BEFORE THE
ARKANSAS PUBLIC SERVICE COMMISSION

IN THE MATTER OF SOUTHWESTERN	**)**	
ELECTRIC POWER COMPANY'S	**)**	
PETITION FOR A DECLARATORY	**)**	
ORDER FINDING THAT INSTALLATION	**)**	**DOCKET NO. 12-008-U**
OF ENVIRONMENTAL CONTROLS AT	**)**	
THE FLINT CREEK POWER PLANT IS	**)**	
IN THE PUBLIC INTEREST	**)**	

DIRECT TESTIMONY OF

CHRISTIAN T. BEAM

ON BEHALF OF

SOUTHWESTERN ELECTRIC POWER COMPANY

FEBRUARY 8, 2012

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EXHIBITS

I. INTRODUCTION AND QUALIFICATIONS

Q. **PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.**

A. My name is Christian T. Beam. My business address is 1 Riverside Plaza, Columbus, Ohio 43215.

Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A. My title is Managing Director – Projects and Construction in the Generation Engineering, Projects and Field Services (EP&FS) organization for the American Electric Power Service Corporation (AEPSC). AEPSC supplies engineering, financing, accounting and similar planning and advisory services to the subsidiaries of American Electric Power Company, Inc. (AEP or "the Company"), including Southwestern Electric Power Company (SWEPCO).

Q. PLEASE DESCRIBE YOUR EDUCATIONAL AND PROFESSIONAL BACKGROUND.

A. I earned a Bachelor's Degree in Applied Science with a focus on project management from DeVry University. I am a certified Project Management Professional (PMP) and completed the AEP Leadership Program at The Ohio State University in 2007. I have held positions of escalating responsibility since I started with Ohio Power Company (a subsidiary of AEP) in 1990 in the Utility Operations department at the Kammer Plant. In 1997, I moved to AEPSC and was named Outage Project Supervisor for the Regional Service Organization (RSO) serving the Kammer/Mitchell and Cardinal Plants. In 2000, I assumed a new role as Superintendent for the RSO supporting

Southwestern Electric Power Company (another AEP subsidiary) and subsequently became Manager - Region Outage Management in 2002. In 2004, I was named Manager for the Flue Gas Desulphurization (FGD) retrofit project at APCo's Mountaineer Plant. I became Manager - Construction Technology in 2007 and then Director - Construction in 2008. In 2009, I was named the Project Director – Environmental Retrofit Projects. I assumed my current position in 2010.

Q. WHAT ARE YOUR PRIMARY RESPONSIBILITIES IN YOUR CURRENT POSITION?

A. As Managing Director - Projects and Construction, I am responsible for the construction and start-up services associated with all environmental retrofit and new generation projects and the project management of AEP's western fleet.

Q. HAVE YOU PREVIOUSLY FILED TESTIMONY AS A WITNESS BEFORE ANY REGULATORY COMMISSION?

A. Yes, before the Public Service Commission of West Virginia in 11-0274-E-GI, the Commonwealth of Virginia State Corporation Commission in PUE-2011-00036, and the Public Utility Commission of Texas Docket No. 39708.

II. PURPOSE OF TESTIMONY

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. The purpose of my testimony in this proceeding is to provide a brief overview of the Flint Creek Power Plant and to describe the process that is being performed by the AEPSC, on the behalf of SWEPCO, to retrofit Flint Creek with environmental equipment including the proposed flue gas desulfurization (FGD) with pulse jet fabric filter (FF), also referred to as a baghouse, to reduce the plant's emissions of sulfur dioxide (SO_2) and activated carbon injection (ACI) to reduce the plant's emissions of mercury (Hg). I will also describe AEPSC's efforts to select the best SO_2 and hazardous air pollutants (HAPS) reduction technology for Flint Creek, the expected performance of the technology, and the current cost estimate to retrofit the technology on the unit. SWEPCO also anticipates a need for low NO_X burners and over-fired air for environmental compliance. Finally, I will provide information on the current status of the project and the project plan, including the critical milestones to meet the environmental regulatory compliance deadlines.

Q. ARE YOU SPONSORING ANY EXHIBITS IN THIS PROCEEDING?

A. Yes, I am sponsoring Exhibit CTB-1 – Project Schedule and CTB-2-FGD Technology Options.

III. OVERVIEW OF FLINT CREEK POWER PLANT

Q. PLEASE DESCRIBE THE FLINT CREEK POWER PLANT.

A. The Flint Creek Power Plant is a jointly-owned plant located in Benton County, Arkansas near the town of Gentry. Arkansas Electric Cooperative Corporation (AECC) is the co-owner of the plant on a 50/50 net output and cost basis. Flint Creek is a single-unit, pulverized coal-fired plant with a net capacity of 528 MW and was placed in service in 1978. SWEPCO's ownership portion of this unit is 264 MW net, and is responsible for operating and maintaining the plant.

The Flint Creek unit is fueled with low sulfur Powder River Basin (PRB) coal received via unit coal trains. Fuel oil is used for ignition and flame stabilization on this base-load unit. The unit is currently equipped with electrostatic precipitators for fly ash control. Fly ash collected from the electrostatic precipitators is sold for by-product re-use as part of the company's sustainability program. Ash not sold for re-use is currently transported via truck to an on-site permit-approved landfill.

IV. ENVIRONMENTAL PROJECTS PROCESS

Q. PLEASE DESCRIBE THE PLANNING ACTIVITIES CONDUCTED BY THE COMPANY FOR THE RETROFIT OF ENVIRONMENTAL CONTROLS AT FLINT CREEK.

A. As addressed by Company witness Weaver, the Company has acted to identify the most economical SO_2, mercury and other HAPS reduction technology, and has also developed an associated cost estimate in order to perform analyses to determine if the project is economically beneficial for SWEPCO customers.

