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MISSOURI PUBLIC SERVICE COMMISSION

CASE NO. ER-2011-0028

DIRECT TESTIMONY

OF

MARK C. BIRK

ON

BEHALF OF

UNION ELECTRIC COMPANY
d/b/a AmerenUE

St. Louis, Missouri
September, 2010

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DIRECT TESTIMONY

OF

MARK C. BIRK

CASE NO. ER-2011-0028

I. INTRODUCTION

Q. Please state your name and business address.

A. My name is Mark C. Birk. My business address is One Ameren Plaza, 1901 Chouteau Avenue, St. Louis, Missouri.

Q. By whom and in what capacity are you employed?

A. I am employed by Union Electric Company d/b/a AmerenUE ("Company" or "AmerenUE") as Vice President of Power Operations.

Q. Please describe your educational background and employment experience.

A. I received my Bachelor of Science degree in Electrical Engineering from the University of Missouri-Rolla in 1986 and my Master of Science in Electrical Engineering from the same institution in 1991. In 2009, I also received a Master of Business Administration from Washington University in St. Louis. I am a licensed professional engineer in the State of Missouri. I began my employment with Union Electric Company in 1986 as an assistant engineer in the nuclear function. In 1989, I transferred to Union Electric's Meramec Power Plant as an electrical engineer. In 1996, I transferred to the Energy Supply Operations Group and became a Power Supply Supervisor. I became Manager of Energy Supply Operations in the spring of 2000. I became General Manager of Energy Delivery Technical Services in the fall of 2001 and

Vice President of that department in 2002. I became Vice President of Ameren Energy, Inc., Ameren Corporation's short-term trading affiliate, in the fall of 2003 and assumed my current position with AmerenUE as Vice President of Power Operations in September of 2004.

Q. Please summarize your duties and responsibilities as Vice President of Power Operations for AmerenUE.

A. I am responsible for all of the generation assets of AmerenUE, except the Callaway Nuclear Plant, which is within the responsibility of Adam C. Heflin. This includes responsibility for the Company's coal-fired base load fleet, responsibility for the Company's intermediate and peaking combustion turbine generating units, and responsibility for the Company's hydroelectric plants. In addition to being chief safety officer for AmerenUE's non-nuclear generation fleet, I am also responsible for the safe, reliable and efficient operation of the plants, environmental compliance at the plants, and the design, construction management and implementation of all plant-related projects.

II. PURPOSE OF TESTIMONY

Q. What is the purpose of your direct testimony in this proceeding?

A. The purpose of my testimony is to address two issues, as follows: (1) adding to rate base the wet flue gas desulfurization units ("WFGD" or "scrubbers") being installed on both of the generating units at the Sioux Plant, which are expected to be placed in-service in November/December of this year; and (2) adding to rate base a small portion of the Company's investment in the new roller compacted concrete upper reservoir at the Taum Sauk Plant, consistent with the Company's agreement with the State of Missouri, which was placed in-service in April 2010.

III. SIOUX WFGD PROJECT

Q. Please briefly outline the topics you will address relating to the Sioux WFGD Project.

A. My testimony will provide an overview of the project, including (i) a description of the project; (ii) a description of AmerenUE's cost, schedule and overall project management; and (iii) an explanation of the final anticipated cost of the project and how this compares with earlier estimates.

Q. What is the purpose of scrubbers and how do they function?

A. The purpose of the scrubbers is to remove acid gases (e.g., sulfur dioxide or SO_2) from the flue gases before they exit the plant. SO_2 is formed from sulfur naturally occurring in the coal when it is burned to generate electricity at the plant. The scrubbers at Sioux were designed to remove in excess of 95% of the SO_2 generated by the plant. Based upon our expected fuel blend at the Sioux Plant in 2011, this would equate to an approximately 45,000 ton reduction in SO_2 emissions in 2011 versus the 2010 SO_2 emissions. A "wet" scrubber, the type being installed at the Sioux Plant, removes SO_2 by passing the flue gas through a spray of limestone slurry solution in the scrubber reaction vessel (absorber). A chemical reaction between the limestone, air, water and SO_2 converts the SO_2 to calcium sulfate, which is then removed from the scrubber and, in the case of the Sioux Plant, pumped in slurry form to the on-site landfill for final disposal.

Q. Will the Sioux Plant scrubbers provide additional environmental or other benefits?

A. Yes. In addition to SO_2 removal, the scrubbers at the Sioux Plant will also provide the additional benefit of removing oxidized mercury, sulfur trioxide, particulate, hydrogen chloride, and hydrogen fluoride from the flue gases before those gases leave the plant. In addition to the pollution reduction benefits associated with removing these pollutants, there are other benefits as well. For example, given the very likely adoption of new mercury rules in the relatively near future, the scrubbers at the Sioux Plant are expected to significantly lower operations and maintenance ("O&M") costs compared to the other alternative for removing mercury; that is, the use of activated carbon. Another benefit arises from the removal of sulfur trioxide because this chemical compound can condense into sulfuric acid and cause corrosion to plant components. The WFGD units at the Sioux Plant also allow greater fuel flexibility and better diversification across the AmerenUE coal fleet. Prior to installation of the scrubbers the plant could only economically burn a relatively small proportion of Illinois Basin fuels. As the cost of Powder River Basin ("PRB") coal continues to rise (including the very high relative cost of transporting PRB coal from Wyoming), the ability to burn more Illinois Basin coal when it is economical to do so will provide AmerenUE with a greater ability to achieve lower fuel costs and potentially higher unit capacities.

Q. Please provide a description of the scope of work for the scrubber project at Sioux.

A. Key components of the scrubbers that are being installed include the following items:

__**WFGD Absorbers:**__ These are carbon steel vessels which include Stebbins tile ceramic brick liners and various alloy materials. Each generating unit has its own absorber, each of which is approximately 140 feet high and 70 feet in diameter. These absorbers contain multiple piping headers and spray nozzles to effectively disperse the limestone slurry mixture into the flue gases.

Common Service Building: The two absorbers are served by a large common service building approximately 72 feet deep, 198 feet wide and 103 feet (10 stories) high. The main components contained in the service building are the slurry recirculation pumps (approximately 1750 horsepower ("HP") each), and the necessary electrical equipment and other process control related items to continuously supply the limestone slurry to the absorber vessels. Each slurry pump has the capacity to pump more than 54,000 gallons of slurry per minute and, at full load, four of the five pumps are operational. The fifth pump serves as an in-place spare.

Limestone Handling System: A limestone handling system includes two large domes to store powdered limestone, a receiving system with blowers to allow unloading of limestone from outside the plant security fence from up to approximately 40 trucks per day, equipment to mix the limestone with water, storage tanks and forwarding pumps.

Flue Gas Handling System: Significant flue gas handling equipment includes a total of four 14,500 HP induced draft ("ID") fans and an approximately 500-foot (50 story) tall wet chimney. The new ID fans were designed with adequate margin to allow installation of selected catalytic reduction ("SCR") technology for NOx removal should this be required by future environmental regulation.

Electrical System: Extensive electrical and control additions were necessary to power and control all the new equipment as each scrubber uses approximately 12 MW of additional auxiliary power. The majority of electrical switchgear and equipment was fabricated off-site in pre-fabricated modules, or Power Distribution Centers ("PDCs"), as opposed to being supplied and erected on-site. The selection of PDCs was based on an economic evaluation and the desire to reduce construction risk by moving labor to the shop rather than the field environment. For example, the PDC for the scrubber building is a very large structure, approximately 120 feet long by 40 feet wide, and contains 68 high voltage circuit breakers as well as lower voltage breakers, and relay and controls equipment.

In summary, adding the scrubbers at the Sioux Plant can be best compared to newly constructing a large chemical and materials handling plant in an existing generating plant and then interfacing that new plant with the existing plant. Included as Schedule MCB-E1 to this testimony are pictures showing the major components of the scrubbers.

Q. You outlined several benefits of the scrubbers earlier. Please elaborate on why AmerenUE's plans in 2006 were to install scrubbers at some of its plants.

A. The driving forces behind the potential installation of scrubbers at multiple plants, including the Sioux Plant, were the following rules promulgated by the United States Environmental Protection Agency ("USEPA"):

Clean Air Interstate Rule ("CAIR") – March 10, 2005

Clean Air Mercury Rule ("CAMR") – March 15, 2005

Both CAIR and CAMR were "cap & trade"-based rules, allowing compliance either through emission reductions or through a trading program involving SO_2 and mercury ("Hg") emissions allowances. Because CAIR and CAMR impacted all of AmerenUE's coal-fired units and not just Sioux, the Company conducted an economic analysis (based upon the best available information at the time) of various compliance strategies. Specifically, the Company evaluated the following: (1) reliance upon the use of emissions allowances only (which were expected to last only seven to eight years if the existing allowances were used at then-current emission rates), (2) installation of scrubbers on nearly all of AmerenUE's coal-fired generating units, and (3) various combinations of the installation of scrubbers on select generating units and the use of emissions allowances. This analysis included the examination of scenarios where the in-service dates for the scrubbers were varied. As a result of this analysis, AmerenUE developed a compliance strategy which included the installation of scrubbers on select generating units in a phased-in approach and the use of AmerenUE's existing SO_2 emissions allowance bank. This strategy balanced the use of allowances, and the optimization of capital expenditures for scrubbers as the means to comply with the CAIR and CAMR regulations. This strategy also allows a phased-in approach in terms of when costs associated with environmental compliance will be passed on to ratepayers.

Q. Why did AmerenUE decide to proceed with the installation of scrubbers at the Sioux Plant?

A. Having determined that the Company's compliance strategy would rely, in part, on the installation of scrubbers at some of its generating units, AmerenUE decided to install scrubbers at the Sioux Plant for several reasons. In 2005, there was significant uncertainty concerning the pricing and availability of future SO_2 allowances. The Sioux Plant is our most efficient fossil plant from a heat rate perspective. In order to maintain full capacity, however, it must burn a blend of Powder River Basin coal and higher sulfur Eastern coal (e.g., Illinois Basin). By installing scrubbers at the Sioux Plant and effectively utilizing existing SO_2 allowances, AmerenUE was able to comply with CAIR requirements and delay significant capital expenditures associated with expected future scrubber installations at its Rush Island and Labadie Plants. The scrubbers also will provide improved air quality for the St. Louis region as the Sioux Plant emitted the most SO_2 tons per generating unit (approximately 25,000 tons per unit in 2010) of any of the AmerenUE generating units. Lastly, installing scrubbers at the Sioux Plant -- one of the more difficult retrofit construction projects (as explained below) -- would provide operating and construction experience with a new technology for the AmerenUE system which would be useful when the Company proceeded with what was then expected to be the need to install additional scrubbers at its generating plants at Rush Island and Labadie.

It should be noted that in July 2010, the USEPA issued a draft rule that is expected to replace the CAIR rules (called the Clean Air Transport Rule ("CATR")). The CATR is complex and remains under study, but a preliminary review of the new rule suggests that AmerenUE would not be in compliance with the projected emission limits under the CATR without the Sioux scrubbers; that is, use of SO_2 allowances alone would not achieve compliance with the CATR.

Q. Please describe the challenges and complexities (in general – not Sioux specific) associated with a multi-year, large-scale construction project such as the installation of the scrubbers?

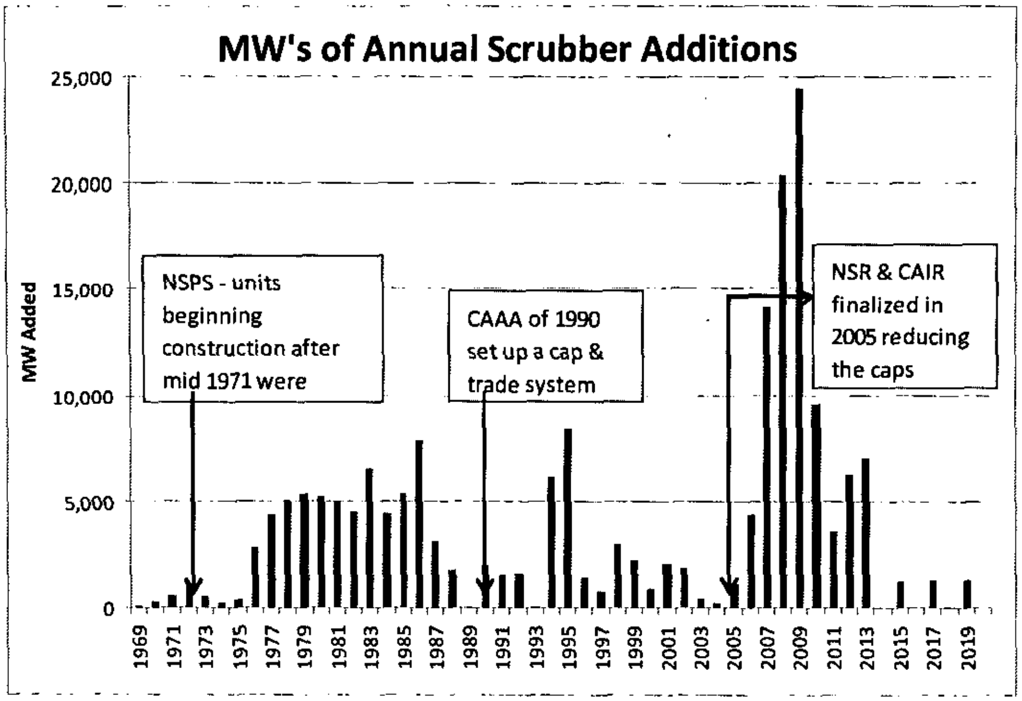
A. The evaluation and selection of the equipment and materials required for complex industrial projects (whether a scrubber or similar projects) present particular challenges and require an extensive design process. Retrofit projects (including scrubbers) are generally far more complicated than new construction as there are typically many more space and operating constraints involved. More specifically, a large project of this type requires literally millions of man-hours including engineering, procurement, contract development, site preparation, and construction of new buildings, chimneys, and equipment that comprises the retrofitted facility (in this case, two scrubbers). A typical scrubber project can contain over 200 miles of electrical cable, 70,000 feet of process piping and 2,000 tons of structural steel. Moreover, large projects require frequent interaction and coordination with the operating plant staff and result in the need to adjust the design and construction to accommodate the on-going operation of the units. Finally, multi-year large projects are impacted as market conditions change over a period of time. Changing market conditions can include changes in the labor, material and equipment markets.

Q. Aside from the normal challenges inherent in engaging in a multi-year, large scale construction project, did the Company face any unique challenges at the Sioux Plant?

A. Yes. The unique challenges relating to the installation of the scrubbers at the Sioux Plant fall into five main categories: first, an extremely tight labor market due to significant planned construction in the region (both utility and non-utility construction) put upward pressure on the costs of labor needed to build the project; second, the large number of utility environmental control projects underway or expected to be underway in the mid- to late-2000s (driven by CAIR/CAMR), including a large number of scrubbers that would be needed, put substantial upward pressure on material and equipment costs; third, commodity prices for raw materials such as steel and copper were increasing significantly because of the growing global economy -- particularly in China; fourth, there are many unique characteristics of the Sioux Plant site relating to its age, location and size which increased the complexity of the installation of scrubbers at the Sioux Plant; and fifth, during construction, the country in general and AmerenUE in particular had to deal with the late 2008/2009 banking and liquidity crisis that made access to cash the Company needed to operate its business uncertain and necessitated a schedule change for the project.

Q. Please elaborate on the challenges which relate to the cost of labor, materials and equipment necessary for construction.

A. In 2006, AmerenUE identified over $100 billion in construction projects in the next five to seven years that would be competing for resources during the installation of scrubbers at the Sioux Plant and other generating units. Significant examples in close proximity included the Prairie State Energy Campus being built in Southern Illinois, an overhaul at the Conoco-Phillips refinery in Wood River, Illinois, and construction of Holcim's St. Genevieve, Missouri cement plant. Analysis of available construction labor resources revealed likely shortages of boilermakers and the other key skilled craft labor required to construct scrubber projects. At the same time that industrial construction in general was in a relative boom period, the new CAIR rule prompted a significant rise in utility scrubber projects across the country, as demonstrated by the following graph:



Q. You mentioned earlier that the Sioux Plant site presented unique challenges to the scrubber project. Please describe them.

A. First and foremost, when Sioux was originally designed in the 1960's, no allocation of space was made for a future expansion of this magnitude Adding the scrubbers at the Sioux Plant was like wedging a football field-sized chemical plant between the existing smokestacks, coal pile and ash pond. As a result, there were significant space and lay-down challenges as well as the need to provide access for up to 550 construction workers at peak levels. Examples of the space constraints include the need to entirely remove the tire derived fuel system ("TDF") to accommodate the scrubber building, the need to remove the old water treatment plant (and to construct a new primary water treatment plant at a different location) to allow space for the new ID fans, and the need to temporarily fill-in a significant portion of the fly ash pond to allow for construction trailers, laydown and fabrication areas near the scrubbers. These constraints can be readily seen at pages 1, 3 and 4 of Schedule MCB-E1. A significant amount of demolition and relocation work was also required beyond the TDF facility including relocation of the waste oil tank and compressed hydrogen, nitrogen and CO_2 tanks.

There were also several support systems at the Sioux Plant that needed to be upgraded as part of the scrubber installations. The scrubbers require a significant amount of water for operation. This required replacement of the circulating water pumps, as well as the low pressure raw water pumps, and piping modifications. The new ID fans required upgrading and replacement of existing ductwork sections as well as controls upgrades.

Other unique features of the Sioux site include its sub-surface structure which, without significant modification, was not suitable for the scrubber construction. Specifically, the Sioux Plant was originally installed on fill removed from the Mississippi River. As a result, all significant scrubber structures required "H-pile" to be driven to bedrock approximately 120 feet below grade. Over 1,400 piles were required to be driven and significant coordination was needed to handle receiving approximately 100 rail cars of pile material as well as movement and storage on-site. Due to its geographic location, the Sioux Plant is also unique among the AmerenUE coal plants in that it can become an island during either Mississippi or Missouri River floods. This potential had a significant impact on the limestone storage systems in that large amounts of reagent must be stored should deliveries not be possible. While a typical plant may maintain an inventory of five to seven days of powdered limestone, the Sioux Plant was designed for 30-day storage, requiring unique dome structures (as opposed to silos) to store the large volume of material necessary to ensure the continued operation of the scrubbers during extreme weather conditions.

Q. Who were the major parties involved with design and construction of the Sioux scrubbers and what roles did they play?

A. There were several major parties involved with the design and construction of the Sioux scrubbers. Key parties and roles were as follows:

- **Sargent & Lundy LLC ("S&L")**: Engineering studies, detailed design, permitting and procurement services for items less than $1 million.
- **Hitachi USA**: Scrubber process design and material supply; i.e., Hitachi provided the primary components of the scrubbers.
- **McCarthy Industrial Inc**: General contractor responsible for mechanical and civil erection.
- **Sachs Electric**: Electrical contractor responsible for electrical and controls installation.
- **Allied Power Solutions, LLC ("APS")**: Construction oversight and coordination, including cost and schedule tracking, ensuring project safety and quality, and providing project-related reporting to the Company.
- **Hillsdale Fabricators**: Ductwork and structural steel supplier.
- **Karenna:** Contractor responsible for the new chimney.

Q. Please describe how AmerenUE managed the Sioux Project.

A. Initially, AmerenUE managed the project primarily through use of Ameren Services Company personnel (including both engineering personnel and project management personnel) and through its contracts with APS and S&L. Effective

January 1, 2008, AmerenUE created a new Power Operations Services ("POS") organization to provide project management, engineering, construction and other operational services to the AmerenUE fossil, combustion turbine generating and hydroelectric plants. The primary reasons for creating the POS organization included considerations related to the Federal Energy Regulatory Commission ("FERC") code of conduct (i.e., information sharing restrictions between AmerenUE and Ameren Corporation's unregulated generating company subsidiaries) and Commission Staff recommendations arising from the Taum Sauk event.

Until the organizational changes in 2008, project management was provided using APS and S&L personnel and also Ameren Services and AmerenUE personnel. APS' project management role was to take primary responsibility for construction oversight, tracking and reporting of construction costs, scheduling, and "lessons learned" across all of the scrubber sites with which APS had involvement. S&L's project management role was to provide estimates on a monthly basis that included construction, material, engineering and all owner costs in an all-inclusive report. Monthly meetings were held with APS, the principal contractors and S&L to provide status updates and to make adjustments as necessary on the project. Weekly meetings were held to address and track project issues, and other meetings were held as necessary on major scope items such as the chimney and coatings.

After the reorganization I mentioned above, and consistent with AmerenUE taking greater responsibility for management and operation of its generating resources when the POS organization was put into place, AmerenUE assumed management of the project in place of Ameren Services and also assumed greater responsibility for project management, procurement and construction, which reduced the extent to which these services were provided by APS and S&L.

Q. You described the role of APS during the course of this Project. Why was APS formed to provide management services to AmerenUE for the project?

A. The APS agreement, coupled with the contracts with the five major contractors (Graycor, Alberici, Sachs, S&L and MCI), formed an alliance structure that provided all work at cost and included a fee-at-risk arrangement. This alliance was formed after lengthy negotiations in the wake of the much more stringent environmental requirements that had been adopted in 2005 (CAIR & CAMR), and at a time when many electric generating companies were facing the need to install scrubbers in the coming decade. Consequently, we were competing across various industries, both in the U.S. and abroad, for the same engineering and construction management services, labor, material and equipment in roughly the same time frame. As a result of these market forces, the cost and duration of designing and constructing scrubbers was increasing and was expected to continue to escalate, and finding qualified contractors and qualified craft labor was becoming more uncertain and difficult.

By using the alliance structure, Ameren Services Company (which, as noted earlier, provided significant services to AmerenUE in managing these kinds of projects at the time) was able to "lock in" major contractors to help mitigate the impact of these issues on the need to install scrubbers. Because Ameren Services was also managing the installation of scrubbers at two plants owned by AmerenUE's affiliate Ameren Energy Resources Generating Company ("AERG"), it was able to leverage the larger scope of the combined projects (three scrubber projects, not one) via the alliance structure.

Combining resources via the alliance structure provided several benefits because it allowed the sharing of contractor management and labor instead of each site competing for limited resources. One benefit realized through the use of the alliance was the transfer of "lessons learned" knowledge across all of the sites. The Sioux Plant has also benefited from operational knowledge gained during construction of scrubbers at AERG's Duck Creek and Coffeen Plants because both plants have already placed their scrubbers in service. An example of lessons learned include the discovery of some liner failures at both facilities shortly after start-up in the flake glass used as the absorber interior lining, which had originally been planned for the Sioux scrubbers. Other lessons learned from AERG include checking clearances in recirculation gearboxes and adjusting the Sioux scrubbers' gearboxes to avoid problems experienced at AERG's Coffeen Plant, and the installation of an additional drain at Sioux with additional coatings to avoid corrosion at the WFGD inlet, like that experienced at AERG's Duck Creek Plant.

Finally, Ameren Services previously had substantial (positive) experience with these contractors and the contractors were familiar with our operations.

Q. How did the contracts within this alliance structure operate?

A. Ameren Services negotiated an agreement with APS, whose members were Alberici, Graycor, MCI, Sachs and S&L (initially). AmerenUE contracted directly (for engineering or construction services, as applicable) with S&L, APS, Sachs and MCI. The APS contract allowed AmerenUE to take advantage of the alliance structure and allowed the benefits of this combined arrangement to be realized by all of the projects at both AmerenUE and AERG. Individual contracts with AmerenUE were "Sioux specific" and provided for the construction and engineering services needed to build the Sioux scrubbers. All of the contracts were cost-based. The contracts used a variable profit structure capped at a maximum profit payout, with the range of profit being the product of extensive negotiations among the companies that were part of the alliance structure. Actual profit realized (within those ranges) was based upon key performance indicators: safety, cost, schedule compliance and customer satisfaction.

Q. Please elaborate on some of the specific responsibilities of APS in this alliance structure.

A. APS provided Project and Construction Management for all the scrubber installations at AmerenUE and AERG. For the Sioux project, its duties included oversight of the engineering deliverables, procurement and construction for the project. APS' responsibilities included providing services for common procurement of bulk materials. This arrangement was developed to maximize purchasing power through volume to reduce costs. Construction Management included responsibilities for subcontractors, schedule, safety, budget, quality assurance/quality control, inventories and deliveries. APS also provided robust construction cost tracking in detailed monthly reports.

Q. How did S&L's role relate to the alliance structure?

A. S&L was directly responsible for providing the engineering services for the project under its contract with AmerenUE. Prior to moving primarily to a construction phase for the project, S&L also operated within the alliance structure as part of APS' construction and project management team. More specifically, while operating within the alliance structure, S&L worked with the construction contractors to coordinate design packages and constructability reviews with the goal of optimizing overall value and reducing costs. As noted, S&L transitioned out of this role with APS when the project moved primarily to its construction phase.

Q. You mentioned that APS provided cost tracking services. What other cost management controls were in place for the Sioux project?

A. APS provided cost tracking services for the construction portion of the project. Cost tracking for the overall scrubber project was managed by a combination of Ameren Services, AmerenUE and S&L. S&L created monthly cost reports based on input from Ameren Services, AmerenUE and APS. Reports were reviewed by AmerenUE and used as a basis for budget and cash flow forecasting for the project. As the project progressed and the scope became better defined, changes to the project were made through a formal change order process. Key reviews for change orders were made for both technical and cost justification. Change orders were tracked by APS. Throughout the course of the Sioux project, AmerenUE—along with third-party auditing firms—audited its construction management practices. As a result of these audits, changes were made during the construction process to better control costs and tighten management practices.

Both internal audits and independent audits performed by KPMG, Ernst and Young and Burns & McDonnell were also employed to control project costs. Each audit was targeted to specific areas of focus and included both APS and S&L. Audit findings and corrective actions were evaluated and addressed by AmerenUE.

Q. What is the estimated cost of the Sioux project?

A. The capital work order currently approved for the project totals approximately $628 million, which was the last definitive estimate for the project based upon a work order extension approved in June 2009. However, since approval of the $628 million estimate we now believe that the final capital cost will be approximately $594 million. The lower $594 million estimate is based upon the advanced status of the project, with engineering now 100% complete and construction now approximately 92% complete.

Q. How do these figures differ from earlier definitive estimates for the project?

A. In May 2008, AmerenUE established the first definitive estimate for the project at approximately $498 million, which was based on engineering being approximately 75% complete. At the time of the May 2008 estimate, major equipment contracts had been awarded, demolition activities were complete, the chimney and absorber shells were complete, absorber building steel was roughly 50% complete, and overall construction was approximately 30% complete. Details regarding the May 2008 estimate were provided to the Staff during an August 2008 project briefing, which is attached to my testimony as Schedule MCB-E2.

Subsequent to May 2008, the project was re-estimated based on meaningful changes (including a significant schedule change caused by the liquidity crisis in late 2008) resulting in an upward revision of the capital estimate in April 2009 to the approximately $628 million estimate that is included in the currently approved work order for the project. The cost change from May 2008 to April 2009 was primarily due to the following:

- Construction cost increases: approximately $47 million, including:
  - Absorber interior lining change.
  - Fall 2008 replacement of ESP inlet ductwork due to draft pressure issues associated with scrubbers.

