and state regulatory commissions will not risk several billion dollars[5] unless they obtain adequate assurances that a CCS technology is capable of achieving the CO_2 performance standard and can be installed at the new coal-fueled plant within the initial ten-year period of operation.

Simply put, a utility operator will never select an electric generating technology or unit design that requires a control equipment retrofit of *unknown* technology to be installed ten years after initial operation. Work done to date on the advancement of CCS technology has yielded incremental improvements in cost and process efficiency. Substantial "game changing" innovations for CCS cost and performance will require the integration of new CCS technologies with advanced next generation coal-based systems, such as advanced IGCC, oxycombustion, and chemical looping combustion or gasification. As a result, EPA's proposed rule is likely to delay for many years the development of CCS technology because new coal-fueled generation will not be built and, without the development of such new coal-based units in the future, the incentive to invest in and advance CCS technology will be greatly diminished.

SUMMARY

AEP believes that EPA's proposed NSPS is a fuel-discriminatory standard that in effect requires nascent, not yet commercially-available CCS technologies to be used on all new coal plants. As such, the proposed NSPS is impractical and not legally justifiable. AEP provided detailed comments to EPA on its concerns with the proposed NSPS and requested that EPA withdraw the rule to

[5] EIA estimates that the capital cost of a single 650 MW coal-fueled EGU without any CCS technology is approximately $1.9 billion. This means that a new multiple unit coal-fueled plant without CCS would cost well in excess of $4 billion including financing costs.

address those concerns.

Given the obvious need for commercially available and cost-effective CCS in order to meet the EPA proposed NSPS for coal plants, H.R. 6172 introduced by Rep. McKinley provides much needed congressional direction in finalizing the NSPS for power plants. The bill requires a report be submitted to Congress "finding that carbon capture and storage is technologically and economically feasible" prior to the finalization of any NSPS for GHGs. This provision helps ensure that any final NSPS will keep coal in the mix as a fuel for the future, provides for greater fuel and energy diversity and lower costs to customers, helps promote the commercial development of CCS technology, and lowers the costs of reducing CO_2 emissions.

Thank you for the opportunity to testify.

ASSESSMENTS OF THE STATE OF CCS DEVELOPMENT FOR COAL-BASED ELECTRIC GENERATION

Organization	Date	State of CCS	Barriers to Commercially Acceptable CCS	Prospects for CCS Development
President Obama's Interagency Task Force on Carbon Capture and Storage. Report of the Interagency Task Force[6]	Aug. 2010	"Current technologies could be used to capture CO_2 from new and existing fossil energy power plants; however, they are not ready for widespread implementation because they have not been demonstrated at the scale necessary to establish confidence for power plant application." (p.50) "CCS technologies...are not likely to be widely deployed at coal-fired power plants....without additional knowledge generated by research, development, and demonstration activities." (p.87)	"Though CCS technologies exist, "scaling up" these existing processes and integrating them with coal-based power generation poses technical, economic, and regulatory challenges." (p.9) "..barriers hamper near-term and long-term demonstration and deployment of CCS technology." (p.14) "A concerted effort to properly address financial, economic, technological, legal, institutional, and social barriers will enable CCS to be a viable climate change mitigation option..." (p.8)	"Administration analyses of proposed climate change legislation suggest that CCS technologies will not be widely deployed in the next two decades..." (p.8) "The focus of CCS RD&D is....to facilitate widespread cost-effective deployment after 2020." (p.9)
The National Coal Council (a Federal Advisory Committee to Secretary of Energy Chu). *Expedited CCS Development: Challenges & Opportunities*[7]	Mar. 2011	"..a range of issues must be addressed before CCS processes are commercially acceptable for coal-based electric generating units. ...key development concerns include the fact that commercial-scale CCS processes have *not yet* been demonstrated on a coal-fired generating unit" (p.1)	"...the current CCS demonstration program in the [U.S.]...is not on pace to significantly advance CCS development in the near-term due to technical and equally non-technical obstacles.... Challenges to CCS development...can be broadly categorized into technical, financial, and regulatory areas." (p.1)	"At the current [development] rate, CCS technologies will continue to be in an early development stage by 2020." (p.64) "Ongoing and planned CCS projects for coal-based generation are advancing the development of the technology, but not at the pace necessary to support an expedited and broad-based deployment of CCS by 2050." (p.14)
DOE / NETL Advanced Carbon Dioxide Capture R&D Program: Technology Update[8]	May 2011	"...in their current state of development [the CO_2 capture technologies being used in industrial applications] are not ready for implementation on coal-based power plants" (p.4)	"[CO_2 capture] technologies are not ready for implementation on coal-based power plants [because] (1) they have not been demonstrated at the larger scale necessary for power plant application; (2) the parasitic loads (steam and power) required to support CO_2 capture would decrease power generating capacity...; and (3) if successfully scaled-up, they would not be cost-effective at their current level of process development." (p.4)	"It is anticipated that successful progression from laboratory-to full-scale demonstration will result in several of these [CO_2 capture] technologies being available for commercial deployment by 2030." (p.10)
DOE / NETL CO_2 Capture and Storage RD&D Roadmap[9]	Dec. 2010	"...cost-effective and efficient CCS technologies will need to be developed and demonstrated at full-scale prior to their availability for widespread commercial deployment." p. 5 "...at their current state of development these [CO_2 capture] technologies are not ready for implementation on coal-based power plants." (p.21)	"...advanced technologies developed in the CCS RD&D effort need to be tested at full scale in an integrated facility before they are ready for commercial deployment." (p.11)	"....the overall timeline for RD&D....involves pursuing advanced CCS technology from the fundamental / applied stage through pilot-scale so that full-scale demonstrations can begin by 2020. The RD&D effort will produce the data and knowledge needed to establish the technology base, reduce implementation risks by industry, and enable broader commercial deployment of CCS to begin by 2030." (p.10)
DOE / NETL Carbon Sequestration Program: Technology Program Plan[10]	Feb. 2011	"The overall objective of the Carbon Sequestration Program is to develop and advance CCS technologies that will be ready for widespread commercial deployment by 2020." (p. 10)	"To accomplish widespread [commercial] deployment [of CCS by 2020], four program goals have been established: (1) [reduce CCS related costs]; (2) [improve the] ability to predict CO_2 [geologic] storage capacity; (3) develop technologies to demonstrate that...CO_2 remains in the injection zones; (4) complete Best Practices Manuals...for site selection, characterization, site operations, and closure practices." (p. 10)	"Only by accomplishing these goals [of the DOE Carbon Sequestration Program] will CCS technologies be ready for safe, effective commercial deployment both domestically and abroad beginning in 2020 and through the next several decades." (p.10)

[6] "Report of the Interagency Task Force on Carbon Capture and Storage." Aug 2010. www.fe.doe.gov/programs/sequestration/ccs_task_force.html
[7] "Expediting CCS Development: Challenges and Opportunities." Mar 2011. Library of Congress Catalog #2011926623. www.nationalcoalcouncil.org
[8] Department of Energy / National Energy Technology Lab. May 2011. www.netl.doe.gov/technologies/coalpower/ewr/pubs/CO2Handbook/
[9] Department of Energy / National Energy Technology Lab. Dec 2010. www.netl.doe.gov/technologies/carbon_seq/refshelf/CCSRoadmap.pdf
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