Q. PLEASE PROVIDE AN OVERVIEW OF THE CURRENT PROJECT PLAN FOR THE FLINT CREEK FGD.

A. The Flint Creek Plant's FGD retrofit project will be executed using the same phased approach that has been successfully employed by AEP on many past projects. The phased approach begins with Phase I, which consists primarily of a feasibility study. Phase IIa is the preliminary engineering and design stage, while Phase IIb provides for detailed engineering, design, and initial site construction activities. Full-scale construction, startup, and commissioning are undertaken in Phase III. A detailed evaluation, followed by financial authorization, is required before the project can proceed from one phase to the next. A graphical timeline showing the phased approach as well as major project milestones is provided in Exhibit CTB-1.

Since 2004, AEP has implemented this phased approach in the installation of FGD systems on nearly 10,800 MW of coal-fired generation and selective catalytic reduction (SCR) systems on more than 8,200 MW. At the height of construction activity in 2007, Engineering News-Record identified AEP's overall construction program as the largest in the utility industry and the second largest in the nation, based on capital invested. The Flint Creek Plant FGD retrofit will positively benefit from years of valuable lessons learned and best practices. AEP's Quality Assurance Program for Projects is based on industry standard methodology established by the Project Management Institute (PMI). In addition, AEP's Project Management leadership team for the Flint Creek Plant FGD Project is PMI Project Management Professional (PMP) certified.

Q. IN WHAT PHASE IS THE FLINT CREEK PLANT'S FGD PROJECT CURRENTLY?

A. The project is currently in Phase I. The project has been initiated and the project planning and conceptual engineering required to support this filing have been completed. A Project Plan will be developed which will include a detailed execution strategy for the engineering, design, procurement, permitting, construction, startup and commissioning of the FGD and ACI systems.

Q. PLEASE DESCRIBE THE ACTIVITIES THAT OCCUR DURING PHASE I.

A. The formal process begins with the preparation and approval of a Capital Improvement Requisition (CI) after which an architect/engineer is engaged to perform the engineering, design, and feasibility studies for Phase I and the ensuing phases of the project. The intent of the Phase I feasibility studies is to investigate the technical options and factors driving the project cost and schedule. During Phase I, the architect/engineer, with input from a team of AEPSC engineers and managers, defines the scope of the project, prepares work plans, and develops a budgetary cost estimate and schedule for implementation. In addition, preliminary environmental permitting activities begin and the FGD and ACI supplier is released to begin conceptual engineering. The results of the Phase I conceptual engineering and feasibility studies are presented to senior management and authorization is sought to proceed to Phase IIa. Approval to proceed to the next project phase is accomplished by either a formal AEPSC and SWEPCO Management meeting or the CI revision approval by the key stakeholders.

Q. PLEASE DESCRIBE THE ACTIVITIES THAT TAKE PLACE IN PHASE IIA.

A. Phase IIa consists of preliminary engineering, design, permitting and procurement work. During this phase, we finalize the project scope, refine the cost estimate and schedule, award the Original Equipment Manufacturer (OEM) contract, procure long lead time equipment, and develop drawings to the point that detailed design work can begin. During Phase IIa, modifications to existing air, water and waste environmental permits are submitted to the Arkansas Department of Environmental Quality to begin the evaluation and approval process, and we assemble the construction and site management teams to begin design evaluations to ensure that the proposed scope of work is optimized for constructability. We also define site preparation plans, determine which, if any, facilities will need to be relocated, select a site preparation contractor, and complete studies to support the various permitting activities that will be required. Upon completion of Phase IIa, the project is again evaluated by key stakeholders to proceed to the next project phase. In this case, a Phase IIb CI revision will be prepared for approval by AEPSC and SWEPCO Management.

Q. PLEASE DESCRIBE PHASE IIB OF THE PROJECT PROCESS.

A. Phase IIb consists of detailed engineering, design, contracting and initial site construction work that can be performed prior to the final approval of the air permit. During this phase, as detailed design progresses, construction bid packages are prepared and major equipment is specified, bid, and purchased. The construction and site management teams are mobilized and begin site construction work, and we proceed through the process of selecting and awarding the major construction contracts. Upon completion of Phase IIb, the project is evaluated once again, and a Phase III CI revision will be prepared for approval by AEPSC and SWEPCO Management.

Q. WHAT TAKES PLACE DURING PHASE III?

A. Phase III consists of the full-scale construction and startup and commissioning of the project. The principal construction contractors mobilize and begin the major construction effort. Engineering and design continues in support of the project throughout the construction and testing activities, including the validation of the design, the preparation of as-built drawings, and the evaluation and approval of necessary design changes. Phase III is complete when the project is complete and the equipment is commissioned and placed in service.

Q. WHAT ARE THE MAJOR BENEFITS DERIVED FROM THIS PHASED APPROACH TO CONSTRUCTION PROJECTS?

A. The phased approach provides structured control of the project scope and costs. It provides a minimum of three specific decision points (the end of Phases I, IIa, and IIb) where engineering and design, cost, and schedule are evaluated to ensure they are meeting the intent and expectations of the project. Starting major construction activities when the detailed discipline design is substantially complete allows construction to proceed, in many cases, on a fixed or target price basis, since many of the design changes that might otherwise result in additional work and cost will have been identified and remedied. Participation by experienced construction team members during the design phases assures that the equipment layout and modularization results in optimized constructability and a smooth transition into the major construction phase of the project.

Q. PLEASE GENERALLY DESCRIBE THE PROCESS FOR SELECTING A SPECIFIC TECHNOLOGY AND OEM VENDOR FOR THE ENVIRONMENTAL CONTROLS TO BE INSTALLED AT ANY UNIT.