  - Powdered limestone costs that were not included in 2008 estimate.
  - Electrical construction costs due to finalization of design.
- Construction slowdown increase of approximately $18 million arising from the need to defer 2009 capital expenditures at AmerenUE due to the severe liquidity crisis that was occurring in the Fall of 2008 and early in 2009.
- Engineered Equipment: Increase of approximately $18 million in engineered equipment due to including the Stebbins tile, and additional powdered limestone mechanical and electrical equipment.
- Indirect Expenses: Approximately $23 million increase including internal and external engineering resources due to design changes, permitting support, start-up and commissioning costs and outside audit costs.
- Withheld Contingency: Decreased approximately $4 million.
- AFUDC: Increase of approximately $28 million.

Details regarding this revised estimate were provided to the Staff during a May 2009 presentation, which is included as Schedule MCB-E3 to my testimony.

Q. What items primarily resulted in the lowering of this estimate to $594 million?

A. The updated approximately $594 million estimate for final completion is based primarily on the following two reductions from the April 2009 estimate of $628 million:

- Approximately $12.5 million decrease in wet grind costs; and
- Approximately $21.5 million decrease in project contingency (since we are now nearing project completion).

Q. The project was approved in September 2005. Was an estimated cost of the project developed at that time?

A. Yes. The project was preliminarily approved and initiated based upon a conceptual estimate in September 2005 of $327 million, which was revised upward to approximately $335 million in 2006 after decisions were made as to the particular FGD technology to be utilized. As is typical of preliminary conceptual estimates, this early Sioux estimate was inaccurate because it was developed at a time when no engineering for the Sioux project had been completed and when no equipment had been purchased. Engineering firms develop these preliminary, conceptual estimates by extrapolating data from previous projects at other plants in other parts of the country. Ultimately, construction costs are highly site-specific. Some factors that influence the cost of scrubber systems include unit size, design, sulfur concentration of the fuel, stack requirements (both from a height and seismic perspective), required electrical system upgrades to the existing plant, materials associated with construction, severity of site constraints (as discussed earlier), material handling systems needed for limestone and scrubber by products, availability and cost of construction labor and market/economic conditions during project construction.

Q. What were the principal drivers of the difference in the conceptual estimate versus the definitive estimate?

A. As I noted, the conceptual estimate was essentially derived from an attempt to use other scrubber project cost estimates as a proxy for the cost of a scrubber at the Sioux Plant, whereas the definitive estimate was based upon Sioux-specific engineering (which in 2008 was 75% complete), and labor, material, and equipment costs. Construction itself was 25% complete when the May 2008 definitive estimate was developed. Moreover, between 2005 (when the conceptual estimate was developed) and May 2008, we saw drastic increases in material quantities and commodity prices including steel and copper; moreover, the pace of announced scrubber and other industrial projects accelerated substantially (driving up equipment and subcontractor costs), and we also ended up designing scrubbers with some features not initially conceptualized (e.g., use of ID fans instead of booster fans; guillotine dampers instead of louvers; and the inclusion of an additional draft system capability to later add a selective catalytic reduction unit, due to anticipated environmental requirements).

Q. Are the scrubbers on track to be placed in service in November/December of this year, as you had mentioned earlier?

A. Yes. The majority of systems associated with the unit 2 scrubber have been tested and plans are in place to begin the scrubber tie-in for unit 2 coincident with its major overhaul that begins in early September. We currently expect unit 2 to return to service, with the scrubber in service, in early November. Commissioning activities are currently ongoing on unit 1 and we currently expect to take unit 1 out of service in mid-November for approximately four weeks to tie-in its scrubber and unit 1 should return to service in mid-December.

IV. TAUM SAUK PLANT/NEW UPPER RESERVOIR PROJECT

Q. What topics relating to the Taum Sauk Plant will you address in this testimony?

A. My testimony provides an overview of the Taum Sauk Hydroelectric Plant and the new upper reservoir project including: (i) a description of the plant and the new upper reservoir; (ii) details of the December 2005 breach of the old upper reservoir, and the subsequent investigation into the breach; (iii) a discussion of the costs relating to enhancements in the new upper reservoir versus the old upper reservoir, and a brief discussion of costs that would have been incurred even in the absence of the failure of the old upper reservoir; and (iv) a description of the costs of the project, the rate base investment included in the revenue requirement in this case, and costs that AmerenUE has absorbed arising from the breach.

A. TAUM SAUK PLANT DESCRIPTION

Q. Please provide a description of the Taum Sauk Plant.

A. The Taum Sauk Plant is located in Reynolds County, Missouri, on the East Fork of the Black River, approximately 90 miles southwest of St. Louis. It is a reversible pumped storage project used to supplement the generation and transmission facilities of AmerenUE, and consists of a ridge top upper reservoir, a shaft and tunnel conduit, two 220 megawatt pump-turbine units, a motor-generator plant, and a lower reservoir. The plant originally began operation in 1963, and was taken out of service after the upper reservoir breach that occurred on December 14, 2005. The plant resumed normal commercial operation on April 15, 2010.

Q. How does a pumped storage plant like Taum Sauk operate?

A. Taum Sauk is used primarily on a peaking basis and is dispatched when the demand for electricity is greatest. The pumped storage system works much like a conventional hydroelectric plant, but is usually used to meet daily peak power demands for short periods. Water stored in an upper reservoir is released to flow through turbines and into a lower reservoir during periods of high energy demand. Then, overnight, when the demand for electricity is low and market prices for electricity tend to be reduced, the water is pumped back into the upper reservoir, where it is stored until needed. As water passes through the powerhouse, water spins the turbines, which drive generators to produce electricity. As an added benefit, Taum Sauk is able to come on-line at full capacity in a very short timeframe, as opposed to the longer start-up times required for most other types of generation.

Q. What value does Taum Sauk add to the AmerenUE generating fleet?

A. The Taum Sauk Plant's unique characteristics provide several benefits to the AmerenUE generation portfolio. It allows us to effectively store energy - like a big battery - and use it when it's needed most. AmerenUE is able to make use of excess low-cost generation at night from nuclear, coal, wind, and other generating resources to pump water to the upper reservoir. During the day when energy loads are at their peak, we are able to utilize this stored potential energy and provide generation, thereby eliminating the near-term need to install additional base load generation facilities. Unlike most of AmerenUE's coal-fired generation, the Taum Sauk Plant is capable of coming on-line and can be loaded to full capability within ten minutes. This unique ability positions the plant to support the stability and reliability of the regional electric system, should another generating asset be forced off-line for some reason. The plant's turbine runners were replaced in the late 1990's, which increased the efficiency and reliability of the plant.

B. THE DECEMBER 2005 BREACH

Q. Please provide an explanation of the breach event that occurred on December 14, 2005.

A. During the early morning hours on December 14, 2005, a portion of the parapet wall and the northwest corner of the dike around the upper reservoir breached over a width of about 700 feet, causing an uncontrolled, rapid release of water down the west slope of Profitt Mountain and into the East Fork of the Black River. The release of water destroyed a private residence, flooded Route N, and caused property and environmental damage to Johnson's Shut-Ins State Park and Campground. Fortunately there were no fatalities. AmerenUE commissioned a forensic investigation into the causes of the breach event and the stability failure of the dike. A primary cause of the breach was the unintentional over-pumping of the reservoir, due to problems with the level control instrumentation. Dam engineering firm Paul C. Rizzo Associates ("PCR") completed the investigation, which concluded the following:

> The stability failure of the dike was caused by:
>
> (1) A rapid rise in the phreatic surface and the associated pore pressure at the dike/foundation interface caused by the flow overtopping the parapet wall.
> (2) Weak foundation conditions attributed to the original design and construction specifications.
> (3) Inadequate shear strength of the material comprising the rock-fill attributed to the original design and construction practices.
> (4) Poor construction practices and failure to meet the intended design criteria.[1]

The Federal Energy Regulatory Commission ("FERC") also performed an independent investigation, which documented findings similar to the PCR report leading up to the failure of the parapet wall and section of dike. However, the FERC investigation differed slightly from the PCR report on the failure scenario. The FERC report noted that overtopping of the parapet wall started eroding the dike material on the downstream toe of the reservoir. The erosion then progressed below the parapet wall, likely causing instability and resulting in the initial loss of one or two parapet wall sections. Subsequent erosion and breach of the rock-fill embankment resulted in the final overall breach.

Q. What were the lessons learned and actions taken resulting from the forensic investigation that was performed?

A. While the original upper reservoir design was consistent with the general design practice of the late 1950s and early 1960s, it is not consistent with current

[1] PCR, 2006, *Forensic Investigation and Root Cause Analysis, December 14, 2005 Incident, Upper Reservoir Dike, Taum Sauk Plant, FERC Project No. 2277*, p. 129 ("PCR Forensic Investigation Report").

engineering design practice and, as indicated in the direct testimony of PCR President and CEO Paul C. Rizzo, who is also filing direct testimony in this proceeding on behalf of AmerenUE, was not consistent with current dam safety requirements, including the FERC's Engineering Guidelines. Specifically, the rock that filled the old upper reservoir dike was dumped and then sluiced with water to remove fine material which moved the rock into a more dense state. Today, rock-fill is compacted with compacters and carefully monitored to prevent the inclusion of "fines" within the rock. Water sluicing is an abandoned practice. In addition, the modern day designer places a great deal of emphasis on the preparation of the foundation rock, including hand cleaning and removal of soil, weathered rock and other relatively low strength material – none of which were adequately specified in the original design.

It was PCR's opinion that the construction practices followed in the field during original construction were not consistent with the design as shown on the drawings and in the specifications. Sluicing was specified by the designer for the removal of fines from the dumped rock-fill. Observation of the breach slopes clearly indicated that this was not uniformly achieved during construction. The design also called for the foundation rock to be cleaned with a bulldozer such that not more than two inches of low-strength material was left in place under the foundation. Yet, our field investigation determined that as much as 18 inches of virgin, low-strength material was left in place in certain areas.

The PCR Forensic Investigation Report also found a number of contributing causes, which either singularly or in combination with other contributing causes, would not have caused the stability failure of the rock-fill dike. First, the failure of the reservoir level monitoring instrumentation to function as intended due to a failure of the instrumentation support system. Second, the failure of the level protection instrumentation to function as intended due to a misplacement of the level protection instrumentation as a result of human error. Third, it was PCR's opinion that inadequate attention was paid to dam safety considerations in regard to the design, operation, and management of the facility, and that this may also have been a contributing cause of the event. However, as noted, none of these contributing causes by themselves would have led to the stability failure of the dike.

AmerenUE took a number of actions in response to these investigatory findings, including the establishment of a formal Dam Safety Program, which included the creation of a new Chief Dam Safety Engineer position; the establishment of a new Quality Management Department; and the implementation of formal evaluation of training requirements, which resulted in substantial additional training (in a variety of areas) for AmerenUE Generation employees.

C. THE NEW UPPER RESERVOIR PROJECT

Q. How was the decision made to build a new upper reservoir, and what approvals were required?

A. After the forensic investigation of the breach was complete, AmerenUE quickly moved forward with a preliminary design for a new upper reservoir, and produced conceptual drawings, cost estimates, and schedules. Various alternatives were reviewed and compared. AmerenUE worked closely with the FERC to determine the best and most economical method to bring the plant back to an operational condition. A Board of Consultants ("BOC") recommended by AmerenUE and approved by the FERC, together with an Independent Panel of Consultants ("IPOC") appointed by the FERC, and AmerenUE's consultant, PCR, all determined that the best alternative was the construction of a new upper reservoir utilizing Roller Compacted Concrete ("RCC"). During the design phase of the project, AmerenUE entered into a settlement agreement with the State of Missouri, settling all claims associated with the breach event. As part of this settlement, AmerenUE was required to build a new upper reservoir and bring the plant back into operation. AmerenUE satisfied the requirements set forth by the FERC, and in August, 2007 received authorization for the construction project. The first RCC was placed on October 10, 2007.

Q. What type of procedures and project controls did AmerenUE have in place to ensure that the new upper reservoir was constructed with the highest possible quality?

A. At the outset of the project, the FERC required AmerenUE to retain the BOC, which I referred to earlier. The BOC was made up of internationally recognized hydroelectric engineering experts, and its composition was approved by the FERC. The FERC also retained its own panel of industry experts (the IPOC mentioned earlier) to oversee the design and construction efforts. These groups, along with personnel from various FERC regions, met regularly during the design and construction to initially review the design, and eventually to study the construction phase. AmerenUE's own Dam Safety and Hydro Engineering ("DSHE") department also played a large role during each phase through design and on-site construction reviews. Commission Staff engineers were part of the efforts as well and regularly attended the FERC/BOC/IPOC meetings.

To ensure the project was constructed with the highest possible quality, AmerenUE adopted a formal Quality Control and Inspection Program ("QCIP"). The QCIP formed the framework by which the construction could be controlled and quality assured. The QCIP was written specifically for the project, although it utilized the guidelines required by the FERC. The QCIP was led and formally administered by AmerenUE's Chief Dam Safety Engineer ("CDSE") and Project Manager. While the general contractor performed much of the quality control efforts in the field, quality assurance was maintained by the on-site Resident Engineers and an outside independent testing agency (Fall Line Testing). Quality assurance/quality control activities were controlled by the Resident Engineer, and formal "stop work" authority was granted to certain individuals through the program. Audits of the program were required and performed at the direction of the CDSE.

Q. Were there any circumstances or conditions that were not reasonably foreseeable prior to the start of the project that were encountered in constructing the new the upper reservoir?

A. During the over two-year-long construction period, many challenges were presented which the project management team overcame to complete the project. Although each challenge was unique, one of the most difficult to deal with was the inclement weather experienced at high elevations on Proffitt Mountain from 2007-2009. This timeframe had one of the wettest springs on record for the area, as well as some of the colder and icier winters of recent years. Extreme heat, cold snaps, fog, and frequent storms (highlighted by the May 8, 2009 "inland hurricane" storm that shut down power and operations for an extended period of time and caused approximately $1 million worth of damage to construction equipment) were events that constantly challenged the management teams and often resulted in schedule setbacks.

In addition to the weather issues, other events also challenged the site professionals. During excavation of the foundation, geologic anomalies (e.g., unexpected clay seams that required extensive excavation so that the foundation could rest on bedrock) were uncovered. These anomalies required deeper excavations and additional design and construction efforts. Another issue that was not initially foreseen was the amount of "fines" or "dirty aggregate" in the original rock-fill dike. These fines contributed to a deleterious coating on the rock that was to be used in the RCC mix. This coating was difficult to remove and caused additional unforeseen expenses and schedule setbacks. Another unforeseen item that was identified early on in the construction period was some cracking between construction joints, which was addressed by a minor design change that called for adding additional PVC water-stops. The cost associated with all of these unforeseen circumstances or conditions totaled approximately $26 million.

Q. When did Taum Sauk go back into service?

A. The Taum Sauk Plant completed all of the in-service criteria agreed upon between the Company and the Commission Staff on April 15, 2010. It has been dispatched as required on a regular basis since that time.

Q. How has the plant been operating since it has returned to service?

A. The plant has operated extremely well and reliably since its return to service. Because the plant was idle for in excess of four years, we expected to have a period of time after the return to service that would require trouble-shooting of components where problems arose. There were some minor complications when the plant was operated during the first filling, but other than that, the plant has operated extremely well. In fact, as of mid-July, Taum Sauk had generated 84 days out of the 93 possible, and was available every day since the April 15th return to service.

D. ENHANCEMENTS AND COSTS THAT WOULD HAVE BEEN INCURRED ABSENT THE BREACH

Q. You mentioned a settlement agreement with the state of Missouri. Please elaborate.

A. The state of Missouri filed suit against AmerenUE for damages to Johnson's Shut-Ins State Park and Campground, which was heavily damaged by the water that rushed down Profitt Mountain as a result of the breach. The state's lawsuit was resolved by a November 2007 Consent Judgment agreed to by AmerenUE, which was approved by the Reynolds County Circuit Court and which resolved all claims of the state against AmerenUE. Under the Consent Judgment, AmerenUE agreed to build the new upper reservoir, pay damages and expend sums relating to rebuilding Johnson's Shut-Ins State Park and Campground of approximately $180 million, license an AmerenUE-owned railway corridor to the state for use as an extension to the Katy Trail in Western Missouri, and grant the state the right of first refusal to purchase Church Mountain, which is owned by AmerenUE. AmerenUE also agreed to continue to pay property taxes to the Reynolds County School Fund during the construction project to make up for tax revenues lost due to the plant being out of service. Finally, AmerenUE agreed that it would only seek to recover "allowed costs" from ratepayers, which are defined by the Consent Judgment as enhancements, costs incurred due to circumstances or conditions that are currently not reasonably foreseeable and costs that would have been incurred absent the breach.[2] As discussed below, AmerenUE has included in rate base approximately $92 million of the approximately $491 million in total construction costs for the new upper reservoir, all of which are allowed costs under the Consent Judgment.

Q. Enhancements are one type of allowed cost under the settlement agreement. What enhancements exist in the new upper reservoir?

A. At the outset of the project, AmerenUE made a conscious decision to construct the new upper reservoir using the most current state-of-the-art design, construction, and systems. We felt that it was important to construct the new reservoir such that it would be of the highest possible quality, and safe to operate for generations to come. Some of the discrete enhancements in the new upper reservoir not present in the old reservoir include the overflow release structure, the drainage and inspection gallery, a continuous upstream grout curtain, a cementitious floor, a crest concrete roadway and guardrail, crest-to-gallery and foundation drains, and new instrumentation. The new instrumentation is located throughout the dam in the inspection gallery and the new instrumentation building. The instrumentation in the gallery includes piezometers, flumes, and an accelerometer. The instruments in the instrumentation building include a vast array of control and protection probes for reservoir level control. The instruments there include differential pressure probes, conductivity probes, mechanical displacement (float) devices, radar instruments, and ultrasonic gap switches. All of this new instrumentation has redundant communication paths and power sources, and includes continuous video monitoring by approximately 12 cameras. The instruments are

[2] The Consent Judgment also required AmerenUE to provide written notice to the Attorney General, Director of the Department of Natural Resources and Director of the Department of Conservation prior to seeking to recover allowed costs in rates. Those notices were timely provided last month.

connected to AmerenUE's Local Area Network, and the new Distributed Control System. Operators and engineers are able to review and analyze the data received from the instrumentation on-site or remotely. The foregoing enhancements materially improve the performance, safety and reliability of the new upper reservoir as compared to the old upper reservoir. The cost of these discrete enhancements is approximately $67 million.

Q. Please provide additional information about these discrete enhancements.

A. The overflow release structure is an area approximately 800 feet long on the southeast portion of the dam where the crest is 2 feet lower than the rest of the dam. Should all of the level control and protection systems fail to shut off the pumps, the water will flow over the overflow release structure, down energy dissipation steps that are part of the structure, and into a "stilling basin." It will then flow down an uninhabited portion of Proffit Mountain (all on AmerenUE's property), and back into the lower reservoir.

The drainage and inspection gallery runs through the center portion of the dam, and runs the entire perimeter. The crest to gallery drains and foundation drains both drain to this gallery, where the leakage is quantified and safely routed out of the dam. The gallery contains vibrating wire piezometers, an accelerometer, joint meters, and flumes – all instrumentation to measure the "health" of the dam and provide real time information to the operators on how the dam is performing.

The continuous upstream grout curtain installed on the upstream portion of the dam prior to the first filling consists of holes drilled at very close spacing around the inside perimeter and filled with pressurized cementitious grout. The intent of the curtain is to fill in any cracks or voids to keep water from leaking under the dam.

The cementitious floor seals the exposed bedrock (to keep water from leaking through the floor) and to ensure positive drainage to the vertical shaft. During the periodic maintenance of the upper reservoir, the new floor is expected to keep the major siltation away from the dam walls and allow for much quicker access to dam interior.

The new crest roadway and guardrail allows for the passage of two vehicles, and has a robust downstream guardrail. It is much more durable and safe, in that it allows maintenance personnel to keep the roadway clear in the winter months. The previous dam crest was a gravel roadway, only wide enough for one vehicle, it was susceptible to frequent icing and winter weather problems, and did not have a downstream guardrail.

As noted, there are also crest-to-gallery and foundation drains, which are embedded within the dam, and were installed to collect any leakage (through the dam or under it) and safely route it to the drainage gallery.

The new instrumentation in the dam is significant. This instrumentation is located within the drainage gallery, on the dam crest, and within the instrumentation house. It includes the level control and protection equipment, as well as video cameras.

Q. Are those discrete items the only enhancements?

A. No. The safety, quality, reliability and life of the upper reservoir is also greatly increased by the fact that it is an RCC structure built to today's much more stringent dam safety guidelines, including the FERC's Engineering Guidelines, which didn't even exist in the 1960s. Perhaps most noteworthy among the enhanced features of the structure is the foundation of the new upper reservoir. The old upper reservoir did have "a foundation," but it was vastly inferior to the foundation in the new upper reservoir. The old foundation wasn't even built on bedrock in a significant number of areas and was constructed of dumped rock-fill. By contrast, the new foundation is set on bedrock – in some cases approximately 60 feet below grade level – and is made entirely of concrete. The new foundation was constructed to stringent seismic design standards, which have increased dramatically since the previous reservoir was designed approximately 50 years ago. The engineer-of-record, PCR, utilized the new FERC seismic standards when the new reservoir was designed. As a result, the new reservoir is designed to withstand much stronger seismic events, and has new strong motion (accelerometer) instrumentation to monitor and alarm when events like these occur. The new dam is capable of withstanding a magnitude 7.7 event in the New Madrid Seismic Zone or a 5.8 event within the local area around the Taum Sauk Plant. The cost of constructing this enhanced foundation was approximately $127 million.

There are also other enhancements to the dam that make it safer, more reliable and longer lived than the original upper reservoir. The roller compacted concrete used for the dam is far superior to the rock-fill material used for the prior dam in that it is safer, more durable, will last longer, and will withstand seismic events far greater than anything the old upper reservoir could have withstood.

Q. Do the enhancements you discussed have tangible benefits for AmerenUE's customers?

A. Yes. Because the new upper reservoir is comprised of RCC and conventional concrete, and as noted because it has an enhanced foundation that is set on bedrock, it has a service life far in excess of the service life that could have been achieved from the older upper reservoir.[3] The new upper reservoir's expected service life with

[3] In fact, as Mr. Rizzo testifies, the old upper reservoir's service life was essentially at its end, even if the breach had not occurred.

regular maintenance is at least 80 years. The longer service life provides the Company and its ratepayers the benefits of having a pumped-storage unit of this kind as part of AmerenUE's generation portfolio for decades to come.[4]

Q. Please elaborate on the benefit of this facility.

A. As I described earlier, the Taum Sauk Plant provides quick peaking capacity but also allows the Company to lower its overall net fuel costs (fuel and purchased power costs less off-system sales) because the power generated by the plant is more valuable than the power it takes to pump water up the mountain. This provides lower cost power to retail ratepayers when the power is used to serve load, and also allows a large quantity of off-system sales which also lower costs for customers.

The much longer life of the new facility (at least 80 years) means that the capacity and energy value of the facility – i.e., those lower net fuel costs – will accrue for decades. We have very conservatively estimated that the value of this energy and capacity over the next 80 years in 2010 dollars is at least $170 million.

The new upper reservoir also has additional energy value, apart from that produced by its longer life. This is because although the new upper reservoir was built essentially within the same footprint and shape as the old reservoir, we have determined that the upper reservoir has slightly greater capacity than the old upper reservoir. This too translates into additional energy and lower net fuel costs. We determined this by performing topographical surveys to compare the volume of the new reservoir with that of the old reservoir. While we are still evaluating the precise amount of additional capacity, our initial review shows an increase of approximately 100 megawatt-hours ("MWh's") per day during approximately three-fourths of the year (i.e,, the non-winter

[4] AmerenUE is depreciating the plant over 80 years.

months). Moreover, because of the manner in which we had to operate the older upper reservoir, we have an even greater capacity increase during the winter. This is because for various reasons associated with the water-retaining parapet wall, the old reservoir had to be placed into "winter service," which meant that AmerenUE operated the reservoir about 8 feet below its normal operating level from approximately December 15th through March 15th. Because the new upper reservoir does not have a water-retaining parapet wall, the "winter service" restrictions will not be required. As a result, we've estimated that approximately 300 additional MWh's per day can be generated by the plant during the winter months that were previously not possible. We've estimated the value of this additional energy (throughout the entire year) over an eighty year life to be approximately $7 million in 2010 dollars.

Q. Would some or all of the costs that AmerenUE incurred to build the new upper reservoir have been incurred even if the December, 2005 breach had not occurred?

A. Yes. As outlined in detail in Mr. Rizzo's direct testimony, the FERC-required Potential Failure Modes Analysis that would have commenced in 2008 and likely ended two or three years later would have ultimately required AmerenUE to either shut the plant down permanently at a huge cost, or to tear down the old upper reservoir and build a new upper reservoir essentially like the upper reservoir that we did build. In summary, essentially all of the costs we incurred would have been incurred even if the breach had not occurred.

E. PROJECT COSTS

Q. What was the final cost for the construction of the new upper reservoir?

A. As noted earlier, the final construction costs for the new upper reservoir are expected to be approximately $491 million.

Q. How much of the upper reservoir construction costs were covered by insurance?

A. AmerenUE recovered approximately $422 million from its property insurers. Approximately $25 million of that recovery relates to replacement power coverage, and approximately $3 million relates to covered operations and maintenance costs, leaving approximately $394 million of property insurance proceeds available for construction (approximately $97 million less than the expected construction costs). Approximately $6 million of the property insurance deductible relates to the construction portion of the insurance recovery.

Q. How much of the Company's investment in the new upper reservoir is included in rate base in this rate case?

A. After subtracting the approximately $6 million deductible mentioned above, we have included a total of approximately $92 million in the rate base that underlies our revenue requirement for this case.[5] This equates to a revenue requirement of approximately $15 million annually (i.e., the return, taxes and depreciation on the $92 million rate base addition) or a rate increase of approximately half of one percent.

[5] The actual rate base inclusion is $92.3 million, which varies slightly from the difference between the $97 million figure and the approximately $6 million deductible due to rounding.

Q. Is AmerenUE seeking recovery of all the costs it incurred as a result of the Taum Sauk failure?

A. No. AmerenUE has absorbed significant costs associated with the breach that are unrelated to the cost of constructing the new upper reservoir. The following is a list of some of the costs AmerenUE has absorbed[6]:

• Property Claim Deductible:	$15,000,000
• Costs Expensed on Property Claim:	$5,282,390
• Liability Claim Deductible:	$1,000,000
• FERC Fines:	$10,000,000
• Required Local Community Contributions:	$5,000,000
• Lost Energy & Capacity while Out of Service (net of replacement power insurance recovery):	$57,980,534
Total Costs Absorbed:	~~$73,980,534~~ $94,262,924

Q. Please summarize your testimony regarding the Company's investment in the new upper reservoir at the Taum Sauk Plant.

A. The Company has invested approximately $491 million in building a new, state-of-the-art upper reservoir that will enable the Taum Sauk Plant to provide service to customers for at least another 80 years. The approximately $92 million rate base addition included in the revenue requirement in this case consistent with the Company's settlement with the state of Missouri reflects a portion of the cost of enhancements made

[6] AmerenUE is currently involved in insurance litigation regarding collection of amounts related to third-party liabilities that AmerenUE had to pay, for which AmerenUE carried third-party liability insurance. If this litigation does not result in full indemnity for the liabilities AmerenUE has paid, the costs AmerenUE has absorbed will increase.

to the upper reservoir, and is also far less than the investment that would have been required to rebuild the facility even had the December, 2005 breach event not occurred. As a consequence of building this new facility, customers will benefit from this nearly $500 million facility while having just approximately 20% of its cost reflected in their rates. In addition, the new upper reservoir enables the Company to generate energy (and provide capacity) for decades to come, with a resulting benefit to customers (through lower net fuel costs in the Company's fuel adjustment clause) which we estimate, very conservatively, to be approximately $170 million in 2010 dollars.