A. AEP maintains an updated list of technologies that have been proven effective in removing emissions from power plant effluent streams. When a generic control technology (e.g., wet or dry scrubber) has been identified as a potential environmental compliance solution for a specific unit burning an identified range of fuel, an Evaluation Team determines, on a unit-specific basis, which OEMs provide control technologies that can be used on that unit. The Evaluation Team then determines the Total Evaluated Cost (TEC) over the life of the project for each technology. If there is no significant difference between or among the TECs or analyzed business risk, the OEM technology that presents the lowest Total Installed Cost (TIC) is preferred.

Q. PLEASE GENERALLY DESCRIBE THE PROCESS USED TO SELECT A CONSTRUCTION CONTRACTOR FOR THE ENVIRONMENTAL CONTROLS AT ANY UNIT.

A. AEP has processes for evaluating and qualifying construction contractors to ensure they have the capability to perform work of the type and scope envisioned with a demonstrated record of safety focus and performance. Proposals are requested from two or more of the contractors on that list. The final award is based on the TEC and safety performance of those bidders, along with ancillary considerations such as a financial risk assessment, any pricing discounts offered for multiple-unit awards, negotiated shared risk/reward programs, and similar factors.

Q. WHAT STEPS DOES AEP TAKE TO ENSURE THAT PROJECT COSTS ARE REASONABLE AND NECESSARY?

A. The three-phase process enables periodic and structured technical and cost evaluations throughout each phase. The Phase I feasibility study assesses technical options and costs. Phase IIa and IIb engineering produces preliminary, then detailed designs to refine the associated costs.

As previously discussed, contracting for construction activities when the detailed discipline design is substantially complete allows construction to proceed, in many cases, on a fixed or target price basis. This serves to mitigate SWEPCO's and our customers' exposure to upside cost risks. As Phase III construction and startup and commissioning proceeds, we use prudent construction management practices and cost and schedule controls to ensure that the projects are accomplished in a safe, as well as professional, and cost-effective manner. To that end, AEP has developed a robust Quality Assurance/Quality Control manual that includes Standard Operating Procedures for such activities as Project Integration and Planning, Work Management, Preparation of Estimates, Procurement, Project Schedule Control, Project Cost Control, Corrective and Preventive Actions, and, above all, Safety.

Q. PLEASE DESCRIBE AEP'S PROJECT MANAGEMENT PROCESS.

A. AEP uses several formalized management and control processes developed during our years of project execution experience to ensure projects meet cost, schedule, quality, and safety requirements.

Project Cost Management involves the planning, estimating, forecasting, and controlling processes used during each phase of project execution. Estimates and budgets are revised as the project progresses through its phases, and metrics are used to report and manage against those budgets. The cost projections are refined as more engineering is completed, detailed scope is finalized, and estimates are updated with quotes for supply. A detailed risk assessment is completed and revised to determine the level of contingency required by the risks identified as the project progresses.

Project Schedule Management ensures that the overall project is executed in accordance with the needs of the interfacing groups so that work is completed in support of the initial operation date. This is accomplished through the use of scheduling tools, the establishment and monitoring of critical project milestones, and the monitoring of specific performance and production metrics. The development of an integrated schedule involves the application of sequencing and durations for the activities required to complete the project. AEPSC acts as the project integrator and the architecture/engineer (A/E), contractors, and vendors provide comprehensive monthly status reports on the project schedule as well as weekly comprehensive schedule updates that include information on activity progress, 30-day look-ahead reports, the status of major activities, and cost/schedule integration information.

Project Quality Management ensures that the installed project meets all AEPSC requirements for form, fit, function, and performance. AEPSC Engineering develops a detailed scope of work (SOW) which includes design criteria and specifications for the FGD equipment. A Quality Oversight Plan (QOP) will be developed to determine what inspections will be conducted, their frequency and the responsible person(s). As part of this plan, an engineering evaluation plan is developed and executed to ensure the quality of the A/E's engineering deliverables. The AEPSC construction site manager will assure field inspections are performed both independently and concurrently with any contractor's inspections. All assessments will be documented to ensure compliance with the QOP.

Project Safety Management processes are used by AEPSC to ensure that the project is completed in the safest manner possible. AEPSC has a corporate goal of "Target Zero", which means zero harm to all employees and contractors. The Company has an established culture of providing the safest possible workplace. Every person in an AEPSC facility or on an AEPSC project needs to be proactive in working towards the Company's "Target Zero" goal. A cornerstone in achieving this goal is planning safety into the work. A safe project involves "planning the work and then working the plan."

Q. PLEASE DESCRIBE OTHER FORMALIZED MANAGEMENT AND CONTROL PROCESSES USED BY AEP.

A. The Company also formally manages and controls procurement, contracts, and risk activities.

Project Procurement/Contract Management utilizes competitive bid and program purchase processes to ensure low costs from contractors and vendors that meet AEPSC performance and technical specifications.

Project Risk Management involves the formal process of identifying, quantifying, and mitigating risks associated with the project. This is done through the development of a detailed risk register so that risk can be prioritized and resources efficiently focused on mitigating the most critical risks. The risk register is updated periodically throughout the project duration to ensure risk mitigation priorities are valid.

Q. WILL THE PHASE I FEASIBILITY STUDIES COVER THE ENTIRE SCOPE OF THE FLINT CREEK FGD PROJECT?

A. Yes. AEP will establish a Division of Work (DOW) clearly defining the responsibilities of the assigned parties not only for the FGD technology, but also site development, reagent and material unloading and handling systems, any required switchyard modifications and the identification of all permitting requirements. AEP design criteria will be clearly communicated to the A/E and the OEM to ensure the benefits of our knowledge and experience in owning, maintaining and operating similar systems is carried forward on the Flint Creek Plant project.

Q. CAN YOU PROVIDE A GRAPHICAL SUMMARY OF THE PHASED APPROACH TO CONSTRUCTION?

A. Yes. Exhibit CTB-1 shows a preliminary project schedule for the various activities that will take place during this phased approach to construction.

Q. WHEN IS EACH PHASE ESTIMATED TO BEGIN?

A. Each phase and subsequent activities are displayed in Exhibit CTB-1. Phase I has already commenced and activities are expected to be completed in the third quarter of 2012 with Phase IIa to start in the same time frame. Phase IIb is estimated to begin in the first quarter of 2013 and be completed by the end of the fourth quarter of the same year. We are currently planning on commencing Phase III site construction activities on approximately January 1, 2014, predicated upon the receipt of the Permit-to-Install (PTI), often referred to as the air permit, from the Arkansas Department of Environmental Quality (ADEQ). Any delays to the issuance of the air permit may result in schedule delays and cost impacts to the overall execution of the project.

V. TECHNOLOGY SELECTION

Q. WHAT FGD SYSTEMS WERE CONSIDERED AND HOW DO THEY WORK TO REDUCE SO_2 EMISSIONS?

A. A variety of SO_2 control processes and technologies are in use within the industry, but two commercialized processes emerged for comparative study on Flint Creek: Limestone Forced Oxidation (LSFO) Spray Tower Wet FGD and Lime Dry FGD with Recycle. These processes are typically referred to in the industry as wet FGD (WFGD) and dry FGD (DFGD) systems, respectively.

In a WFGD system, alkaline reagent slurry (usually lime or limestone) is injected into a vessel, where it reacts with the flue gas to collect the SO_2. A WFGD absorber utilizes a high volume of liquid slurry continuously circulating in the absorber vessel and collecting in the absorber reaction tank where the scrubbing reaction occurs. A DFGD is comprised of the absorber vessel or duct integrated with a FF. The DFGD does not utilize a liquid filled reaction tank, but instead relies on the scrubbing reactions to take place as the flue gas intermingles with the lime inside the vessel or ductwork and also in the highly reactive dust cake on the surface of the downstream fabric filter media.

Q. WHAT ARE THE KEY OPERATIONAL DIFFERENCES BETWEEN A WET FGD AND A DRY FGD SYSTEM?

A. In most WFGD systems, limestone slurry is used as the reagent and a gypsum byproduct is formed as a result of the chemical reaction. In DFGD systems, lime is used as the reagent and calcium sulfite is formed as a result of the chemical reaction.

The WFGD process requires an additional step not required of a DFGD. A WFGD requires dewatering of the reaction byproducts for solids handling, landfill suitability, and water reuse or disposal; a DFGD collects the reaction byproducts directly in a downstream fabric filter. Thus, solids dewatering or wastewater treatment is not required for a DFGD system.

On a comparable inlet SO_2 concentration, water consumption, auxiliary power usage, solid waste disposal, and equipment footprint are higher for a WFGD than for a DFGD. Co-benefit emissions control for mercury and other Hazardous Air Pollutants (HAPs) is better with a DFGD versus a WFGD due to the integral fabric filter (FF) baghouse associated with the DFGD technology. This is due to the dual functionality of the FF to both remove particulate matter and provide additional contact time between flue gas and reagent to further reduce SO2 emissions.

Plants with WFGD operate with a "wet stack" or a visible thick water vapor plume exiting the stack under all ambient conditions. The stack plume from a DFGD is typically not visible because it operates above the flue gas saturation temperature. A slight water vapor plume might become visible under certain ambient conditions of temperature and humidity.

Q. DID THE COMPANY CONDUCT A STUDY TO COMPARE THE USE OF A WFGD TO A DFGD FOR FLINT CREEK?

A. Yes. The Projects and Construction group provided technology performance parameters and cost estimates for the initial high level overview of reasonable SO_2 compliance options available to SWEPCO customers. Technical and economic evaluations were performed to compare and contrast the WFGD and DFGD technology options that may be applied while burning 0.8 lb sulfur/mmBTU coal. The evaluation of the FGD technology options considered environmental and technical performance, retrofit constraints, and collateral environmental and technical impacts associated with the evaluated technologies. An economic analysis was performed, as outlined in Company witness Scott C. Weaver's testimony.

An OEM proprietary DFGD system was compared to a Spray Dryer Absorber (SDA) technology, Circulating Dry Fluidized Bed Scrubber (CDS) technology, and the Limestone Forced Oxidized (LSFO) Spray Tower WFGD technology.

Q. WHAT ARE THE COST COMPARISONS BETWEEN A DFGD AND A WFGD?

A. A detailed cost estimate for a DFGD has not been completed for Flint Creek since engineering and design is only in the very early phases. However, our initial Flint Creek Plant cost comparison supports the industry expectation that DFGD is less capital intensive than WFGD. DFGD uses less exotic materials of construction than a WFGD, which not only reduces the initial capital costs, but also future maintenance and equipment replacement costs. In addition, fixed and variable O&M costs are very different, primarily driven by the costs of the reagent used (lime versus limestone). The fuel sulfur content will influence the reagent consumption and thus the variable cost of either technology.

Q. PLEASE OFFER AN OVERVIEW OF THE FGD RETROFIT ALTERNATIVES CONSIDERED FOR FLINT CREEK?

A. The Company, as well as an AEP EP&FS and AEP Fuel, Emissions & Logistics (FEL) cross-functional team, initially identified and economically-screened a combination of five (5) FGD technology options that were acceptable emission removal solutions for Flint Creek. Exhibit CTB-2 lists those options; however, they can generally be broken down into: 1) two variations of a "wet" FGD; 2) three forms of "dry" FGD technology; 3) a traditional sorbent-injection (SDA) dry FGD; 4) a circulating dry scrubber (CDS) technology; and 5) an OEM proprietary modular DFGD technology ("NID™" design). For all options, this technology screening assumed the utilization of a 0.8 lb. per MMBtu sulfur-content, Power River Basin

(PRB) coal source. Finally, the cross-functional team also offered two additional "time-sensitive" cost views pertaining to the NID™ DFGD option. In addition to the "base" 30-month construction period, this technology screening team assessed costs applicable to both a 24-month and a 27-month accelerated construction window.