Q. Does this conclude your direct testimony?

A. Yes, it does.

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of Union Electric Company d/b/a AmerenUE for Authority to File Tariffs Increasing Rates for Electric Service Provided to Customers in the Company's Missouri Service Area.	)))))	Case No. ER-2011-0028

AFFIDAVIT OF MARK C. BIRK

STATE OF MISSOURI)
) ss
CITY OF ST. LOUIS)

Mark C. Birk, being first duly sworn on his oath, states:

1. My name is Mark C. Birk. I work in the City of St. Louis, Missouri, and I am employed by Union Electric Company d/b/a AmerenUE as Vice President, Power Operations.

2. Attached hereto and made a part hereof for all purposes is my Direct Testimony on behalf of Union Electric Company d/b/a AmerenUE consisting of 40 pages, Schedules MCB-E1 through MCB-E3, all of which have been prepared in written form for introduction into evidence in the above-referenced docket.

3. I hereby swear and affirm that my answers contained in the attached testimony to the questions therein propounded are true and correct.

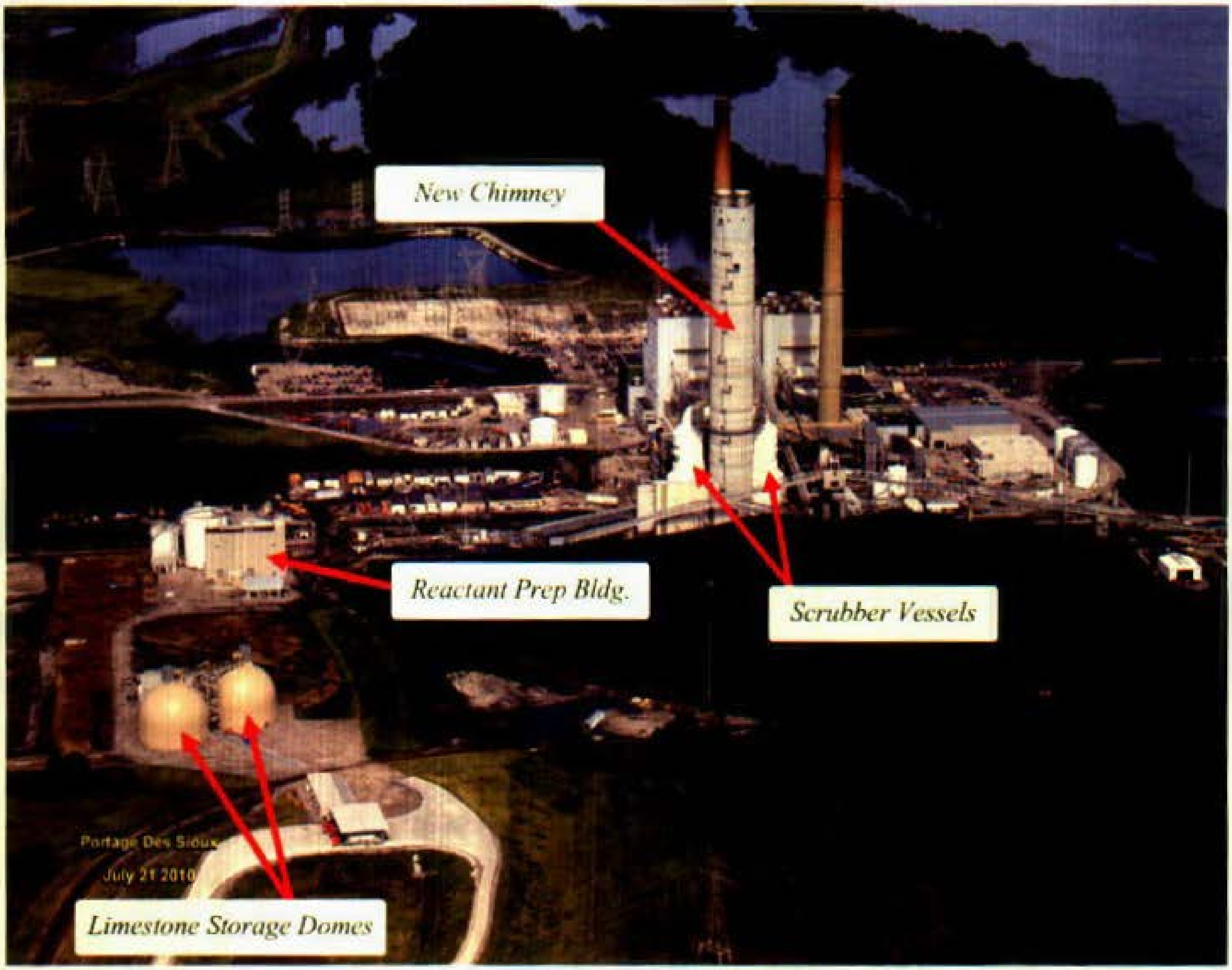
Mark C. Birk
Mark C. Birk

Subscribed and sworn to before me this 3 day of September, 2010.

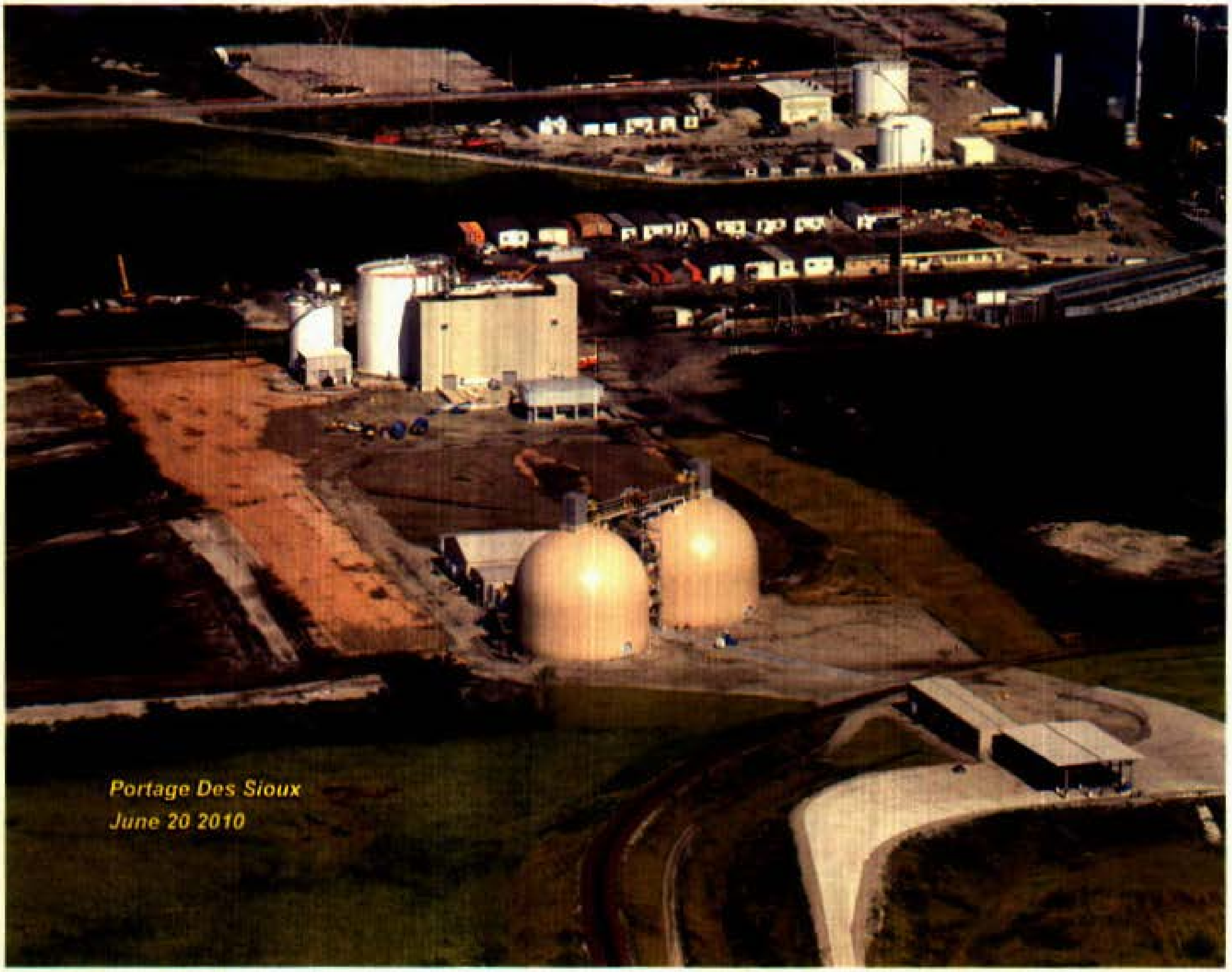
Amanda Tesdall
Notary Public

My commission expires:

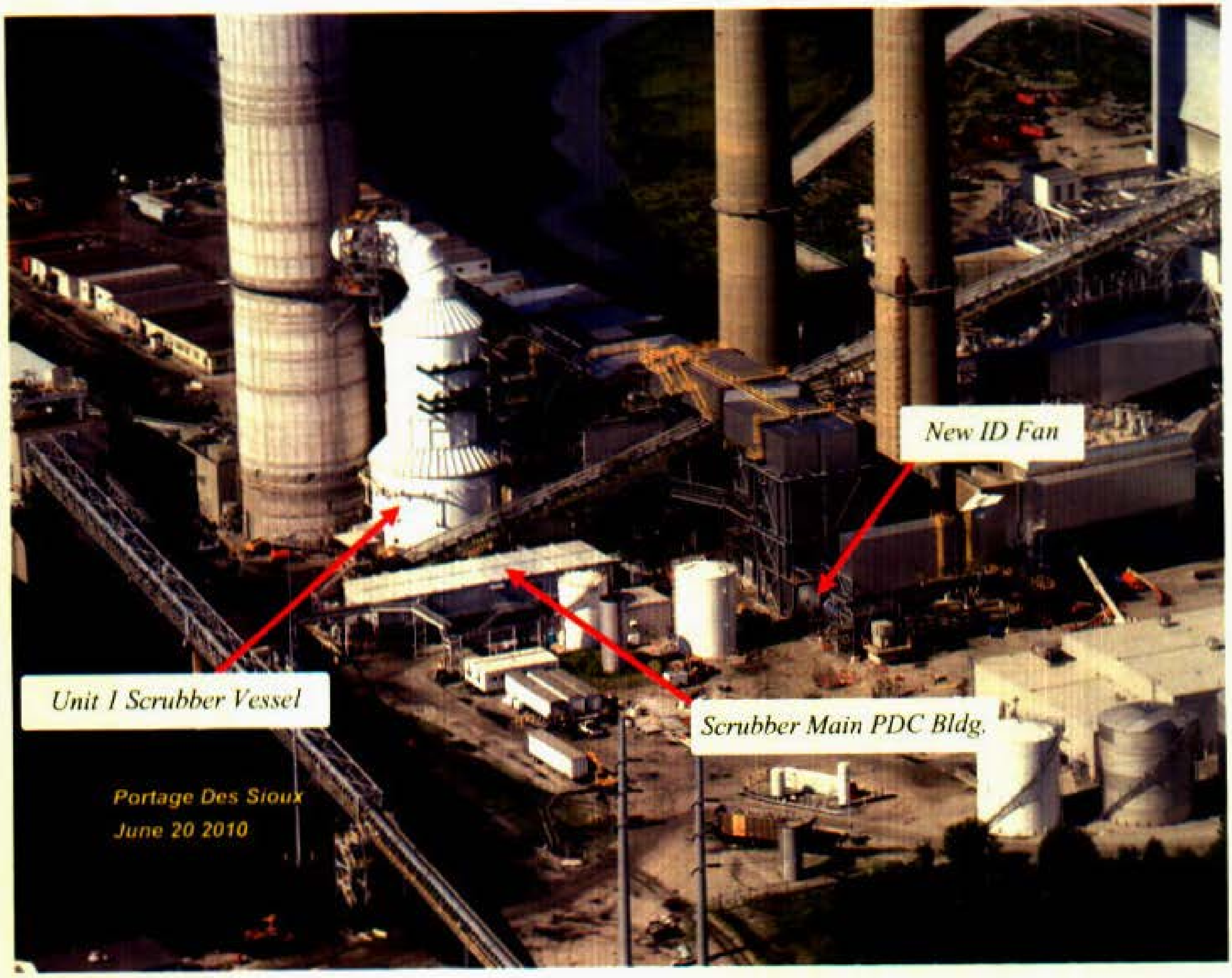
Amanda Tesdall - Notary Public
Notary Seal, State of
Missouri - St. Louis County
Commission #07158967
My Commission Expires 7/29/2011



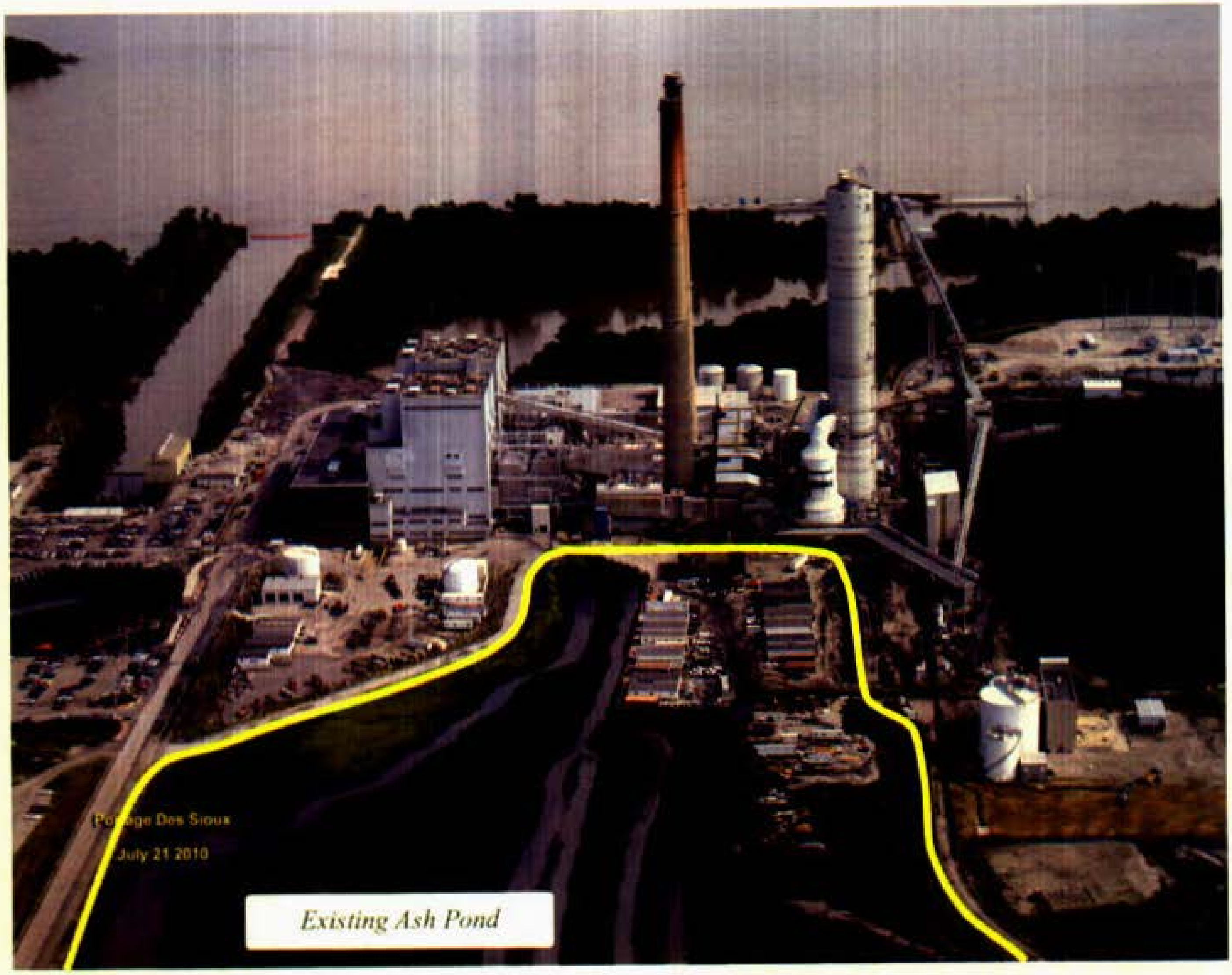
Overall Arial View of Plant, Including New Flue Gas Desulfurization Systems



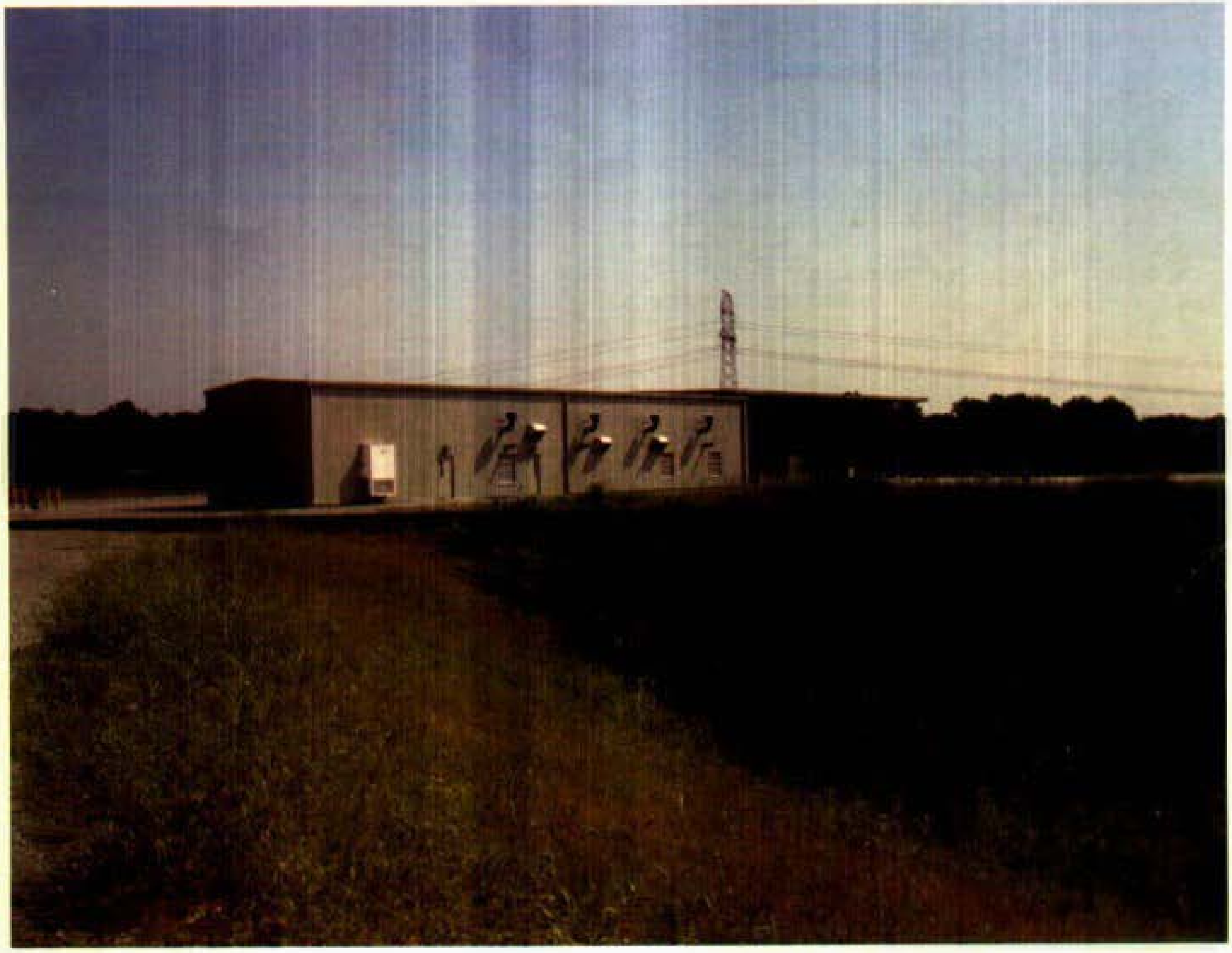
Aerial View of Truck Unloading Station, Powdered Limestone Facility, and Reactant Prep Area



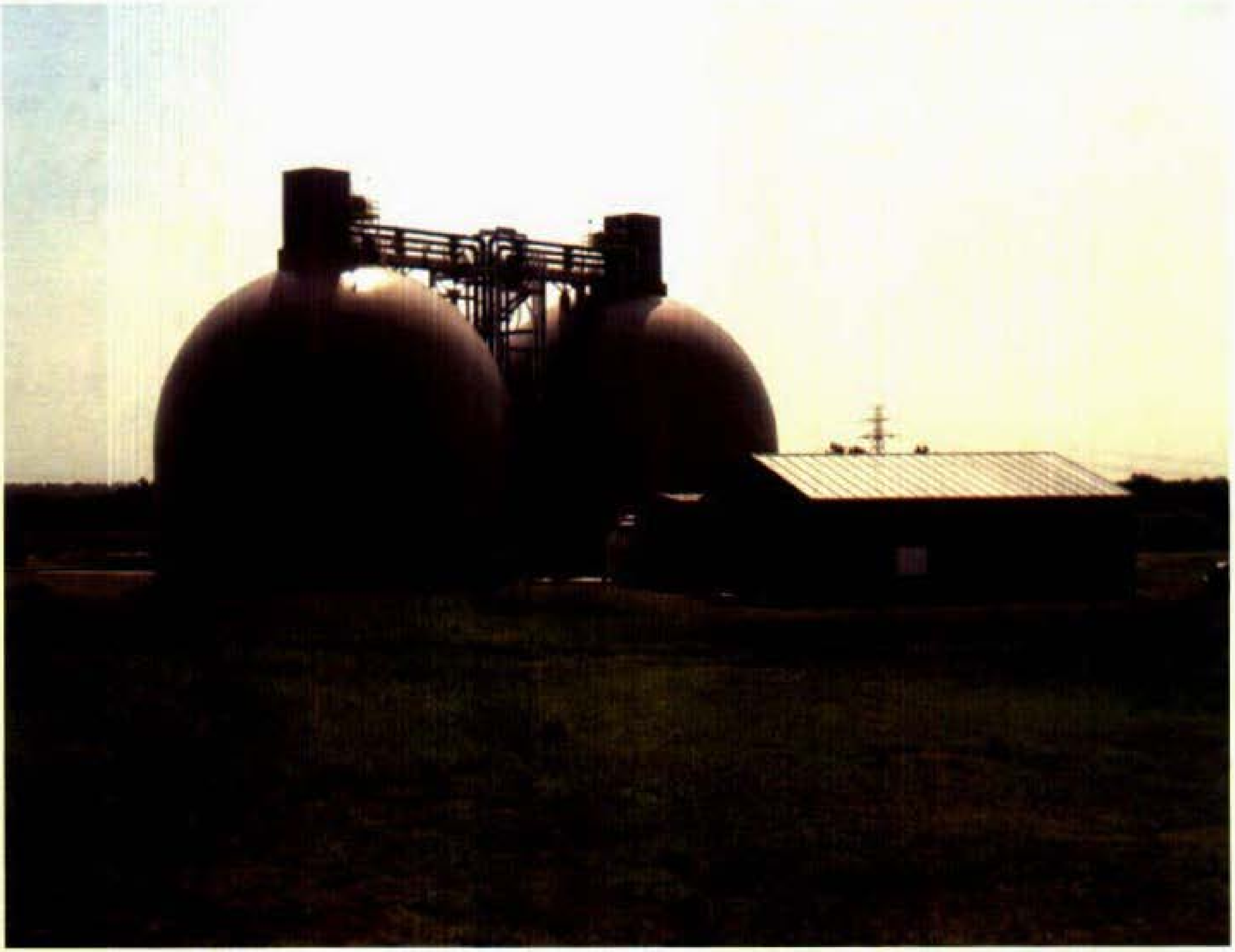
Arial View of New Unit 1 Flue Gas Desulfurization System



Aerial View of New Unit 2 Flue Gas Desulfurization System, note construction trailers and fabrication areas are on top of the existing fly ash pond