Based on the alternative economic screening performed, as summarized in Exhibit CTB-2, it was recommended by the team that the optimum FGD "retrofit" alternative to be utilized for further modeling purposes was the modular NID™ DFGD technology solution. The model utilized a 0.8 lb. per MMBtu sulfur-content coal, and employed a 30-month construction period.

Q. IS ONE OF THE FGD TECHNOLOGIES A CLEAR FRONT RUNNER TO BE SELECTED FOR INSTALLATION AT FLINT CREEK PLANT?

A. Yes. Considering equivalent SO_2 removal efficiencies among the evaluated FGD technology options for the aforementioned design basis, the proprietary DFGD technology is the favored FGD technology based on the following:

- Lowest total evaluated cost on 30-year (2011-2040) cumulative present worth basis (capital and O&M).
- Lowest water consumption - Total water consumption for the DFGD is significantly less than for the WFGD. This is a major consideration given that Flint Creek is considered to be water limited, as the plant is projected to have difficulty maintaining lake level during a repeat of the historical worst three years of runoff even without the addition of a FGD system. Lowest auxiliary power usage - Auxiliary power requirements are significantly less for a DFGD

than for a WFGD.

- Lowest reagent usage - Reagent usage is significantly less for a DFGD than for a WFGD.
- Smallest equipment footprint
- Best supports ACI for mercury removal and other hazardous air pollutants (HAPS) removal – Based upon MATS HAPS limits, in particular for mercury, a DFGD is better suited to an ACI system retrofit because the DFGD already includes a fabric filter. A WFGD installation would require the addition of spray towers and an upstream fabric filter or a wet electrostatic precipitator, along with the installation of an ACI system for mercury control to achieve the levels of mercury reductions possible with a DFGD and ACI.
- Best supports SO_3 removal - A DFGD does not create a visible moisture plume leaving the stack under most conditions, while a WFGD does.
- Best supports future National Pollutant Discharge Elimination System (NPDES) permit compliance

Q. WAS A SPECIFIC DFGD TECHNOLOGY SELECTED FOR THE INSTALLATION AT FLINT CREEK?

A. Yes. As shown in Exhibit CTB-2, the technical and economic evaluation of the FGD technologies shows that the proprietary NID™ DFGD technology is the preferred technology for Flint Creek. While the NID™ technology has all of the benefits of the typical DFGD technologies discussed previously, it also has significant benefits over other DFGD technologies, including the previous SDA technology that was proposed for the Flint Creek Plant prior to the suspension of the project.

The total installed capital costs for NID™ are lower than that for other DFGD technologies. O&M costs are also lower for NID™, as the total amount of lime consumption required for similar SO_2 removal is less than the amount for other DFGD technologies. Unlike other DFGD systems, the NID™ technology process does not require the use of lime slurry and its associated equipment. This results in a less complex system that is easier to install and maintain.

NID™ technology can attain higher levels of SO_2 reduction, with vendor guarantee removal rates of 98% compared to maximum removal rates of 95% for SDA and other DFGD technologies. The higher removal rate for NID™ allows for greater fuel flexibility for the Flint Creek site to meet environmental compliance limits.

. The DFGD system that is proposed for installation at Flint Creek will remove 95% of the SO2 in the flue gas to meet anticipated emission limits for the design basis fuel. However, as discussed above, NID™ technology provides greater flexibility for increased SO_2 removal rates, if required in the future.

Q. PLEASE PROVIDE AN OVERVIEW OF THE EQUIPMENT THAT WILL BE INSTALLED AS PART OF THE DFGD SYSTEM.

A. The following equipment would be installed as part of a DFGD system installation at Flint Creek. This list is not all-inclusive.

- Pebble lime rail and truck unloading equipment and storage silos
- Absorber vessels or ductwork modules

- Induced draft fans and motors
- Tie-in ductwork
- Pulse jet fabric filter
- Ash recycle system foundations, equipment, and building
- Waste storage silo and truck loading equipment
- Equipment to supply electrical needs of new process equipment
- Distributed control system (DCS) for new process equipment
- Balance of plant piping (fire protection, service water, sanitary, etc.)

Q. WHAT IS THE PROJECTED SERVICE LIFE OF THE DFGD SYSTEM?

A. The DFGD system has been specified such that the system shall operate safely, reliably and without excessive maintenance for a design life of 25 years.

Q. PLEASE SUMMARISE WHY A DFGD WAS CHOSEN FOR INSTALLATION AT FLINT CREEK?

A. Based on the above, the DFGD is the technology of choice for Flint Creek to meet the required emission limits. The DFGD project cost estimate will be refined as engineering and design progresses, but DFGD is projected to be the lowest cost option especially when considering multi-pollutant reduction performance compared to WFGD. While both systems would meet the necessary emission limits imposed by the Arkansas Regional Haze Rule (RHR), Cross- State Air Pollution Rule (CSAPR), and the Mercury Air and Toxic Standards (MATS Rule), the DFGD system is better suited for Flint Creek from both a technical and cost perspective.

Q. HAS AN ACI SYSTEM BEEN INCLUDED AS PART OF THE EVALUATION OF THE FGD FOR FLINT CREEK?

A. Yes. In order to meet the mercury removal requirements of the MATS Rule, an ACI system will be required for the Flint Creek Plant. Typically, an ACI system requires the installation of a FF to collect the activated carbon/mercury particulate. Since an FF is an integral component of the DGFD scope, it has been included in the economic and technical evaluation for the Flint Creek Plant environmental projects.

Q. WHAT OTHER ENVIRONMENTAL PROJECTS WILL BE INCLUDED?

A. Low NO_X burners and over-fire air may need to be installed at Flint Creek. Low NO_X burners are designed to burn coal at the lowest reasonable temperature while also starting stable combustion as soon as possible. Over-fire air is commonly used in conjunction with low NO_X burners to further reduce of the amount of oxygen available for combustion in the main burner zone. If low NO_X burners and over-fire air are installed on Flint Creek, the NO_X rate is expected to drop to the 0.18 to 0.22 lbs/mmbtu range.

In addition, a landfill is planned for construction in support of the DFGD system installation, and will be used for the disposal of coal combustion byproducts that are not suitable for commercial or public use. Other systems and equipment to be installed in support of the functionality of the DFGD system for Flint Creek include balanced draft conversion; material handling improvements, steam coil modifications;

unit controls modernization for new process equipment; and continuous emissions monitors (CEMS) upgrades.

Q. IS AN SCR INCLUDED IN THE FLINT CREEK ENVIRONMENTAL PROJECTS FOR MATS RULE, CSAPR AND/OR ARKANSAS RHR COMPLIANCE?

A. No. An SCR is not required for the current compliance strategy for the Flint Creek Plant environmental projects. However, as discussed by Company witness Hendricks, there is a potential for the addition of an SCR at the Flint Creek Plant in the future. As part of the planning for the DFGD system, the potential addition of an SCR at a later date will be included. The possible SCR installation will result in the need to reserve areas on the DFGD equipment General Arrangement (GA) drawings for the installation of an SCR system, and the sizing of new fans to accommodate the potential installation of an SCR in the future.

VI. FLINT CREEK PLANT PROJECT COST ESTIMATE

Q. WHAT IS THE ESTIMATED PROJECT COST FOR THE INSTALLATION OF THE DFGD SYSTEM AND OTHER ASSOCIATED ENVIRONMENTAL CONTROLS ON THE UNIT AT THE FLINT CREEK PLANT?

A. SWEPCO's cost of the DFGD system and associated environmental controls project installations, excluding AFUDC and company overheads, is currently estimated at $408.7 million, as shown in Table 1 below.

Table 1

Flint Creek Plant Environmental Controls Capital Cost Summary

Scope of Work	Direct Cost ($M)
FGD	
DFGD	$312.2
ACI	$14.3
Associated Projects	
Landfill	$25.0
Unit Controls Modernization	$20.0
Low Nox (LNB, OFA)	$16.0
Balanced Draft Modifications	$15.0
Material Handling Improvements	$3.5
CEMS Systems	$2.2
Steam Coil Mods	$0.5
Total	$408.7

This cost estimate includes the installation of the DFGD system, landfill development work that is necessary to dispose of the product from the DFGD, and other associated upgrades to existing plant equipment, including unit controls modernization, low NO_X burners and OFA upgrades, balanced draft modifications, material handling improvements, steam coil upgrades, continuous emission monitoring systems (CEMS) and ACI. This estimate also includes an allocation for support of the project from the AEPSC (Owner's Cost).

Q. HOW WAS THE COST ESTIMATE FOR THE FLINT CREEK PROJECT DEVELOPED?

A. The estimate was developed from technology evaluations and estimates associated with FGD studies for AEP's Big Sandy and Rockport Plants and AEP's years of experience with environmental system construction and startup execution. Competitive bids were solicited for various removal technologies as part of these studies; however, the pricing was based on highly indicative supplier estimates with little to no site specific detail. The selected bid proposal estimates were converted to $/kw indicative pricing to allow for scaling of pricing associated with Flint Creek's 528 MW unit size. The estimates were based on an assumed in-service date occurring during the second quarter of 2016.

Q. WHAT IS THE LEVEL OF ACCURACY CONTAINED IN THE COST ESTIMATE PRESENTED IN THIS TESTIMONY?

A. The cost estimate presented in my direct testimony is based on recognized standards by the Association for the Advancement of Cost Engineering (AACE). Based upon our experience in executing projects such as this and our utilization of actual cost data from recent projects, as outlined above, we believe our range of accuracy to be in -15% to +20% range. We would be somewhat remiss to presume that all site-specific anomalies have been both recognized and accounted for in our estimate methodology and thus have chosen to apply a 10% contingency to our estimate.

Q. WHAT OTHER ACTIVITIES MUST BE COMPLETED PRIOR TO THE DEVELOPMENT OF A MORE DETAILED COST ESTIMATE?

A. As outlined above, the project is currently in Phase I engineering and design. Further project planning and conceptual engineering will be performed and the cost estimate will be refined before proceeding to Phase IIa in the fourth quarter of 2012. During

Phase IIa, the cost estimate will be further refined. This work is currently scheduled to be completed in the first quarter of 2013 before the project can enter Phase IIb. Phase IIb will continue through the fourth quarter of 2013 and will result in a highly detailed cost estimate.

Q. PLEASE DESCRIBE HOW SWEPCO HAS ACCOUNTED FOR THE ESCALATION OF LABOR AND MATERIALS IN THE COST ESTIMATE.

A. SWEPCO has included the escalation of labor and materials in the cost estimate. The estimate takes into consideration AEP's past experience in procuring labor and materials, and the actual annual escalation/de-escalation rates to date.

Q. DOES SWEPCO EMPLOY ANY METHODS TO MITIGATE THE RISK OF ESCALATION OF COSTS THAT MAY AFFECT THE CONSTRUCTION OF THE FLINT CREEK PLANT DFGD?

A. Yes. SWEPCO and its customers will be benefitted by having access to AEPSC's Business Intelligence group. One of the key functions of this group is to analyze past, current and projected future market conditions and recommend alternatives to minimize the risks of volatility present in labor, equipment and material markets. AEPSC's strategy of being first to market, locking in queues in production facilities, entering into procurement arrangements such as Discount Cooperative Agreements with major equipment vendors and procuring materials and commodities in bulk at competitive prices serves to mitigate the risk of market price spikes. This strategy will benefit SWEPCO'S customers as many others in the industry will be undertaking similar large-scale construction projects to comply with the environmental regulations.