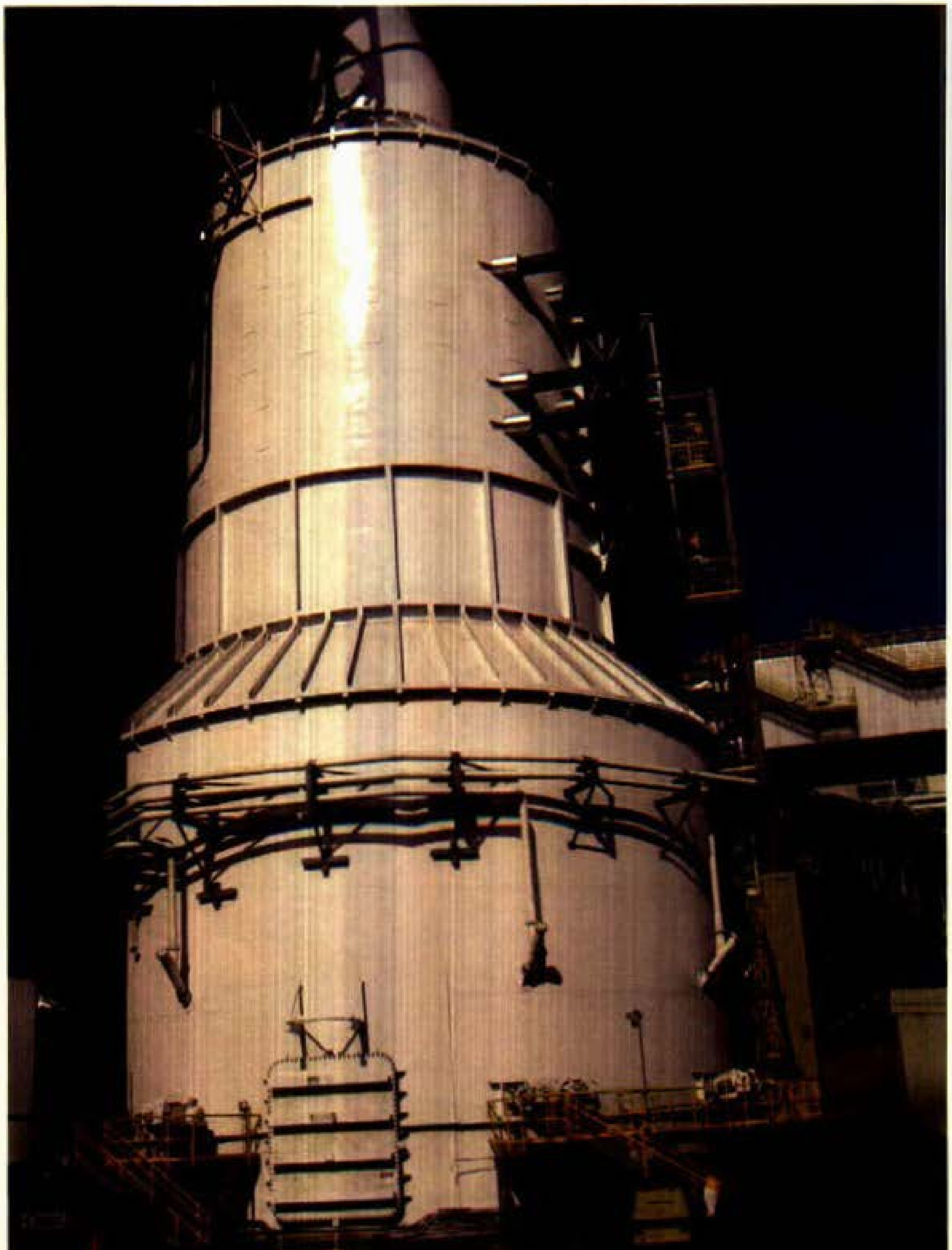


New Powdered Limestone Truck Unloading Facility



New Powdered Limestone Storage Facility

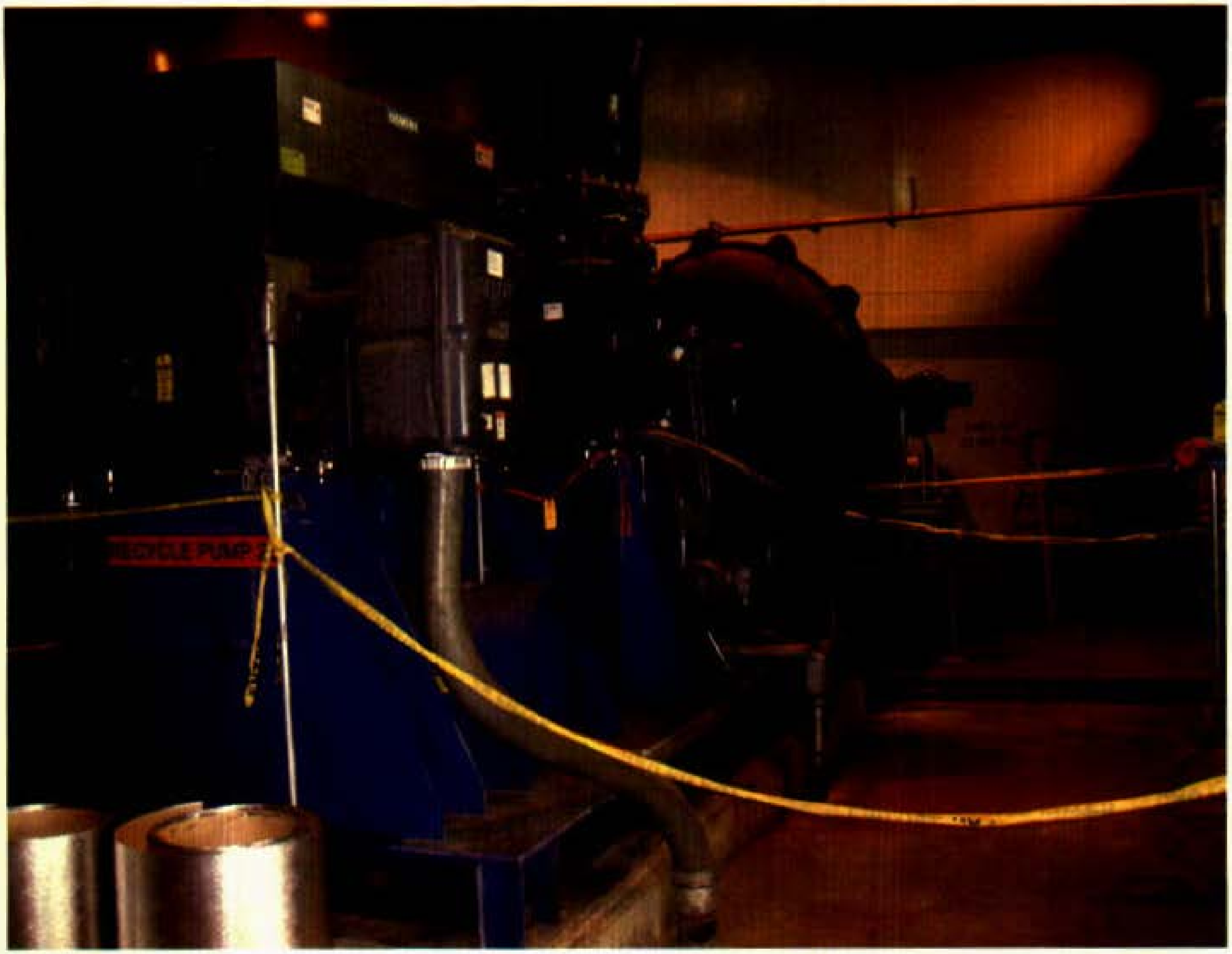
New Unit 1 Flue Gas Desulfurization System and Main Power Distribution Center (PDC) Building



New Unit 1 Absorber Vessel

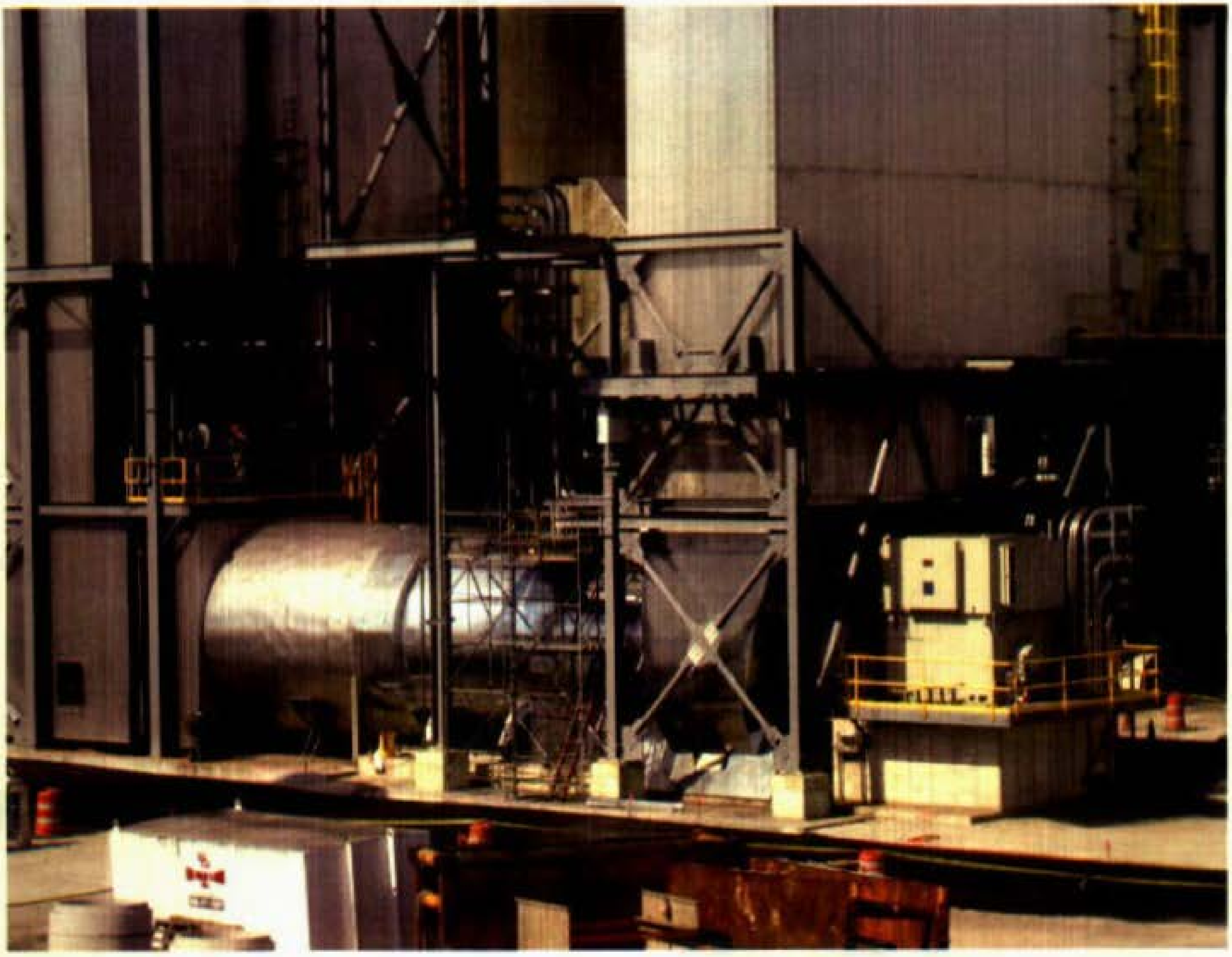
New Unit 2 Absorber Vessel

New Absorber Building As Seen From Unit 2 Side



Closeup View of a Recycle Pump for Unit 2

Inside of Unit 1 Absorber DuringStebbins Tile Installation



New Axial Induced Draft Fan

Another View of the Main PDC Building and Step-down Transformers

Some of the 4160V Breakers Inside the Main PDC Building

Sioux Scrubber Retrofit Project

Progress & Cost Update
August 2008

AmerenUE
Connecting Missouri

Agenda

- Project Background
- Timeline
- Contracting Approach
- Progress to Date
- Cost Projection History
- Cost Factors
  - Labor Demand
  - Equipment & Material Cost Increases
- Other FGD Project Costs

Ameren UE
Connecting Missouri

Project Background

- Project initiated in 2005 due to pending CAIR and CAMR rules and the expectation in the utility industry that these rules or others would require additional emissions controls for:
  - SO_2
  - NO_x
  - Hg
  - Fine particulate including SO_3
- Wet FGD technology was selected based on comparative analyses of commercial and near-commercial processes suitable for retrofit.

AmerenUE Connecting Missouri

Project Background (cont'd)

- Project Benefits:
  - Improved air quality in the St. Louis region.
  - Based on fueling assumptions, Sioux would produce the most SO_2 tons at AmerenUE.
  - Adds to SO_2 position, spreads cash flows, helps to levelize resource requirements, and keeps future options open.
  - Gain experience with scrubber project; e.g. FGD process, design, operations and maintenance before additional scrubbers would be installed at Rush Island and Labadie.
  - Early fuel flexibility (4.0# SO_2) enabled.
  - Evaluated lowest cost option was to install wet scrubbers.

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Project Background (cont'd)

- Sioux FGD Program Scope of Work:
  - Wet LSFO Scrubber for Flue Gas Desulfurization
  - Limestone Reagent
  - Designed for Medium Sulfur Blended Fuel
  - New Water Treatment Plant
  - Substation to Provide Aux Power
  - Transmission Line Mods and Upgrades
  - Wet "Gypsum Stack" for Gypsum Disposal
  - Access Road Improvements
  - Off-Site Limestone Grinding by 3rd Party
  - Current Total Capital Cost Estimate = $588 million

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Timeline Overview

- 2003 to 2005 – Sargent & Lundy assisted with studies, project planning and preparation of specifications for Sioux scrubber process engineered equipment.
- Approval to proceed with bidding FGD requested in September, 2005.
- October '05 through June '06 – procured FGD engineered process equipment.
- Allied Power Solutions formed Fall 2006 – 1st Qtr 2007.
- Began minor site work March 2006 (misc. relocations).
- General Contractor groundbreaking – December '06.
- Unit 1 in-service December '09.
- Unit 2 in-service April 2010.

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Contracting Approach

- Ameren decision to work with major construction companies to gain timely commitments for necessary services/resources.
- Allied Power Solutions formed as LLC comprised of Graycor, MC Industrial, Alberici, and Sachs Electric.
  - Provide program management and project oversight, administration, and management/resources support to projects at Duck Creek, Coffeen, and Sioux.
- MC Industrial and Sachs are prime contractors at Sioux for general and electrical construction services, respectively.
- Contracts are cost-plus with incentive KPI's based on performance.
- Contracting timing and approach were needed to lock in resources that could support the Sioux project schedule.

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Contracting Approach (cont'd)

- Major Sioux FGD Prime Contractors:
  - Sargent & Lundy – A/E design, engineering and project management services.
  - Hitachi – engineered process & equipment.
  - Hillsdale Fabricators – structural steel and ductwork.
  - Karrena – furnish and install concrete chimney and liners. CBI is major subcontractor.
  - Devcon (Futura Coatings) – glass linings and coatings.
  - MC Industrial – general contractor.
  - Sachs Electric – electrical construction.
  - APS – program/project management and support services.
  - Kolb – gypsum stack / landfill civil construction.

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Sioux Scrubber Progress

- Engineering & design – 83% complete.
- Construction:
  - General Contractor (MCI) – 33% complete.
  - Electrical (Sachs) – 18%
  - Chimney (Karrena) – 85%
- Construction photos follow:

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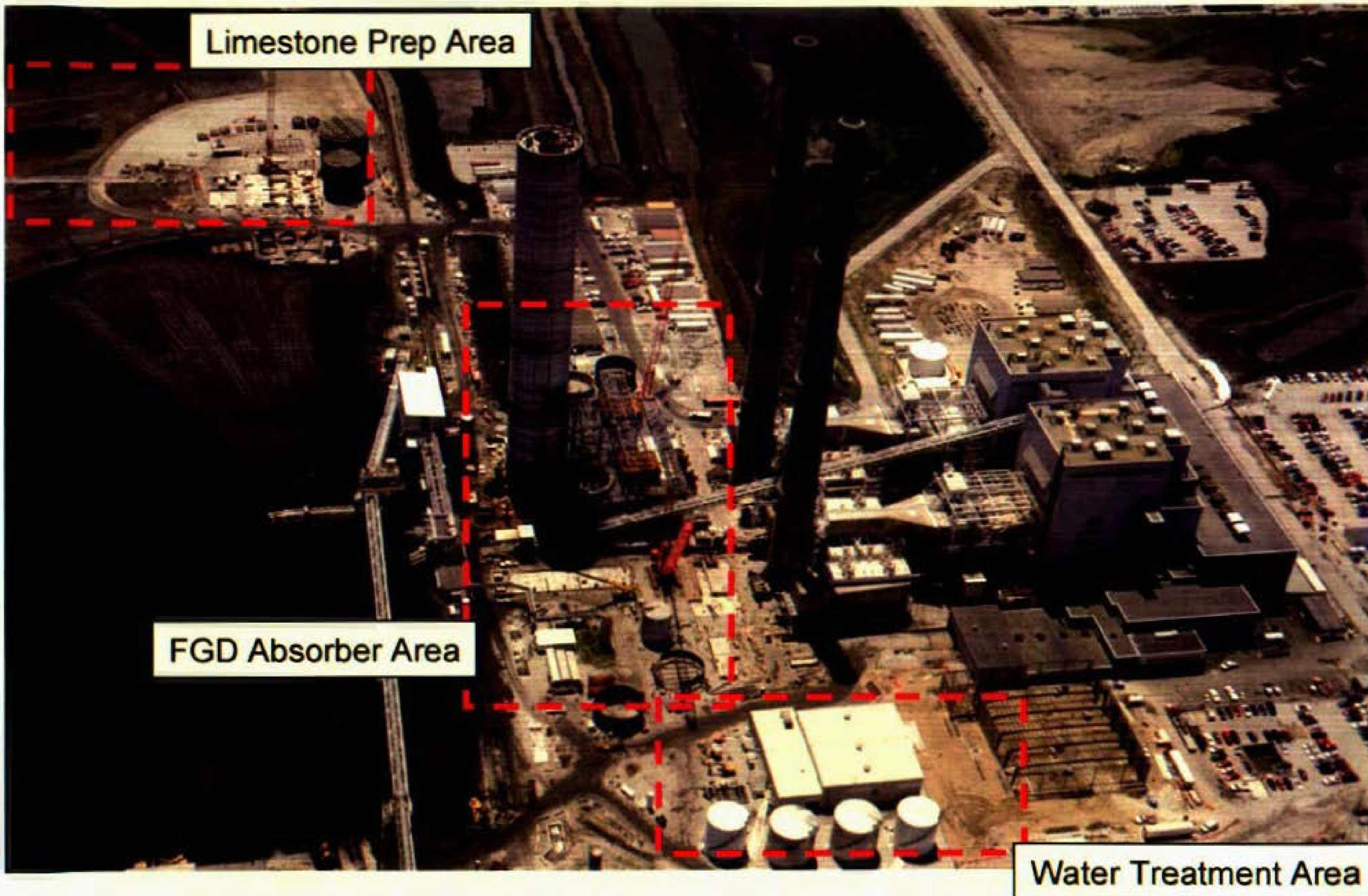
Limestone Prep Area
FGD Absorber Area
Water Treatment Area

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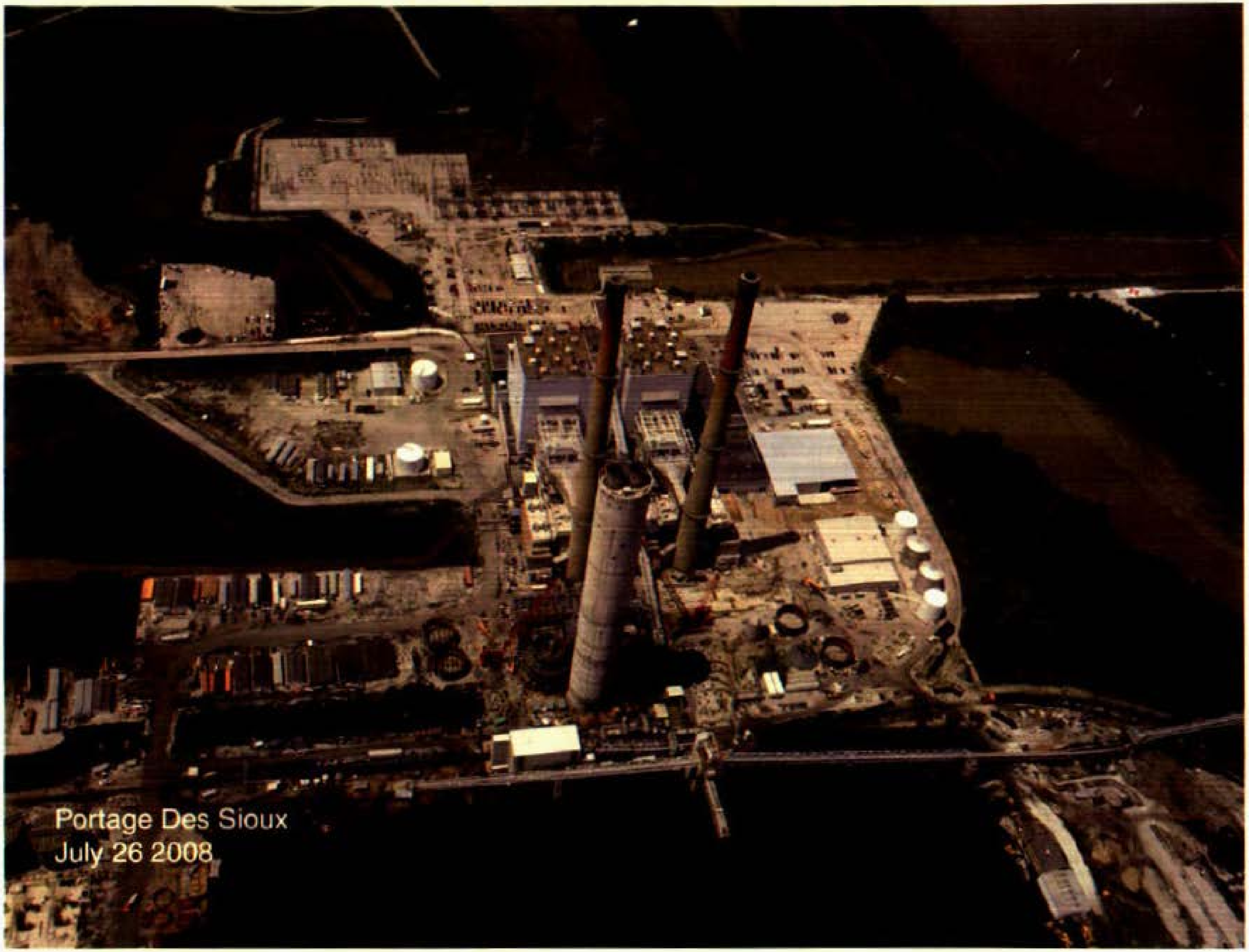

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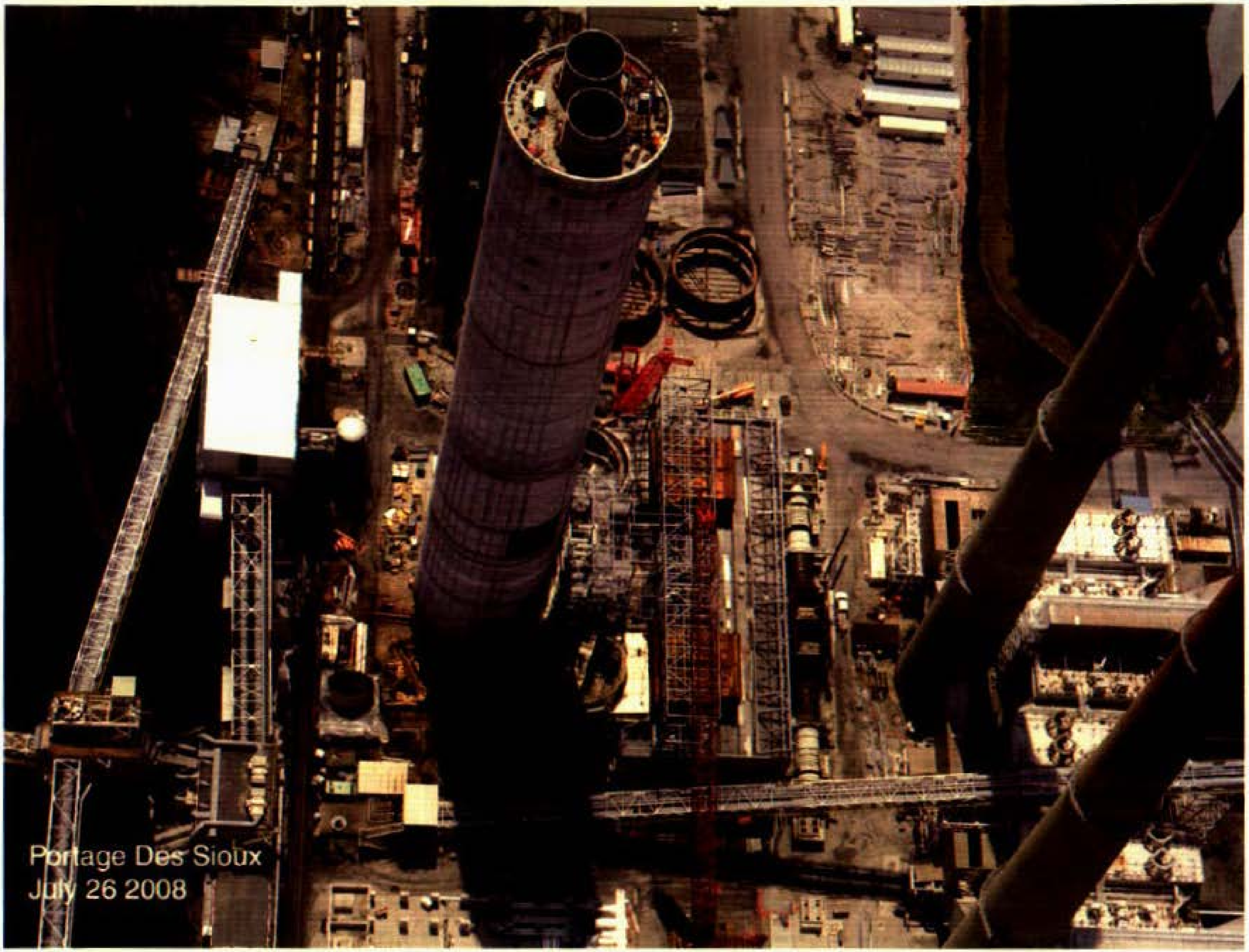

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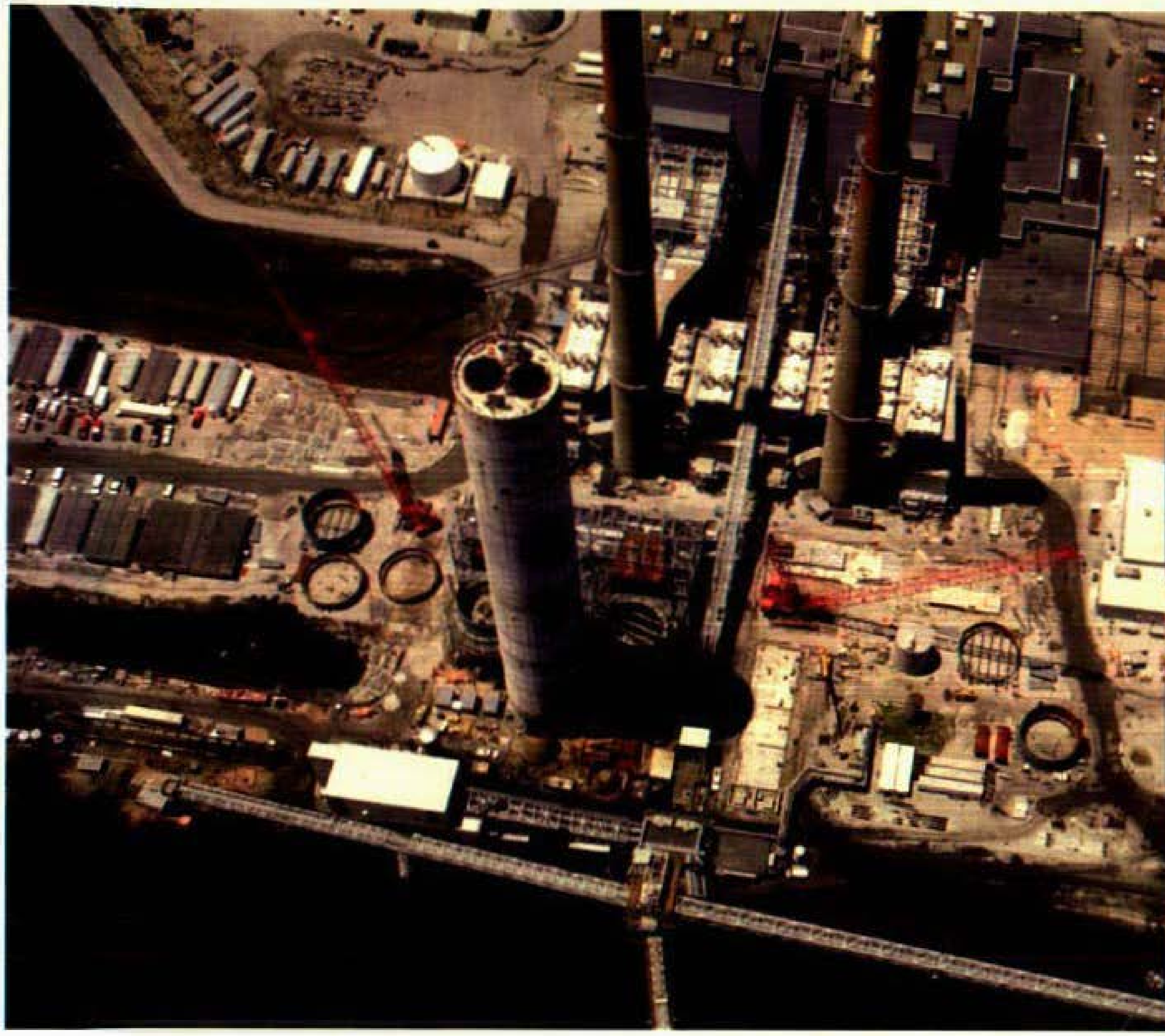