Q. IS IT YOUR PROFESSIONAL OPINION THAT SWEPCO/AEPSC HAS DEVELOPED A REASONABLE COST ESTIMATE FOR CONSTRUCTION OF THE PROJECT?

A. Yes. The cost estimate for the Flint Creek Plant project is reasonable considering the development basis and the degree of site-specific engineering and design work completed to date.

Q. HAVE SIMILAR DFGD PROJECTS BEEN SUCCESSFULLY INSTALLED AT OTHER AEP UNITS COMPARABLE TO THE FLINT CREEK PLANT?

A. AEP is currently installing a DFGD system at the John W. Turk plant in Fulton, Arkansas. The Company has also applied for the grant of a Certificate of Public Convenience and Necessity (CPCN) from the Indiana Utility Regulatory Commission (IURC) and the Kentucky Public Service Commission (KPSC) for the installation of DFGD technology at both the Rockport and Big Sandy Plants. DFGD is a proven and viable technology for SO_2 reduction for coal-fired power plants. AEP has a proven track record of successfully managing the design and construction of many major environmental projects and it is expected that the DFGD installation at Flint Creek will be another success.

Q. HAS AEPSC, ON BEHALF OF SWEPCO, CONDUCTED PAST WORK ASSOCIATED WITH A FGD RETROFIT FOR THE FLINT CREEK PLANT?

A. Yes. As a part of the Clean Air Interstate Rule (CAIR) compliance strategy, AEPSC began preliminary Phase I feasibility analyses on the Flint Creek Plant in the first quarter of 2009. Our Engineering, Procurement, and Construction (EPC) Contractor, Western Clean Coal Partners (WCCP), a joint venture of The Industrial Company (TIC) and Sargent & Lundy (S&L), completed a 90% confidence level, order of magnitude cost estimate for DFGD. AEPSC also completed an order of magnitude cost estimate for a WFGD system based on its installation of WFGD technology in prior years on its eastern fleet of coal-fired power plants.

Q. WHAT FACTORS SUPPORTED THE DECISION TO END PHASE I WORK ASSOCIATED WITH THE FLINT CREEK PLANT DFGD?

A. As discussed by Company witness Hendricks, a decision was made by the Arkansas Pollution Control and Ecology Commission to stay Arkansas State Implementation Plan (SIP) requirements. As a result, SWEPCO decided to suspend activities surrounding the installation of the DFGD until better clarity was available in regards to the SIP requirements.

Q. WHAT WAS THE COST OF THE FLINT CREEK PLANT WORK PRIOR TO THE SUSPENSION?

A. Prior to the suspension of Phase I and some Phase II activities, approximately $7.1 M of cost associated the DFGD project was incurred as of December 31, 2009.

Q. IN VIEW OF THE SUSPENSION OF THE FLINT CREEK PLANT ACTIVITIES, DO YOU CONSIDER THESE COSTS TO HAVE BEEN PRUDENTLY INCURRED?

A. Yes. The costs incurred represent the best efforts at that time to address the necessary part of the development of the Flint Creek DFGD that is required to meet the federal and state emission standards described in the testimony of Mr. Hendricks. Also, the performance of this work generated the necessary information that the project would be more complex and expensive than originally anticipated and led to the conclusion that suspending the project was what provided the most benefit to SWEPCO and our customers until a period that would be economically feasible, and provide better clarity of regulatory requirements. Since the suspension of the original project, an additional commercially proven removal technology has become available for use at the Flint Creek Plant. This new technology is the NID DFGD process and, as previously discussed in my testimony, represents a more cost effective and suitable means to comply with final and proposed EPA regulations which create additional benefit for SWEPCO's customers.

VII. CONCLUSION

Q. PLEASE SUMMARIZE THE NEED FOR THE FLINT CREEK ENVIRONMENTAL RETROFIT PROJECT.

A. The installation of environmental controls at the Flint Creek will help meet compliance requirements for the final and proposed environmental regulations to insure continued operation of this unit as a reliable, cost-effective source of generation for SWEPCO's customers. AEP's phased strategy for the design, engineering, procurement, construction, and startup/commissioning of its environmental compliance projects contributes to a more reliable, safe, timely, and cost effective project at completion. AEP continues to use and improve prudent project management practices and quality control procedures. These practices and procedures, combined with our talented staff and focus on safety, quality, cost and schedule performance, ensure that the Flint Creek DFGD project will be successful.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes.