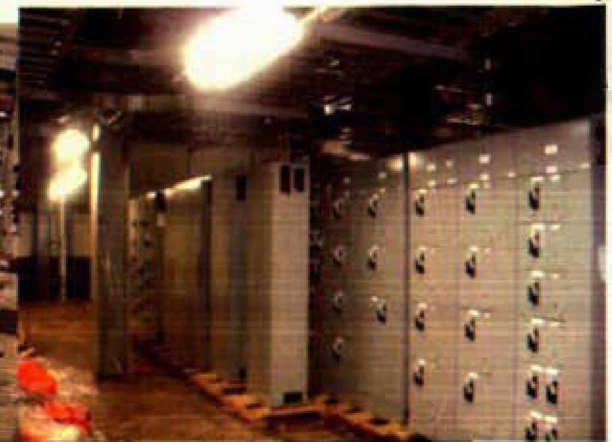

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Portage Des Sioux
July 26 2008

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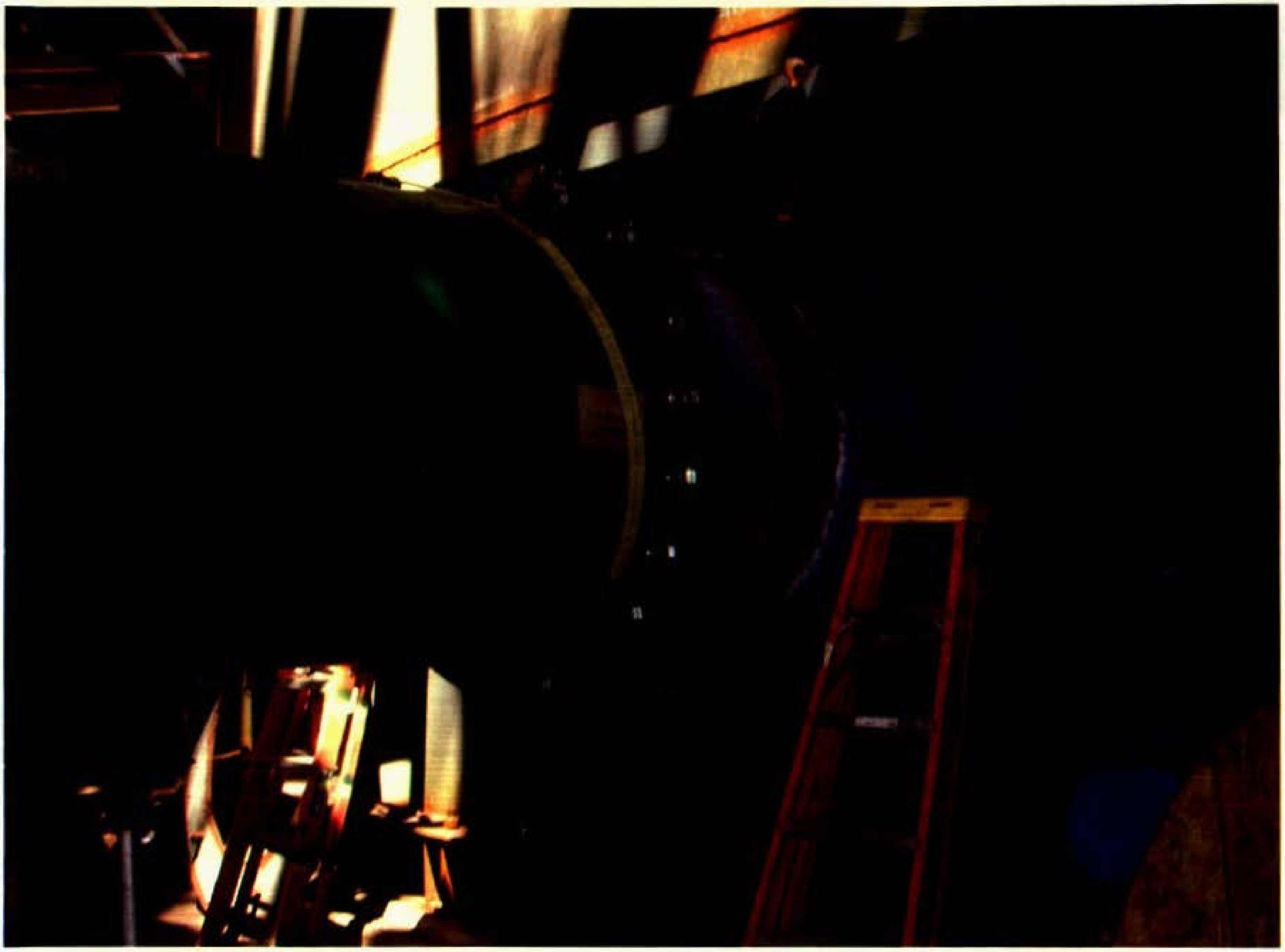

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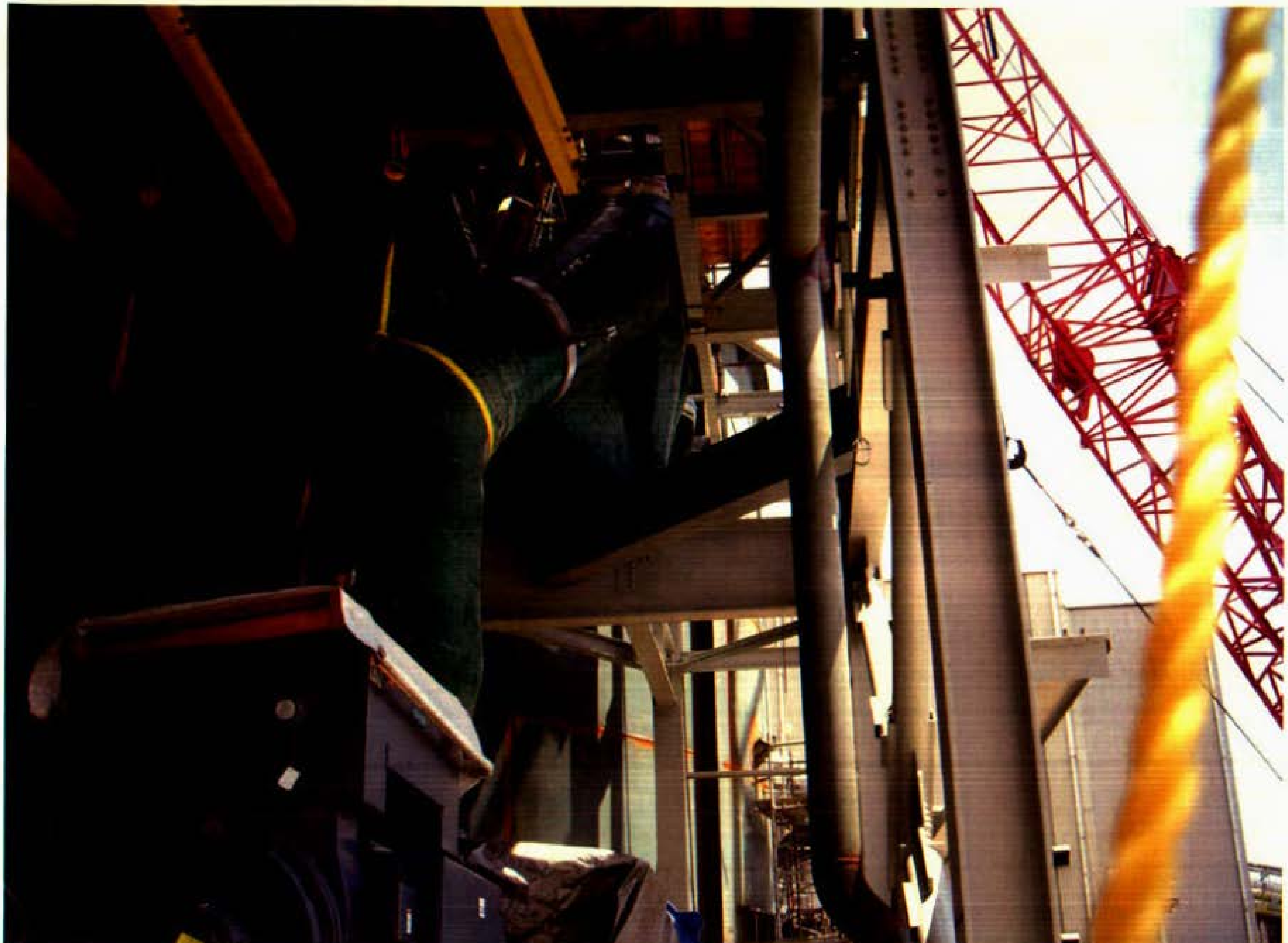

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07/25/2008

Construction Progress

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Sioux Scrubber "Process Island" Cost Review

Note: All costs are given in thousands of U.S. $

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Initial Design Basis (Sept. '05)

- General Requirements
  - Unit Ratings at 535MW (gross), each.
  - 4.0 lb SO2/MBtu coal.
- Reagent handling & Preparation System
  - Limestone delivery by rail or truck.
  - 30 days of limestone storage
  - 2 x 100% ball mills
  - 1 - 24 hour slurry tank
  - 2 x 100% capacity slurry pumps
- Absorber System
  - Single Absorber module for each unit.
  - 4 levels of sprays
  - 2 x 100% oxidation compressors per unit.
  - 2205 alloy absorber, C-276 clad wet/dry interface and outlet duct
- Draft System
  - Bypass dampers
  - 2 x 50% Booster ID Fans, per unit
  - Common chimney with dual flue alloy liners
- Gypsum Handling
  - Primary and secondary dewatering
  - Truck removal from site
- Makeup Water Supply
  - Existing facilities with 1 hour storage tank.
- Wastewater Treatment System
  - FGD blowdown to be treated for heavy metals and suspended solids.
- SO3 Mitigation
  - Trona injection system provided.
- Financial Basis
  - Escalation at 3%
  - AFUDC at 8.84% annual
  - Ameren overheads at 4%
  - System Operation in fall of 2008

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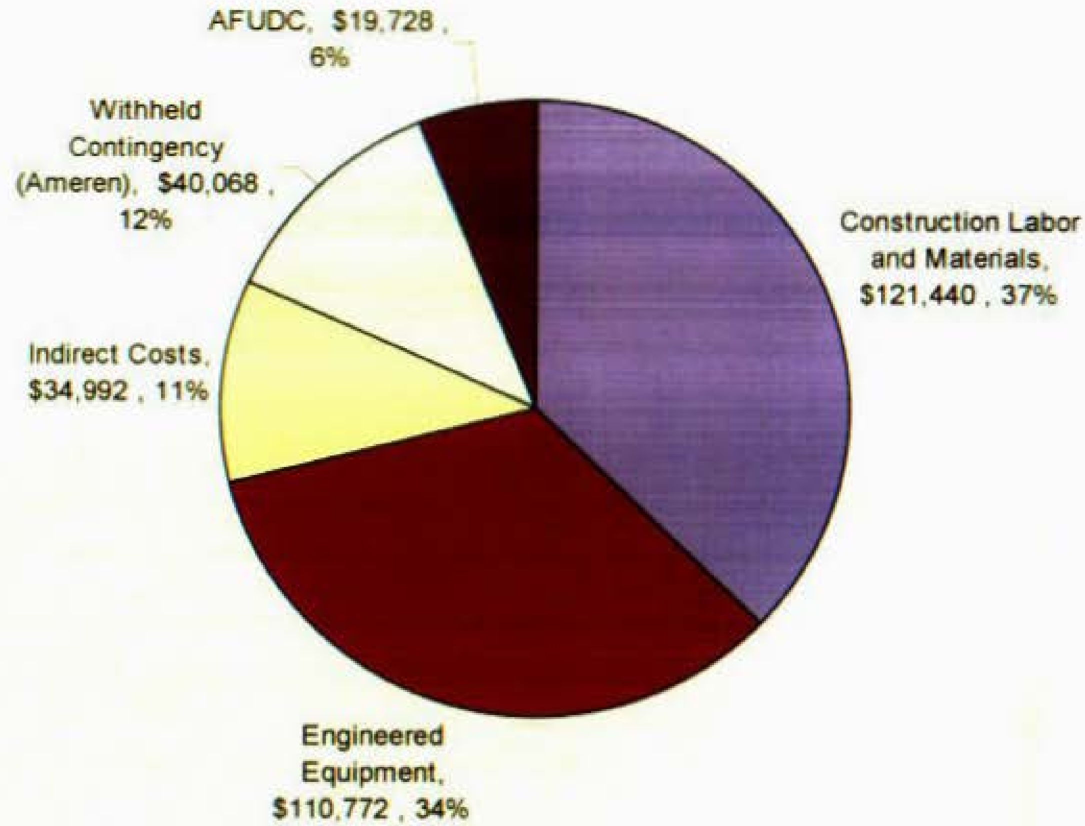
September 2005 Conceptual Cost Estimate*

- Total Cost of $327M
- Cost Estimate based on similar scrubber projects underway in the Midwest.
- Adjusted for St. Louis labor productivity.



* Thousands, U.S. $

Initial vs Current Design Basis

September 2005

- General Requirements
  - Unit Ratings at 535MW (gross), each.
  - 4.0 lb SO_2/MBtu coal.
  - 98% SO_2 collection
- Reagent handling & Preparation System
  - Limestone delivery by rail or truck.
  - 30 days of limestone storage
  - 2 x 100% ball mills
  - 1 - 24 hour slurry tank
  - 2 x 100% capacity slurry pumps per unit
- Absorber System
  - Single Absorber module for each unit.
  - 4 levels of sprays
  - 2 x 100% oxidation compressors per unit.
  - 2205 alloy absorber, C-276 clad wet/dry interface and outlet duct
- Draft System
  - Bypass dampers
  - 2 x 50% Booster ID Fans, per unit
  - Common chimney with dual flue alloy liners
- Gypsum Handling
  - Primary and secondary dewatering
  - Truck removal from site
- Makeup Water Supply
  - Existing facilities with 1 hour storage tank.
- Wastewater Treatment System
  - FGD blowdown to be treated for heavy metals and suspended solids.
- SO_3 Mitigation
  - Trona injection system provided.
- Financial Basis
  - Escalation at 3%
  - AFUDC at 8.84% annual
  - System Operation in fall of 2008
  - Ameren overheads at 4%

May 2008

- General Requirements
  - Unit Ratings at 535MW (gross), each.
  - 4.0 lb SO_2/MBtu coal.
  - **99% SO_2 Collection**
- Reagent handling & Preparation System
  - **Limestone delivery by truck.**
  - **28 days of dry ground limestone storage**
  - **Offsite Grinding**
  - **1 - 48 hour slurry tank**
  - 2 x 100% capacity slurry pumps per unit
- Absorber System
  - Single Absorber module for each unit.
  - **5 levels of sprays**
  - **3 x 100% oxidation compressors per station.**
  - **Flake glass lined absorber & ductwork**
- Draft System
  - **No Bypass dampers**
  - **2 x 50% Axial ID Fans, per unit with SCR capability**
  - **Common chimney with dual flake glass lined liners**
  - **Replace ESP Inlet ducts.**
  - **Relocate water treatment facilities**
- Gypsum Handling
  - **No mechanical dewatering.**
  - **Slurry to landfill**
- Makeup Water Supply
  - **Replace circulating water pumps, new raw water pumps.**
  - **1 hour storage tank.**
- Wastewater Treatment System
  - **No blowdown, zero discharge design.**
- SO_3 Mitigation
  - **No Trona injection system provided.**
- Financial Basis
  - **Escalation as high as 100% for some materials**
  - **AFUDC at 7.98% annual**
  - **System Operation in fall of 2009, spring of 2010**
  - **Ameren overheads at 3.67%**

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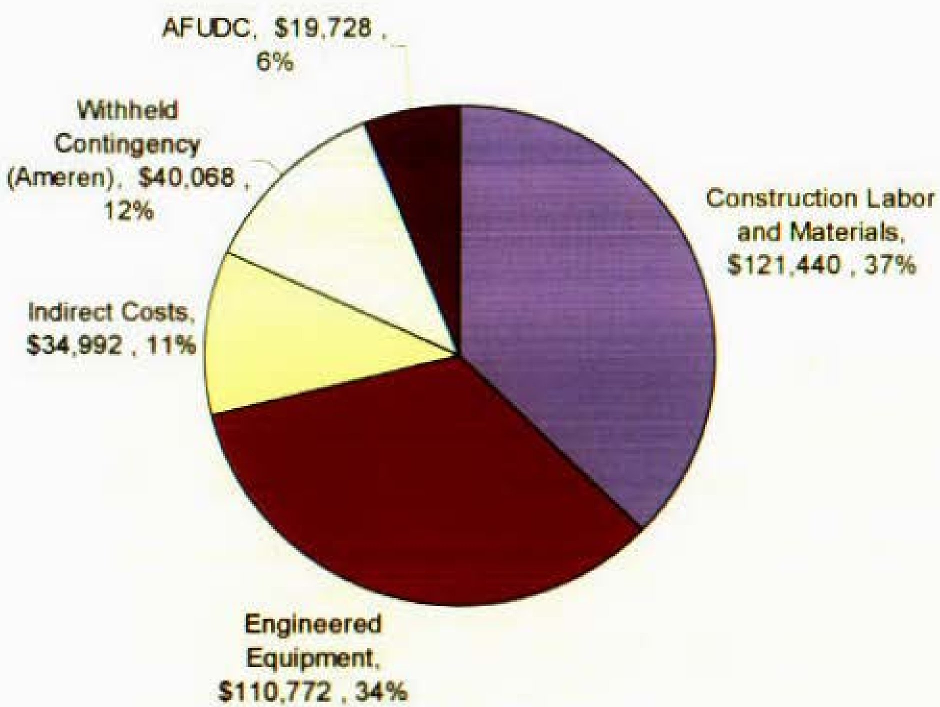
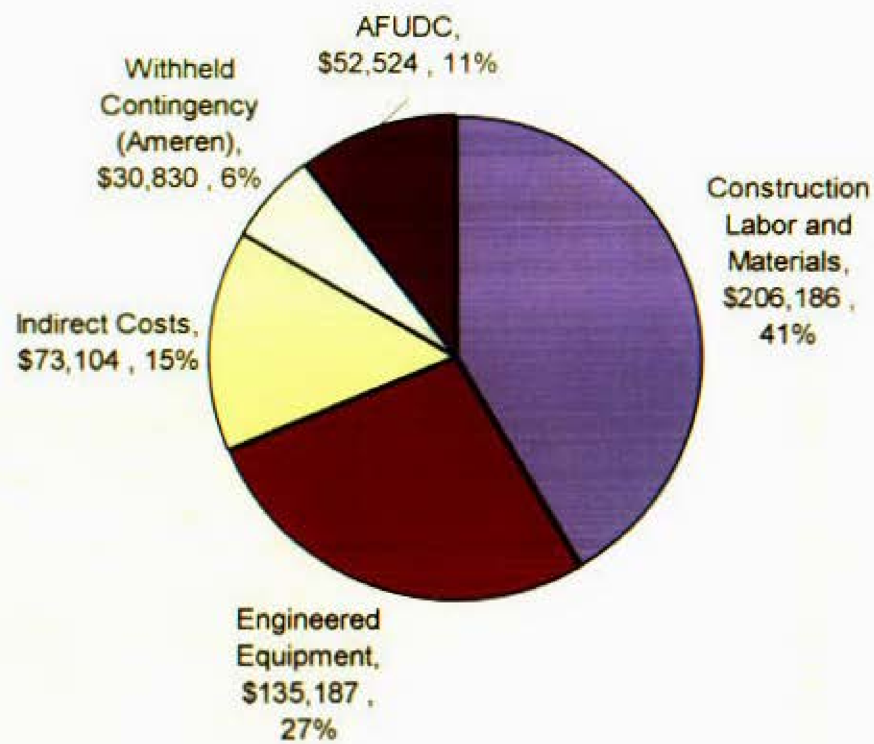
September 2005 Conceptual Cost Estimate versus May 2008 Estimate*

Sept 2005 Estimate



May 2008 Estimate



* Thousands, U.S. $

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Sioux FGD Project
Fact Sheet

- Chimney
  - Height = 496.5 feet
- Absorber vessel size
  - 2 @ 70' diameter –
  - 130' tall, 47' slurry depth
- Absorber Slurry Flow = 54,570 GPM from each of 10 1550HP Weir recycle pumps
- Induced Draft Fans
  - Replacement Axial Fans
  - 2 per Unit – 14,500HP each
- SO_2 removal
  - Per Air permit 96% average reduction with a minimum of 91%
  - 108,500 tons per year using design basis fuel
- Concrete = 15,500 cubic yards
- Piles - steel H shapes - 1450 - most 135' (end bearing) and some 80 ' long (friction type)
- Steel –
  - 2500 tons of structural steel,
  - 1800 tons of ductwork
- Piping - 60,000 LF of piping
- Construction Craft = 1,300,000 hours

- Limestone usage= 275,000 tons per year
- Water usage = 2400 GPM of which 900 GPM is recycled from the gypsum stack
- By product produced = 280,000 tons per year - could be recycled at a later date into wallboard or sold to the cement industry

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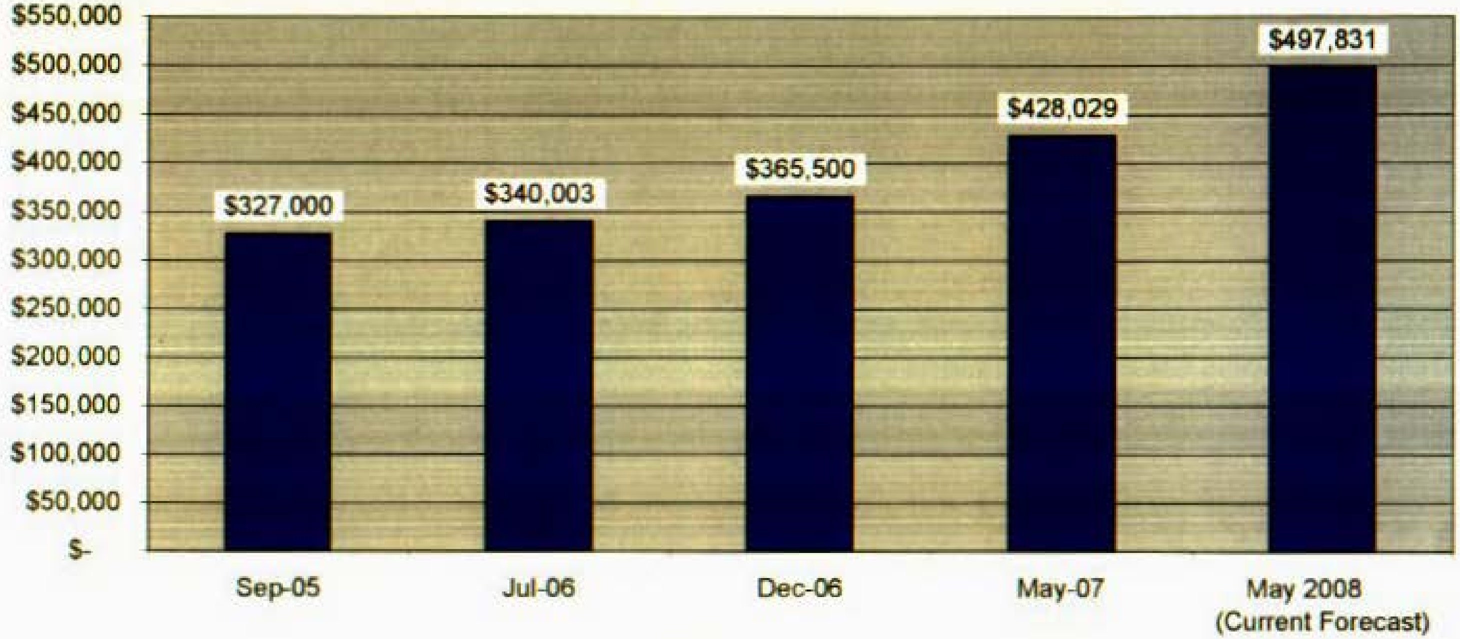
Sioux FGD Cost Estimates



Engineering Status (% Complete)	Conceptual	<1%	17%	38%	75%
Construction Status (% Complete)	0%	0%	2%	10%	26%

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Cost Estimate Evolution

Estimate Issue	Date of Issue	Percent of Engineering Complete	Percent of Construction Complete
Conceptual Estimate	September 2005	Concept	0%
Update based on scrubber system supplier contract award.	July 2006	<1%	0%
Revisions based on additional procurement and design progress.	December 2006	17%	2%
Revisions based on additional procurement and design progress.	May 2007	38%	10%
Monthly from May 2007 through Present	May 2008	75%	26%

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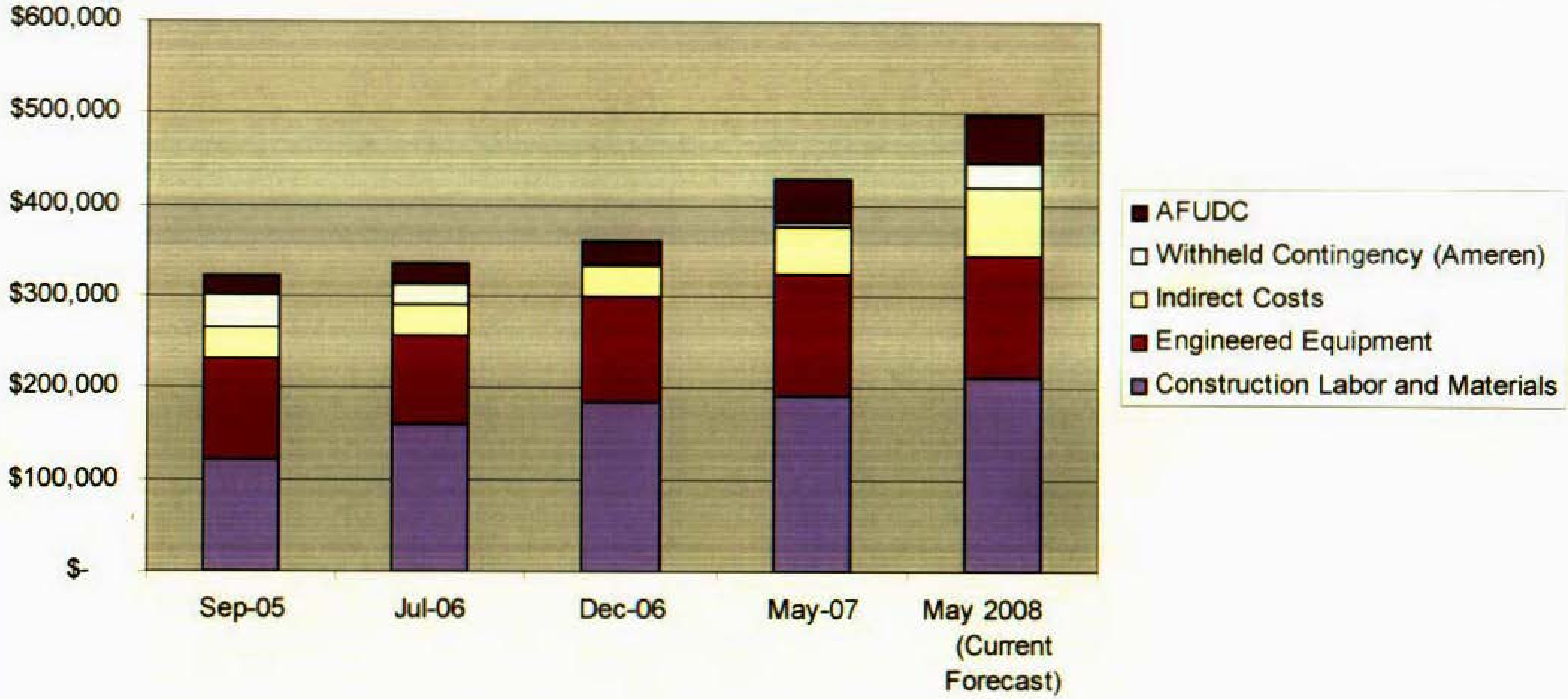
Sioux FGD Project
Cost History



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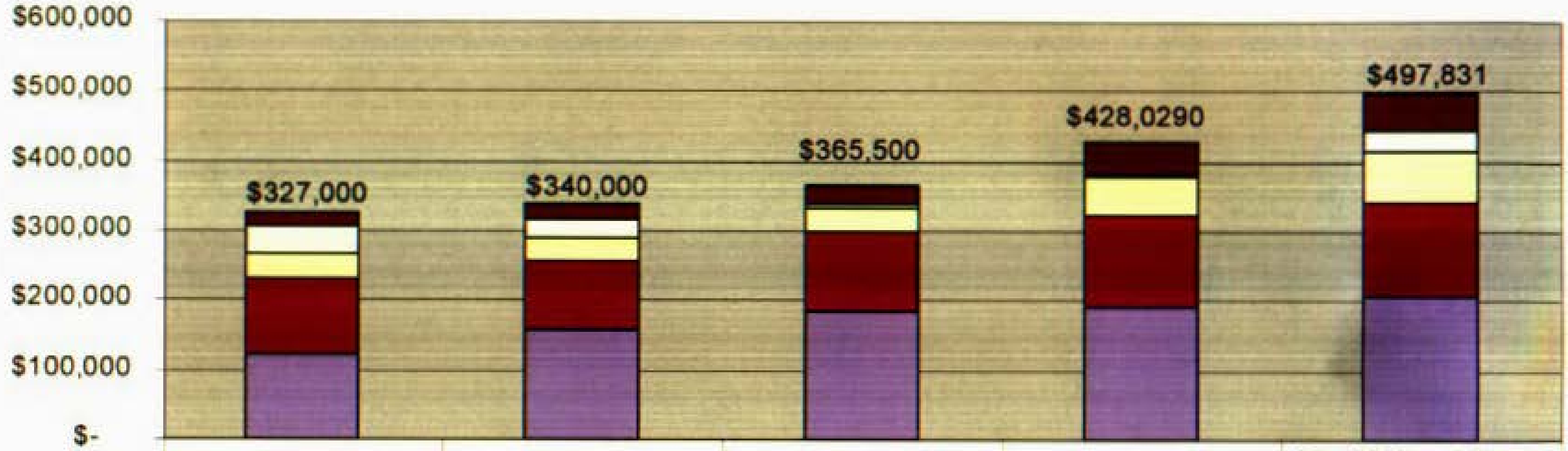
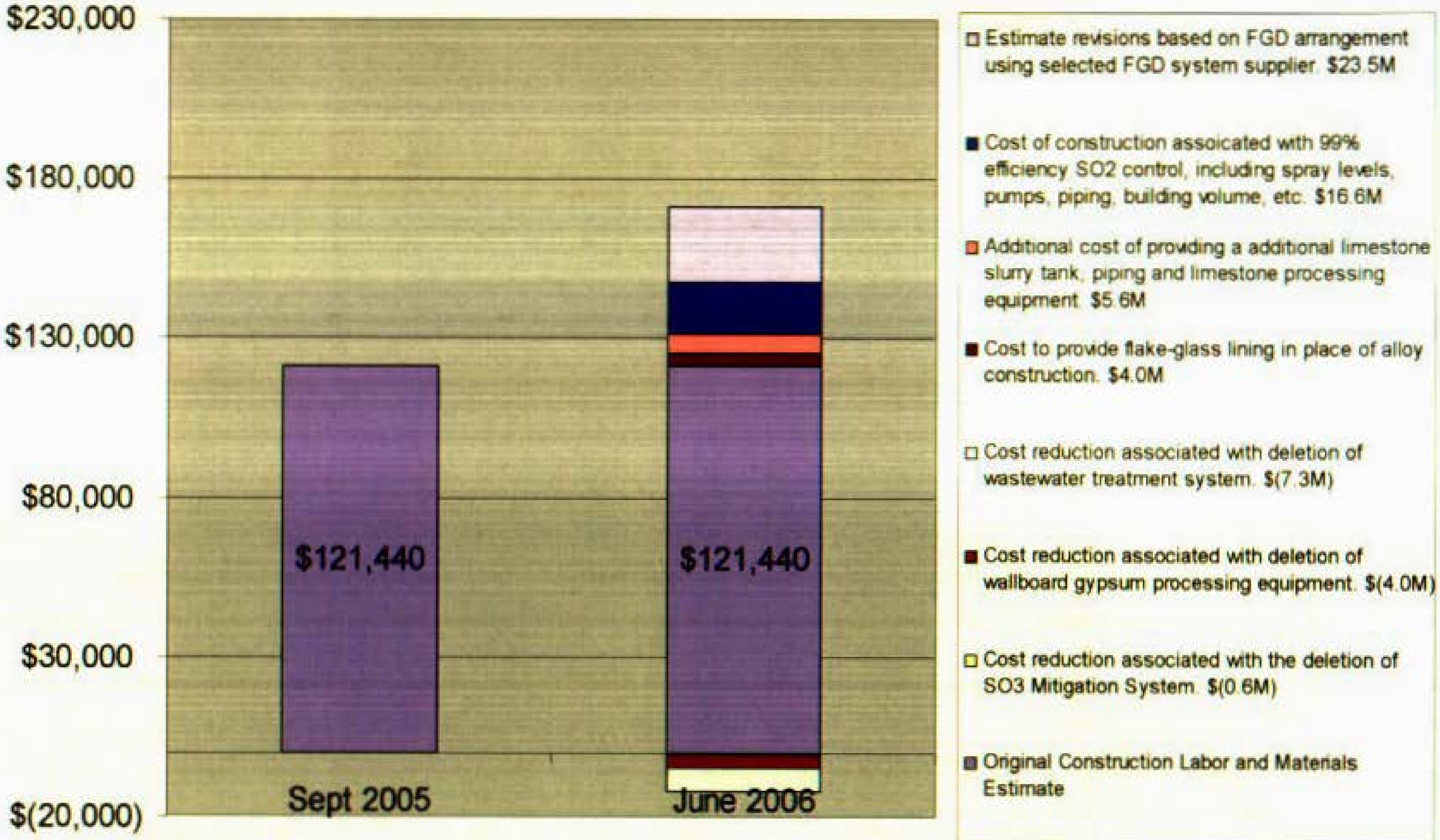
Sioux FGD Project
Cost History



	Sep-05	Jul-06	Dec-06	May-07	May 2008 (Current Forecast)
■ AFUDC	$19,728	$22,526	$24,700	$46,388	$52,524
□ Withheld Contingency (Ameren)	$40,068	$26,761	$8,000	$4,000	$30,830
□ Indirect Costs	$34,992	$32,595	$32,600	$53,268	$73,104
■ Engineered Equipment	$110,772	$98,825	$116,200	$133,104	$135,187
■ Construction Labor and Materials	$121,440	$159,296	$184,000	$191,269	$206,186

Sioux FGD Project
History of Construction Portion of Estimate



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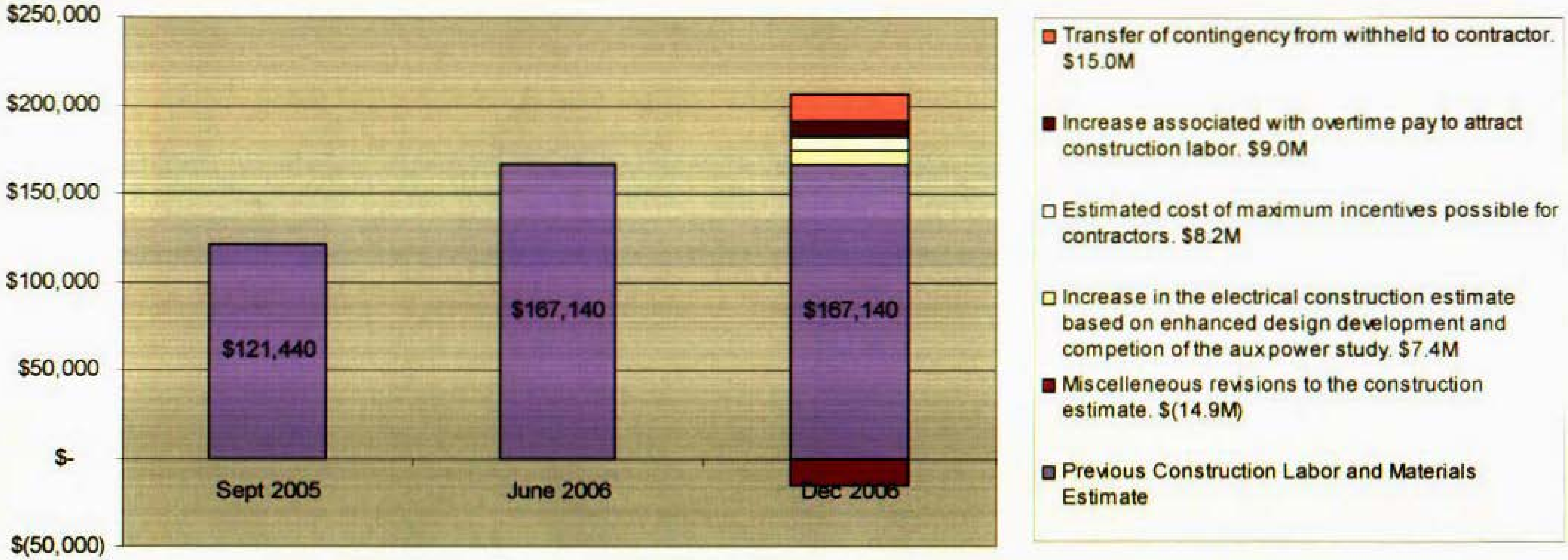
Sioux FGD Project
History of Construction Portion of Estimate



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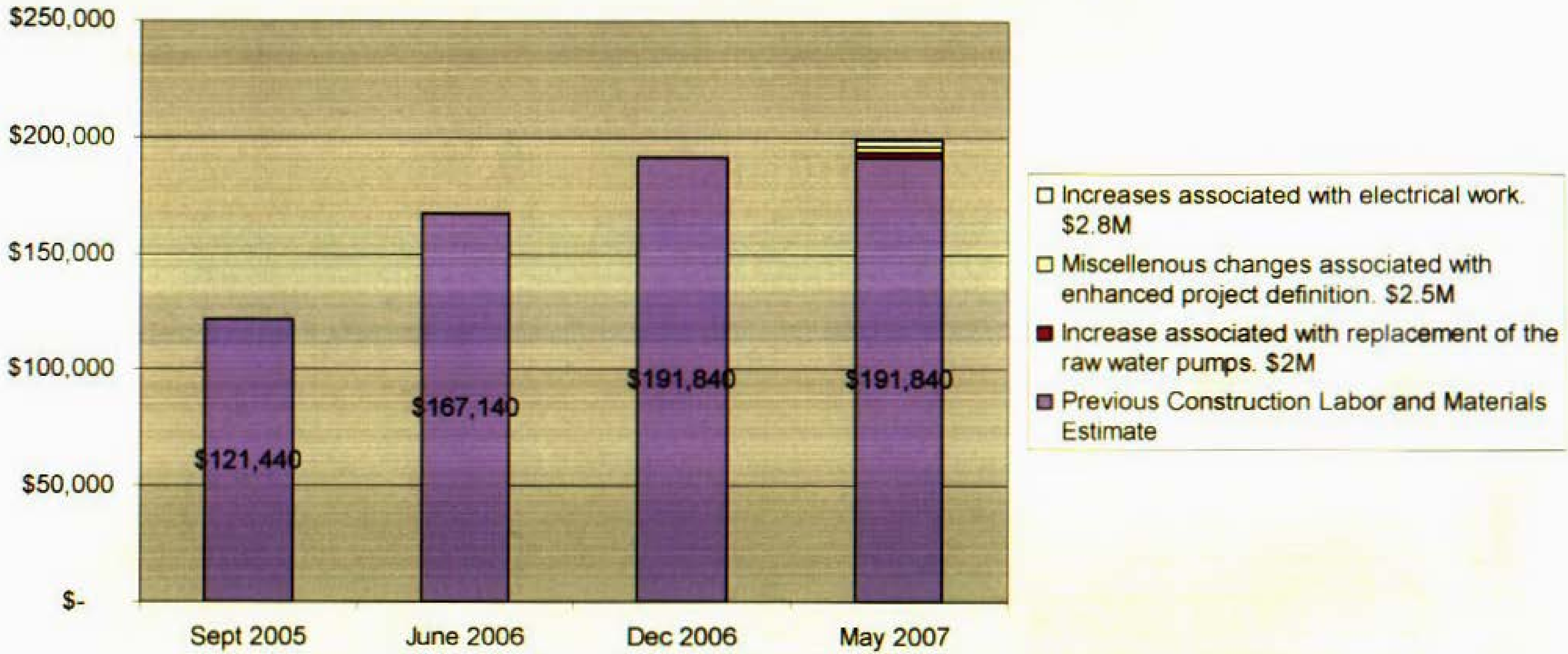
Sioux FGD Project
History of Construction Portion of Estimate



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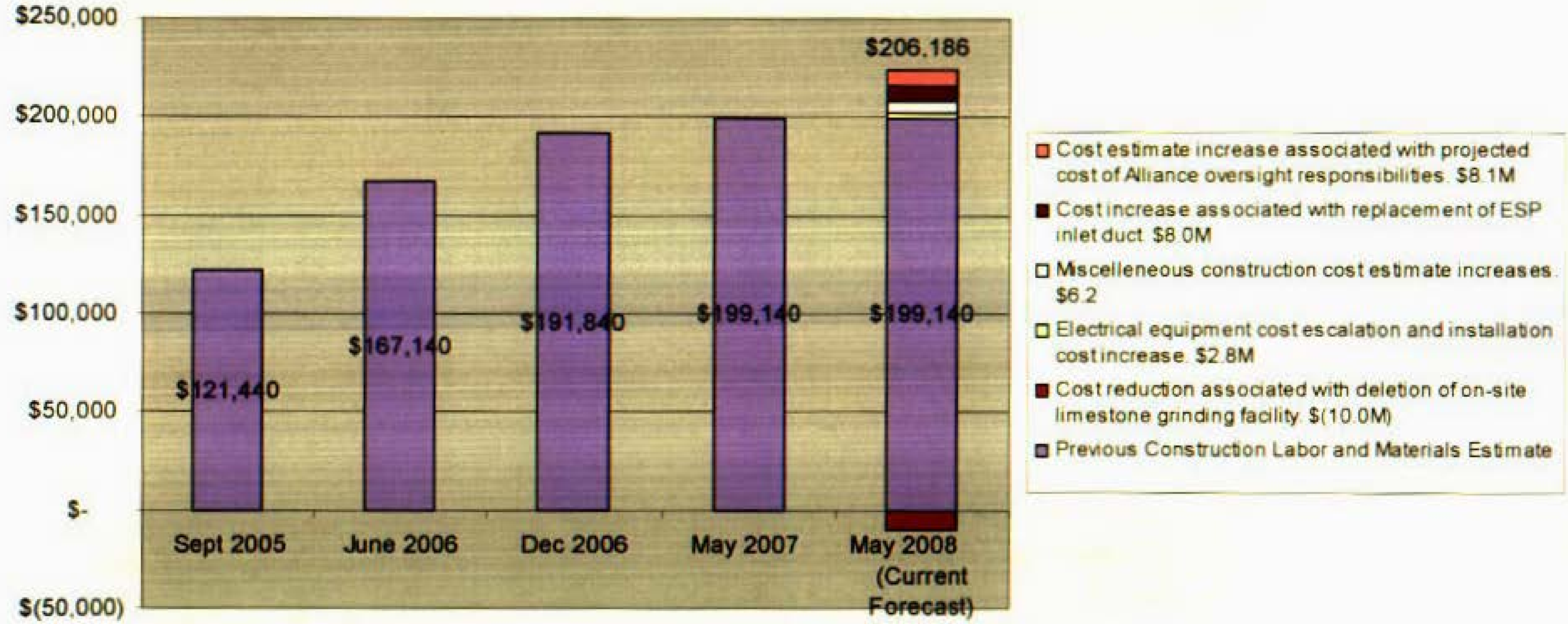
Sioux FGD Project
History of Construction Portion of Estimate



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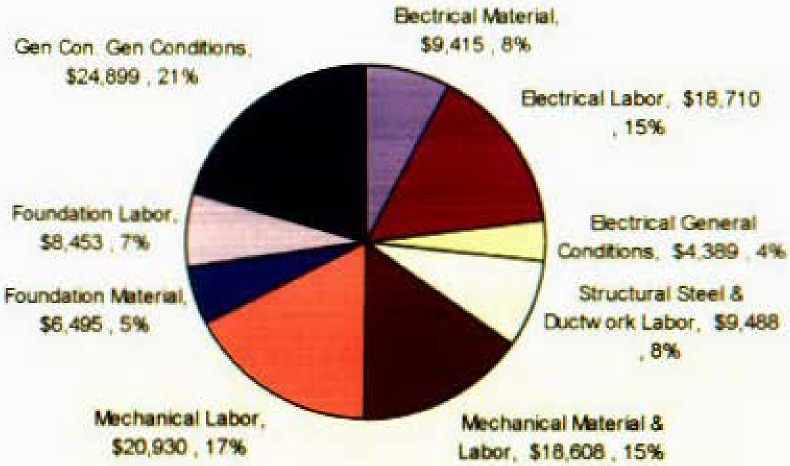
Sioux FGD Project
History of Construction Cost Portion of Estimate

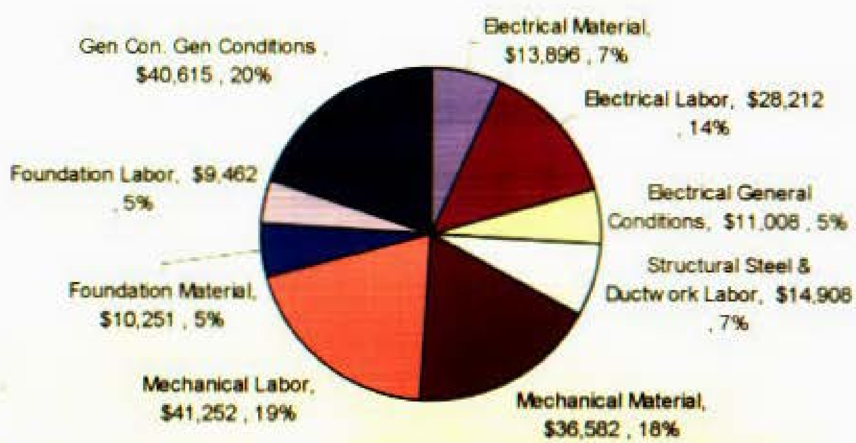
2005 Estimate

$121,440K



2008 Estimate

$206,186K



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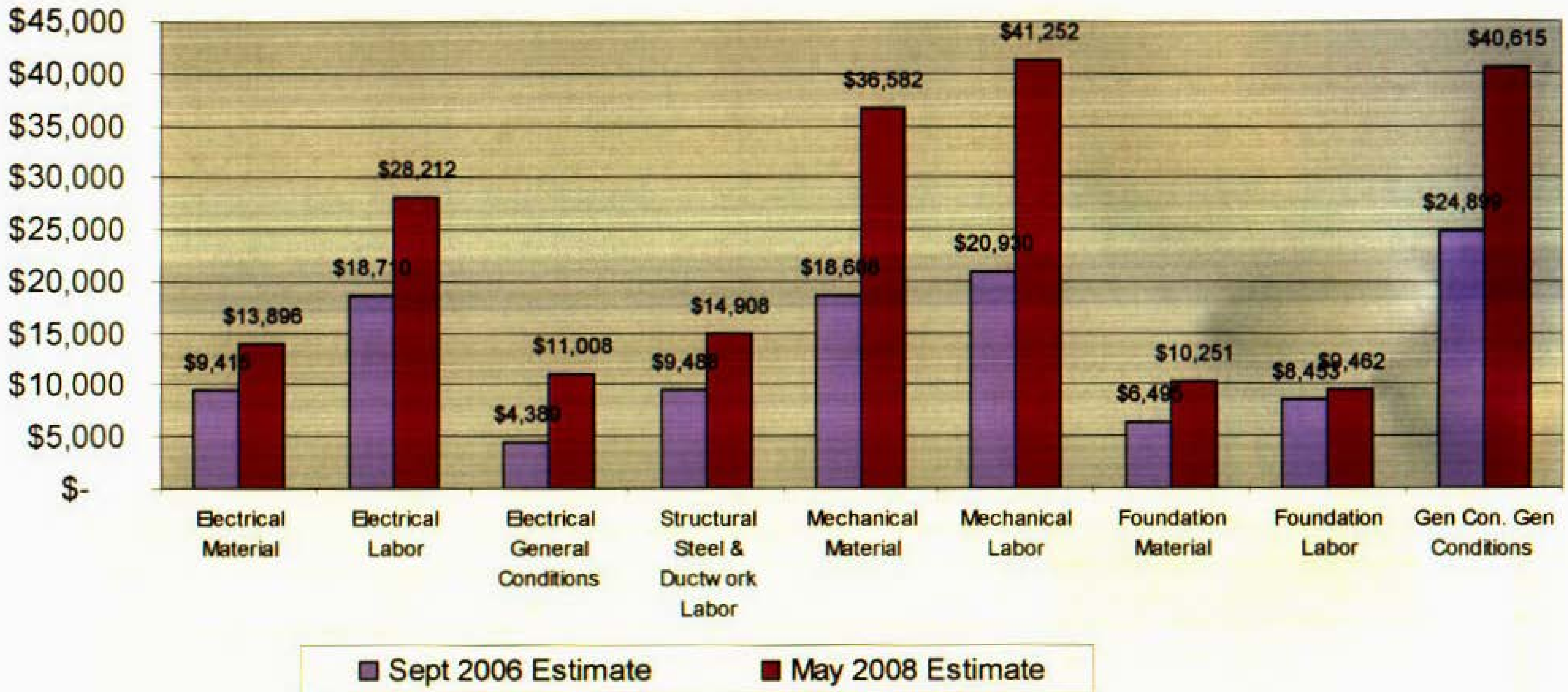
Sioux FGD Project
History of Construction Cost Portion of Estimate



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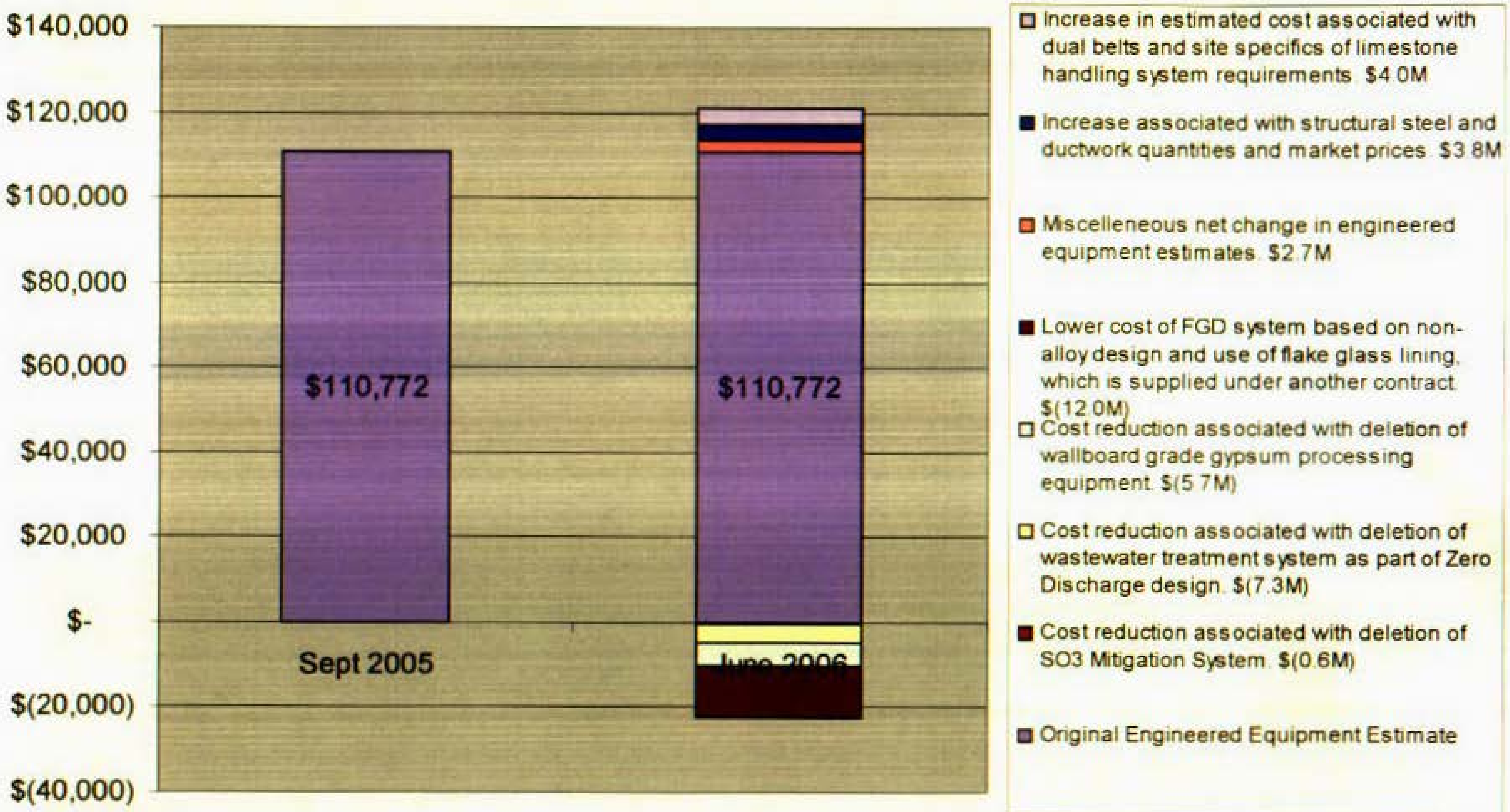
Sioux FGD Project
History of Equipment Cost Portion of Estimate