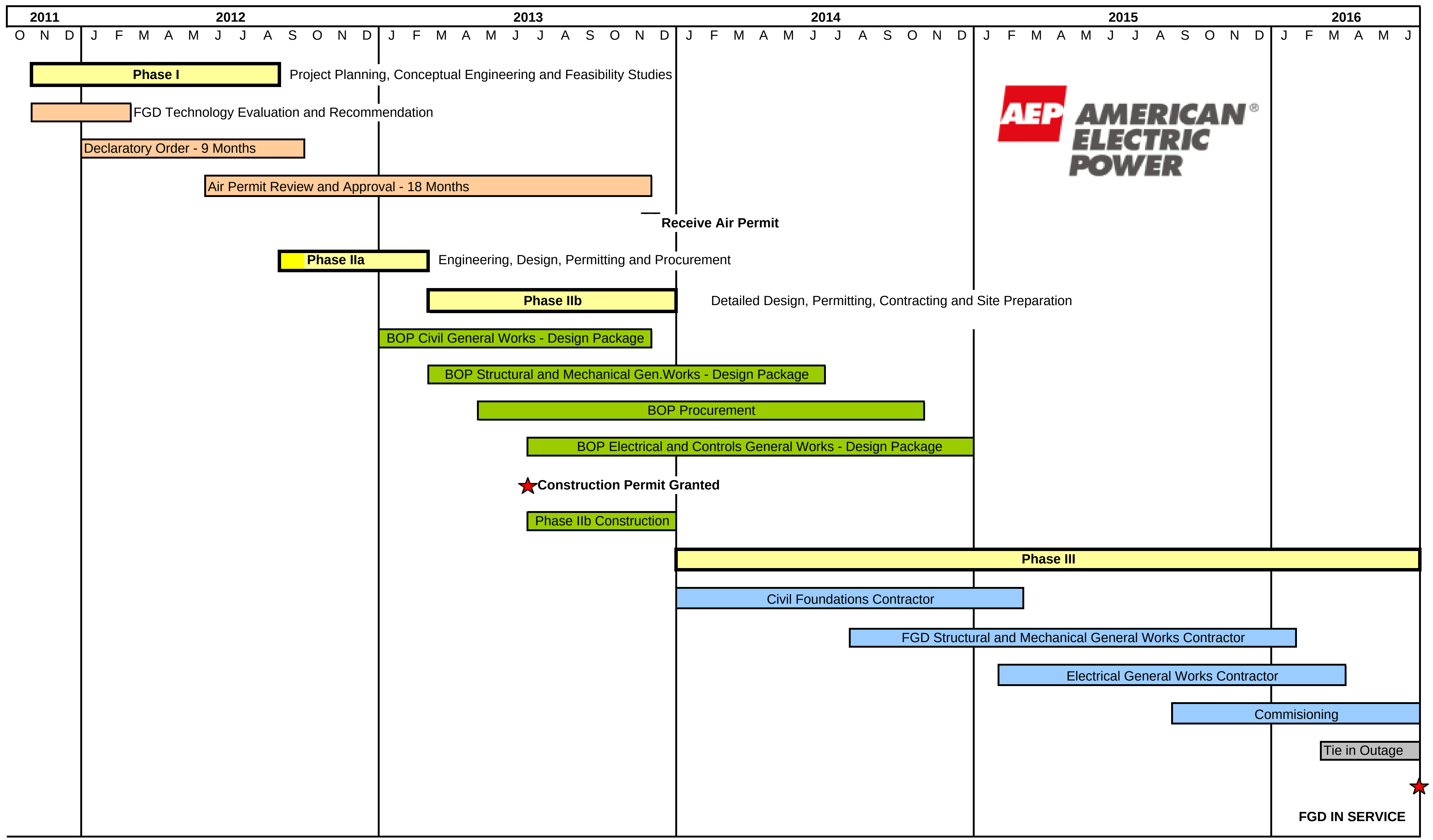

Exhibit CTB-1 - (Level 1) Project Schedule

Summary: Flint Creek Unit 1 FGD Technology (& Timing) Screening
Relative Free Cash (<COST> / SAVINGS) vs. Lowest Cost Case

(Using Project-Specific Free Cash Flow Modeling Tool)

Ranked in order of "Relative 10-Yr NPV" (as well as other objective risk factors)

Rank #	CASE #	DESCRIPTION	Relative 10yr NPV ($000s)	Relative 10yr IRR	Relative 20yr NPV ($000s)	Relative 20yr IRR	Relative Payback (Yrs.)
1	Case 3	DFGD NID + FF [27 mos] - 0.8 lb/Mmbtu	-	-	-	-	-
2	Case 7	DFGD NID + FF [30 mos] - 0.8 lb/Mmbtu	**($2,379)**	-1.9%	($3,210)	-0.2%	0.2
3	Case 5	DFGD SDA+FF - 0.8 lb/Mmbtu	**($2,871)**	0.5%	($1,867)	0.0%	(0.0)
4	Case 6	DFGD NID+FF [24 mos] - 0.8 lb/Mmbtu	**($7,032)**	0.2%	($6,463)	-0.1%	0.1
5	Case 4	DFGD CDS+FF - 0.8 lb/Mmbtu	**($40,551)**	-1.9%	($36,968)	-1.0%	0.8
6	Case 1	WFGD + WESP - 0.8 lb/Mmbtu	**($126,149)**	-5.7%	($120,272)	-2.9%	2.7
7	Case 2	WFGD + Spray Tower&FF - 0.8 lb/Mmbtu	**($159,678)**	-6.9%	($151,512)	-3.5%	5.9

Summary: Flint Creek Unit 1 FGD Technology (& Timing) Screening
Relative REVENUE REQUIREMENT (**COST / <SAVINGS>**) vs. Lowest Cost Case

(Using System-Holistic Strategist® Resource Optimization Modeling Tool)

						Timing Sensitivities	
Rank	Retrofit or Replacement Option	In-Service Date	SWEPCO As-Spent Retrofit Capital Cost ($000)	SWEPCO 2011-2040 CPW Revenue Requirements ($000)	Cost over NID(Case 7) 7/2016 In-Svc ($000)	Cost over NID(Case 3) **4/2016** In-Svc ($000)	Cost over NID(Case 6) **1/2016** In-Svc ($000)
1	NID 30-mo. (Case 7)	7/1/2016	193,360	19,436,651	**-**	(15,878)	(32,031)
2	NID 27-mo. (Case 3)	4/1/2016	199,230	19,452,529	**15,878**	-	(16,153)
3	DFGD SDA (Case 5)	1/1/2016	203,500	19,464,455	**27,804**	11,927	(4,226)
4	DFGD NID 24-mo. (Case 6)	1/1/2016	205,635	19,468,681	**32,031**	16,153	-
5	DFGD CDS (Case 4)	4/1/2016	223,247	19,483,568	**46,917**	31,039	14,886
6	Wet FGD (Case 1)	4/1/2016	271,653	19,556,872	**120,221**	104,344	88,191