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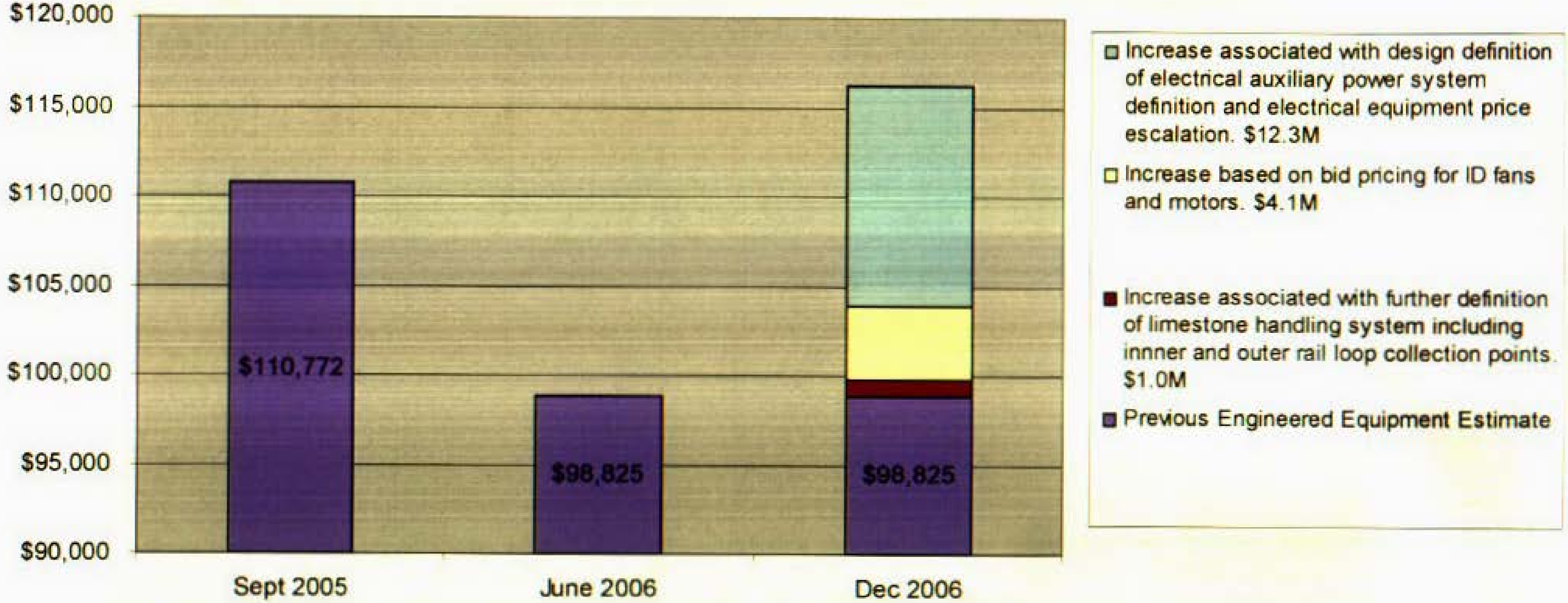
Sioux FGD Project
History of Equipment Cost Portion of Estimate



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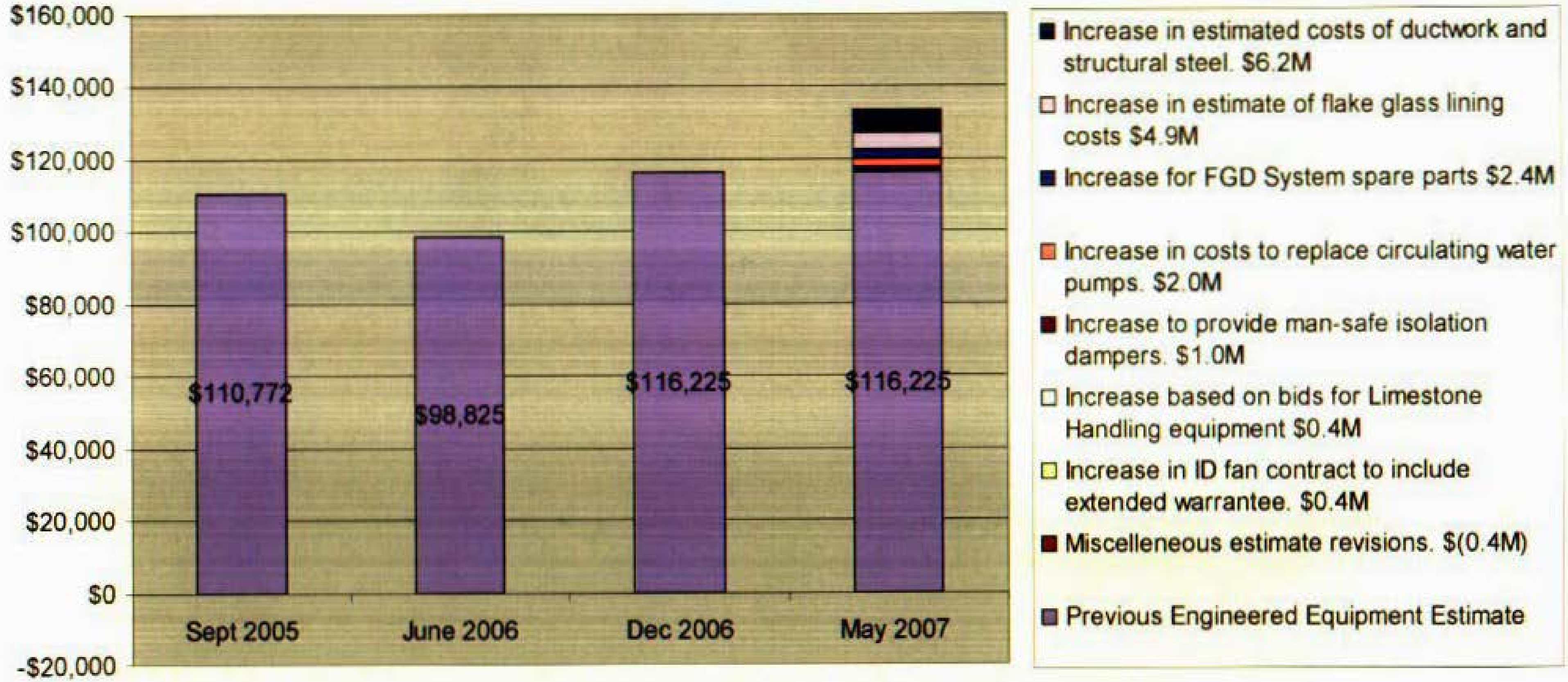
Sioux FGD Project
History of Equipment Cost Portion of Estimate



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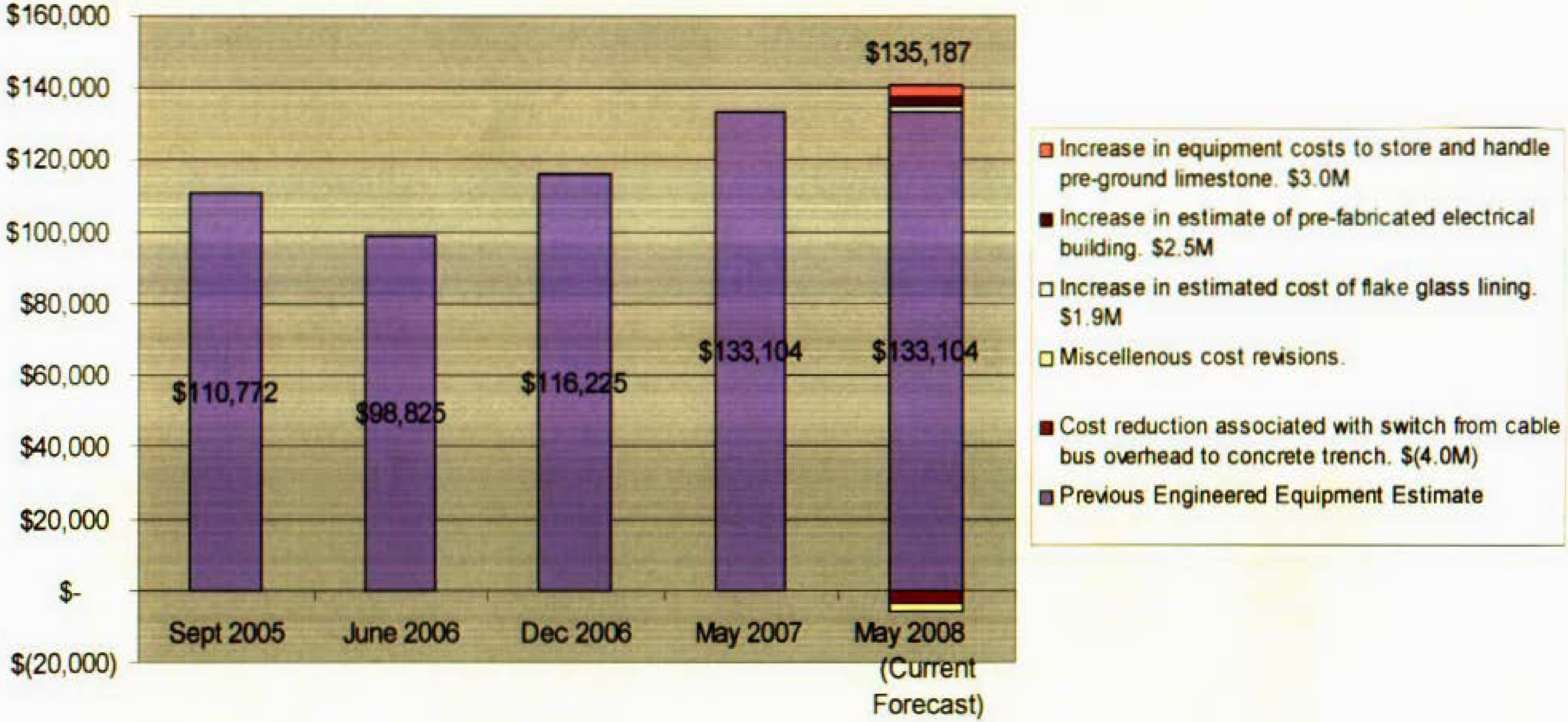
Sioux FGD Project
History of Equipment Cost Portion of Estimate



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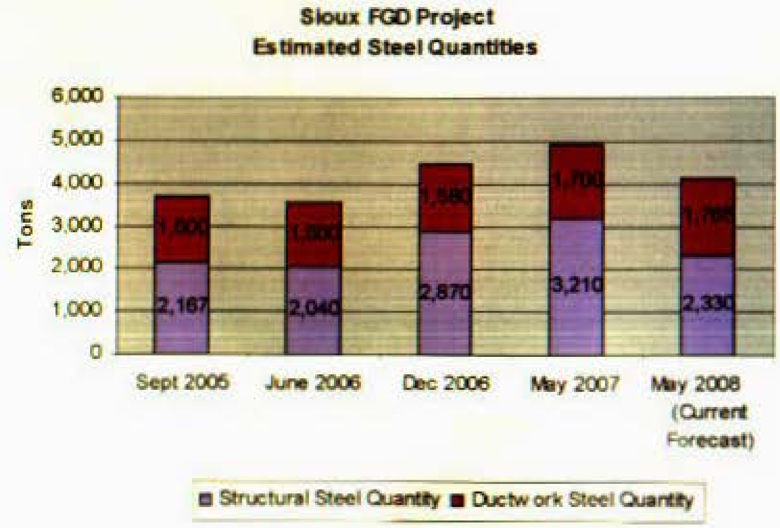
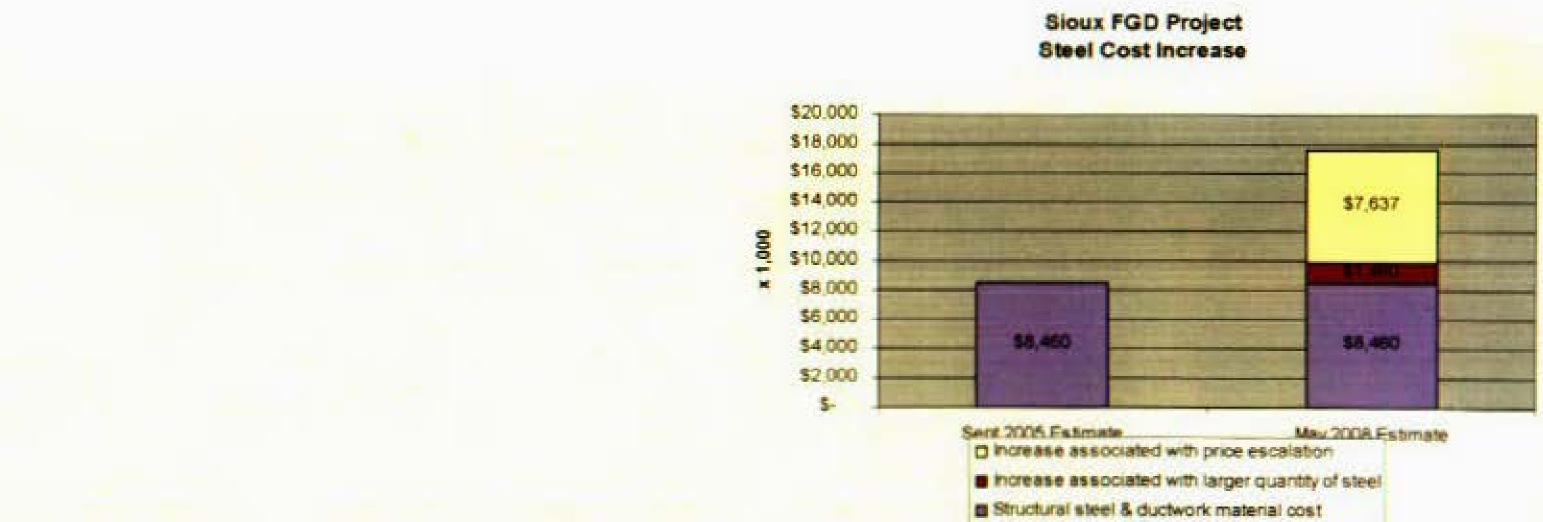
Impact of Steel Prices

- From Sept 2005 to May 2008 the estimated tonnage of steel increased by 12%.
- Steel cost increased by 108%.





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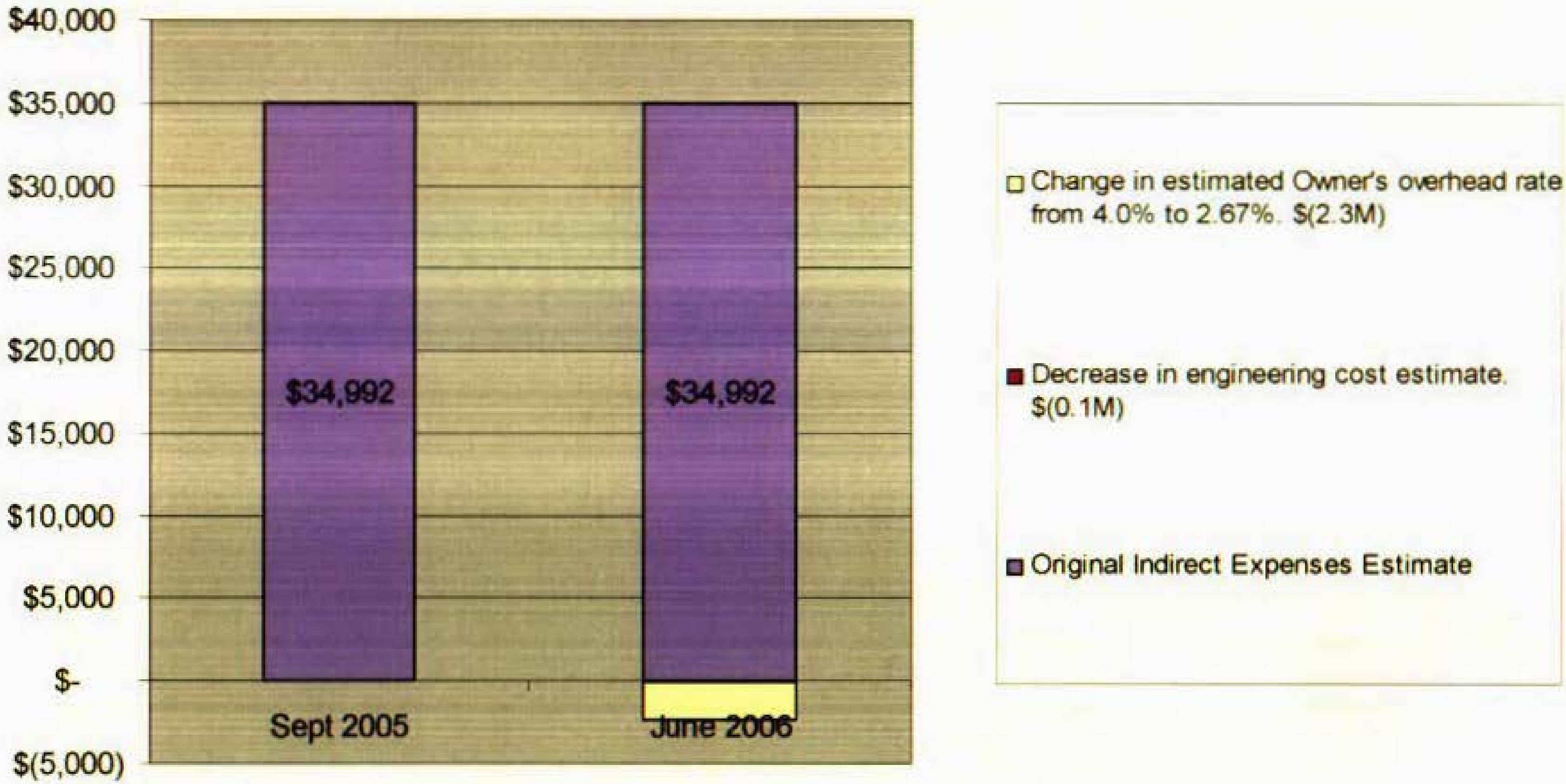
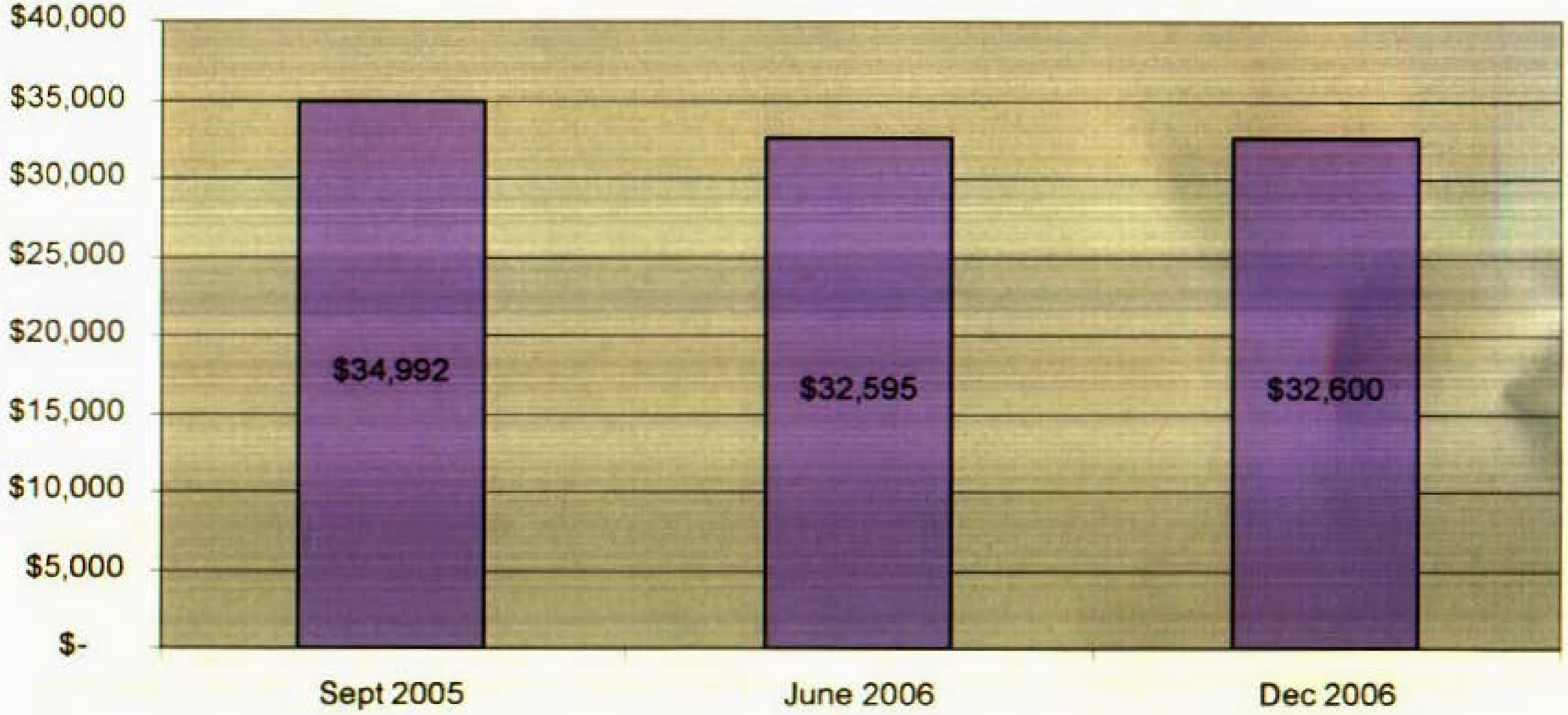
Sioux FGD Project
History of Indirect Expenses Cost Portion of Estimate



Sioux FGD Project
History of Indirect Expenses Cost Portion of Estimate



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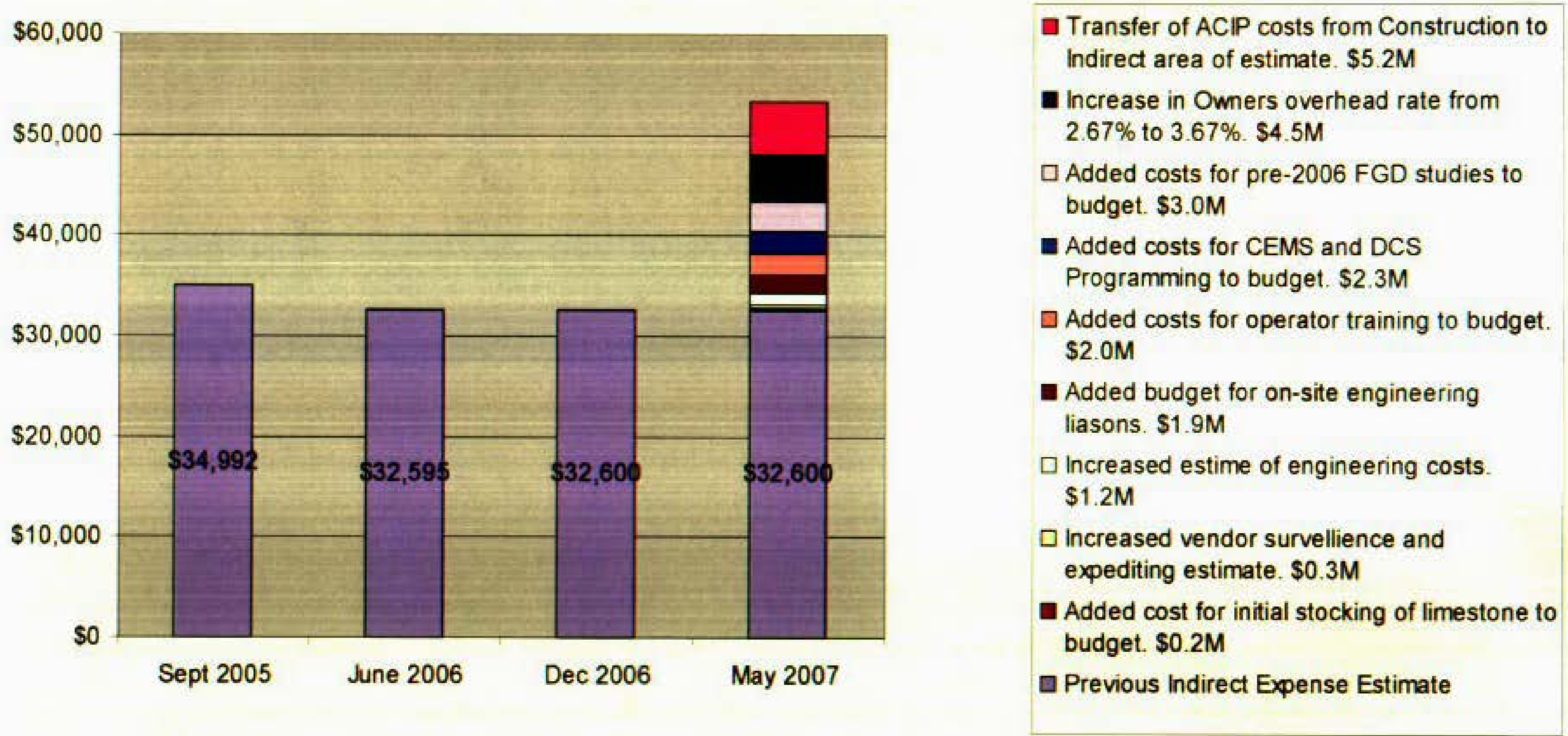
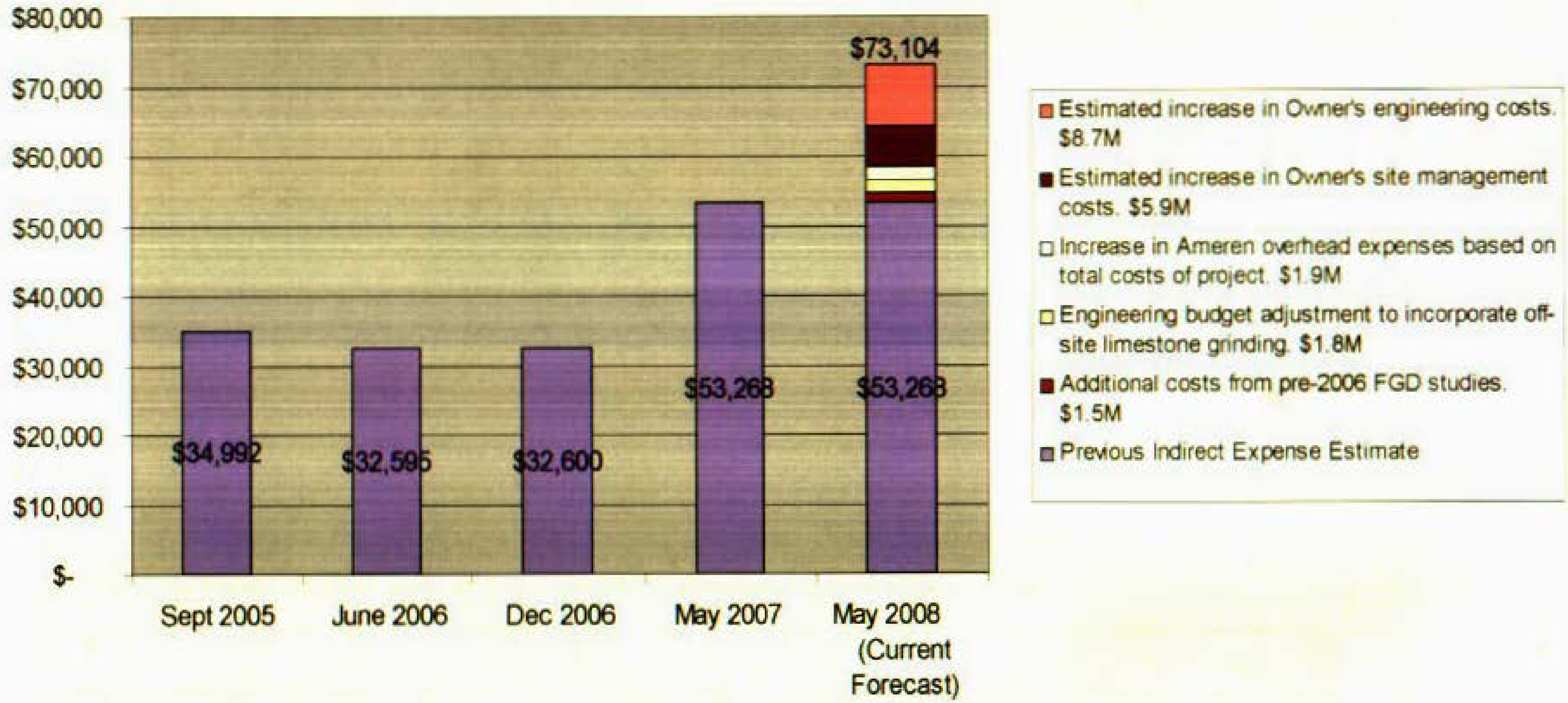
Sioux FGD Project
History of Indirect Expenses Cost Portion of Estimate



Sioux FGD Project
History of Indirect Expenses Cost Portion of Estimate



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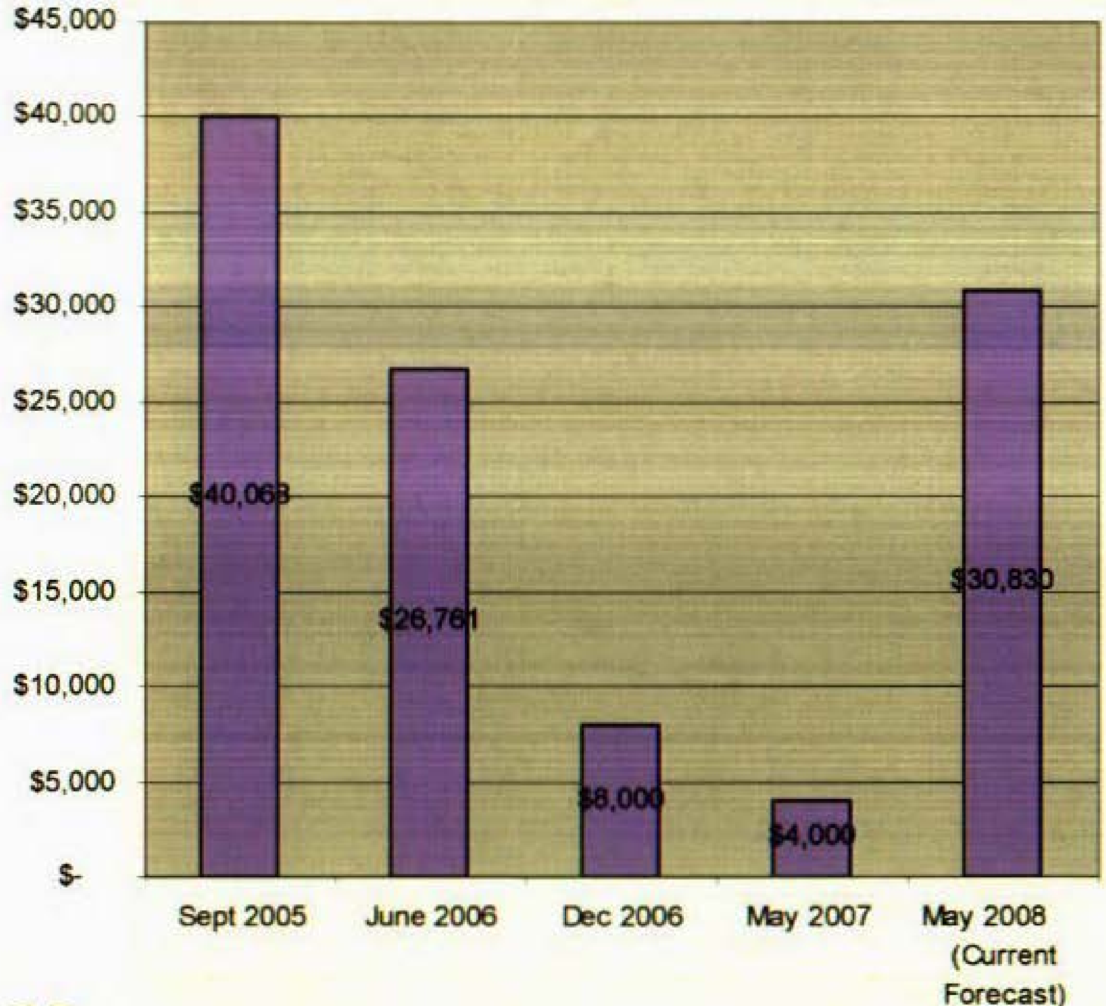
Sioux FGD Project
History of Withheld Contingency Cost Portion of Estimate



- Contingency was reduced in June 2006 estimate based on procurement of FGD system.
- Contingency withheld by Ameren was shifted to "construction contingency" in the construction portion of the estimate, $15M.
- Contingency was increased in the May 2008 estimate based on uncertainty in the performance of Hitachi, National Steel and Devcon.

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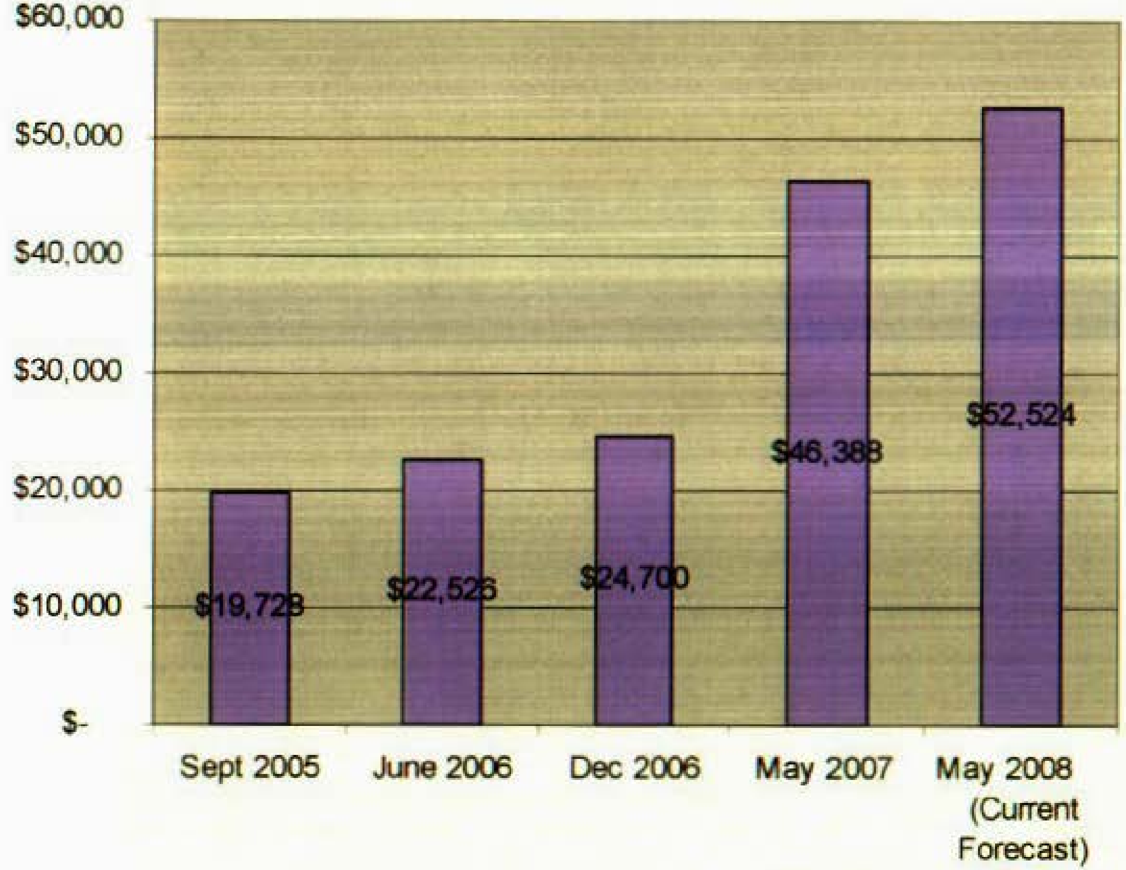
Sioux FGD Project
History of AFUDC Cost Portion of Estimate



- Major change in AFUDC in May 2007 estimate reflecting movement of in-service date from 2008 to 2009.
- Increase in May 2008 estimate is associated with the shift of the Unit 2 in-service date to the spring of 2010.
- Interest rate decreased from 8.84% to 7.98%.

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Cost Factors

Labor Demand

Material Escalation

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Labor Demand

FGD Projects

Midwest Projects

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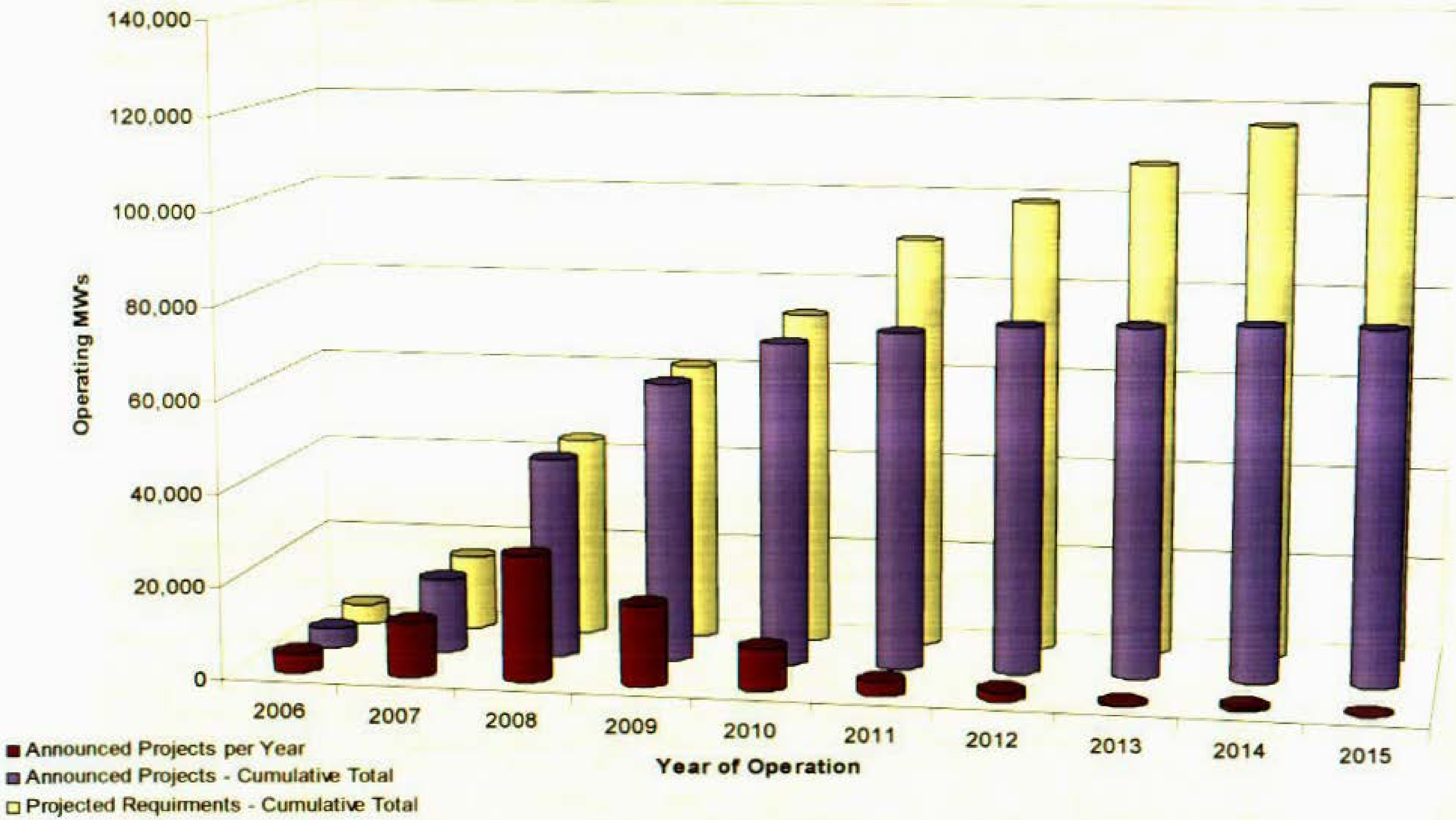
Known FGD Systems Scheduled for Operation and Projected Requirements
MW's Per Year of Operation and Cumulative Totals



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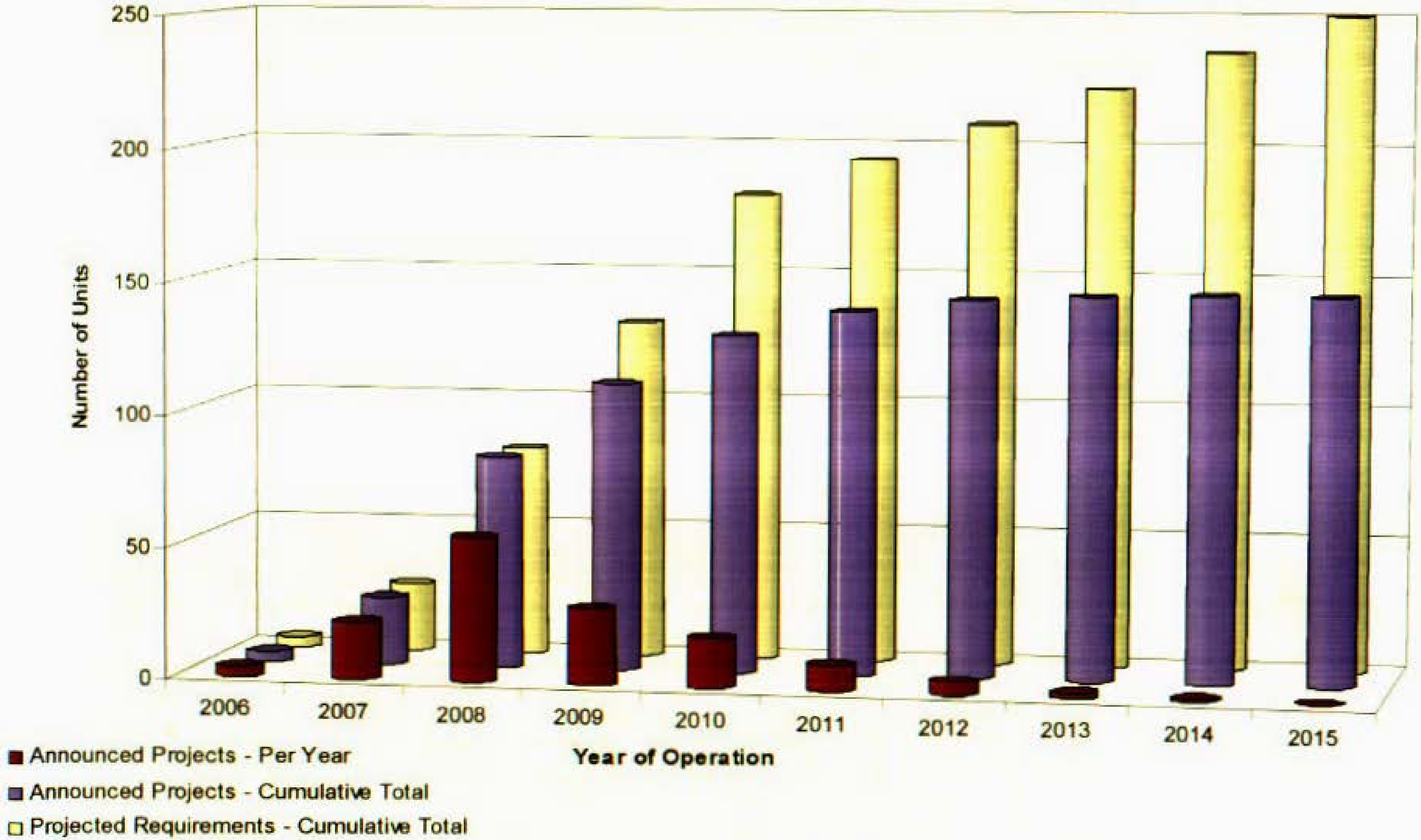
Announced FGD Systems Scheduled for Operation and Projected Requirments
Units Per Year and Cumulative Total



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Current Industry FGD Programs Summary

- About 77,000 MW (~146 units) of FGD systems are underway.
- 2008 is a peak year when about 27,500 MW (55 units) of FGD systems will go into operation.
- Approximately 73,000 MW of FGD systems are needed by 2010.
- Approximately 125,000 MW of FGD systems are needed by 2015.

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Other Industries

- Conoco/Phillips Refinery Expansion
  - Project Cost of $4 Billion
  - Construction from 2008 to 2011
- Holcim Cement Plant
  - Project Cost of $1 Billion
  - Construction from 2006 to 2009
- Marathon Robinson Refinery
- Lafarge Plant Expansion
- Whiting Refinery

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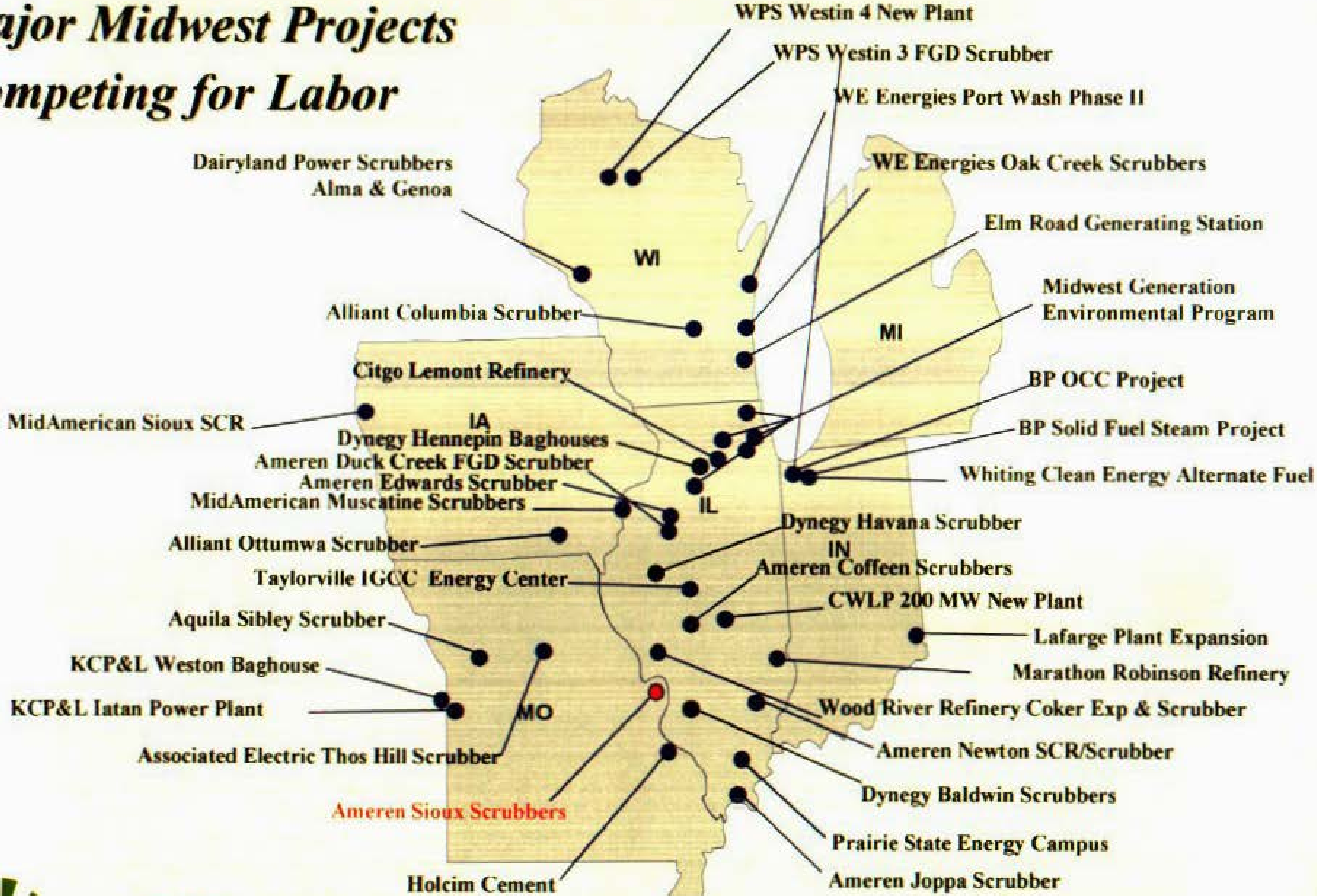
Major Midwest Projects Competing for Labor



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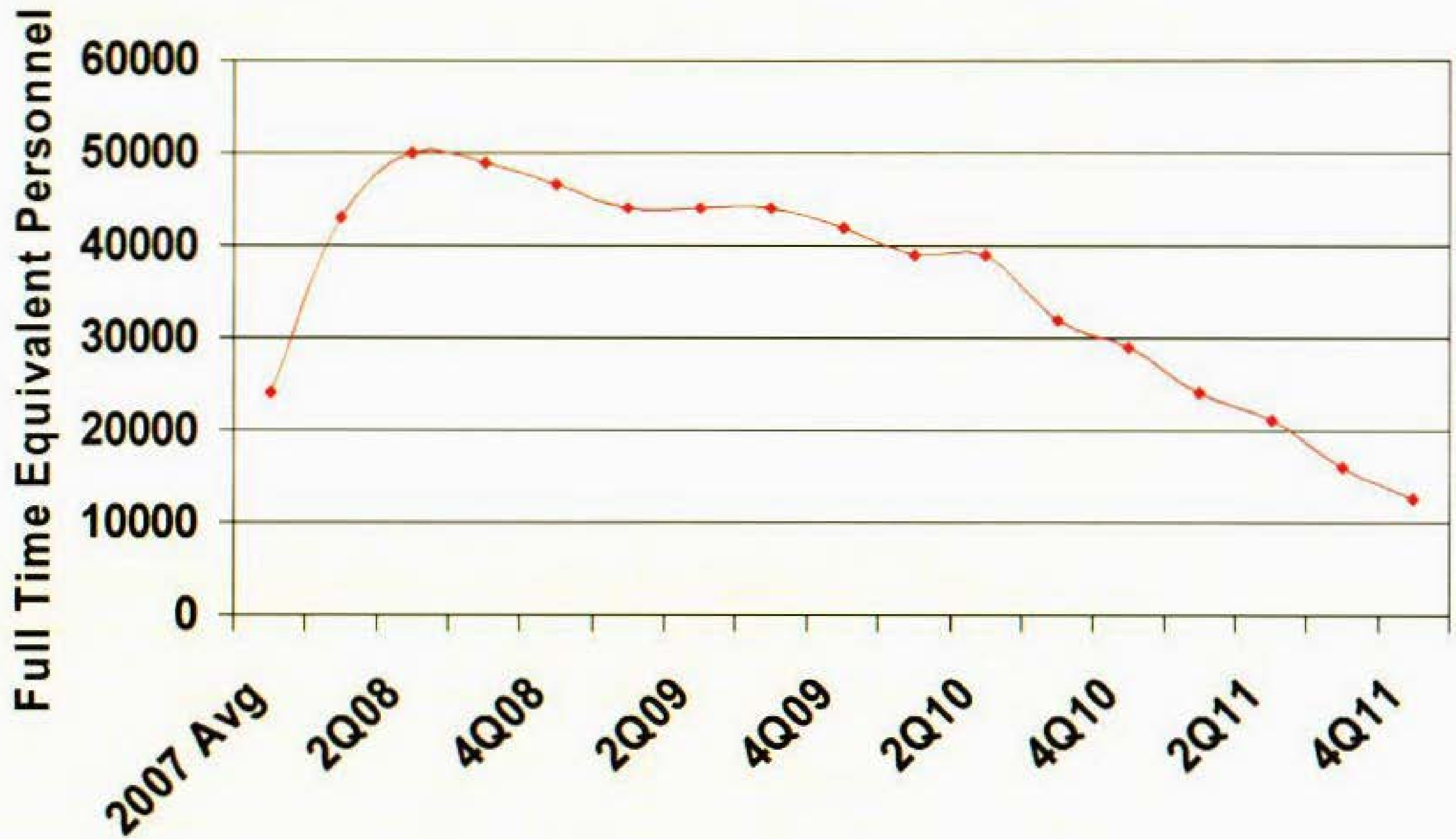
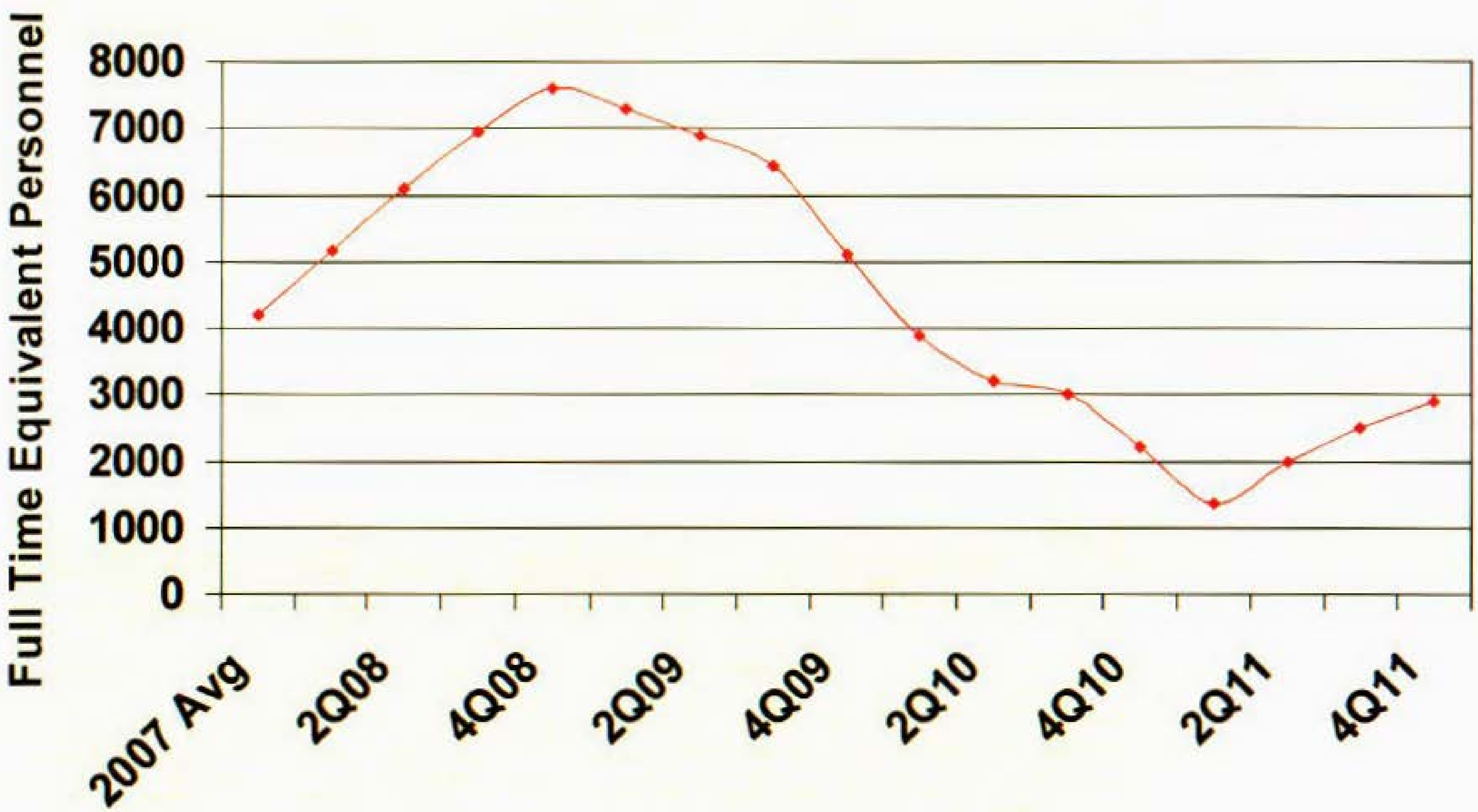
Midwest Labor Supply/Demand

(Source: Construction Labor Research Council)



Missouri Labor Supply/Demand

(Source: Construction Labor Research Council)



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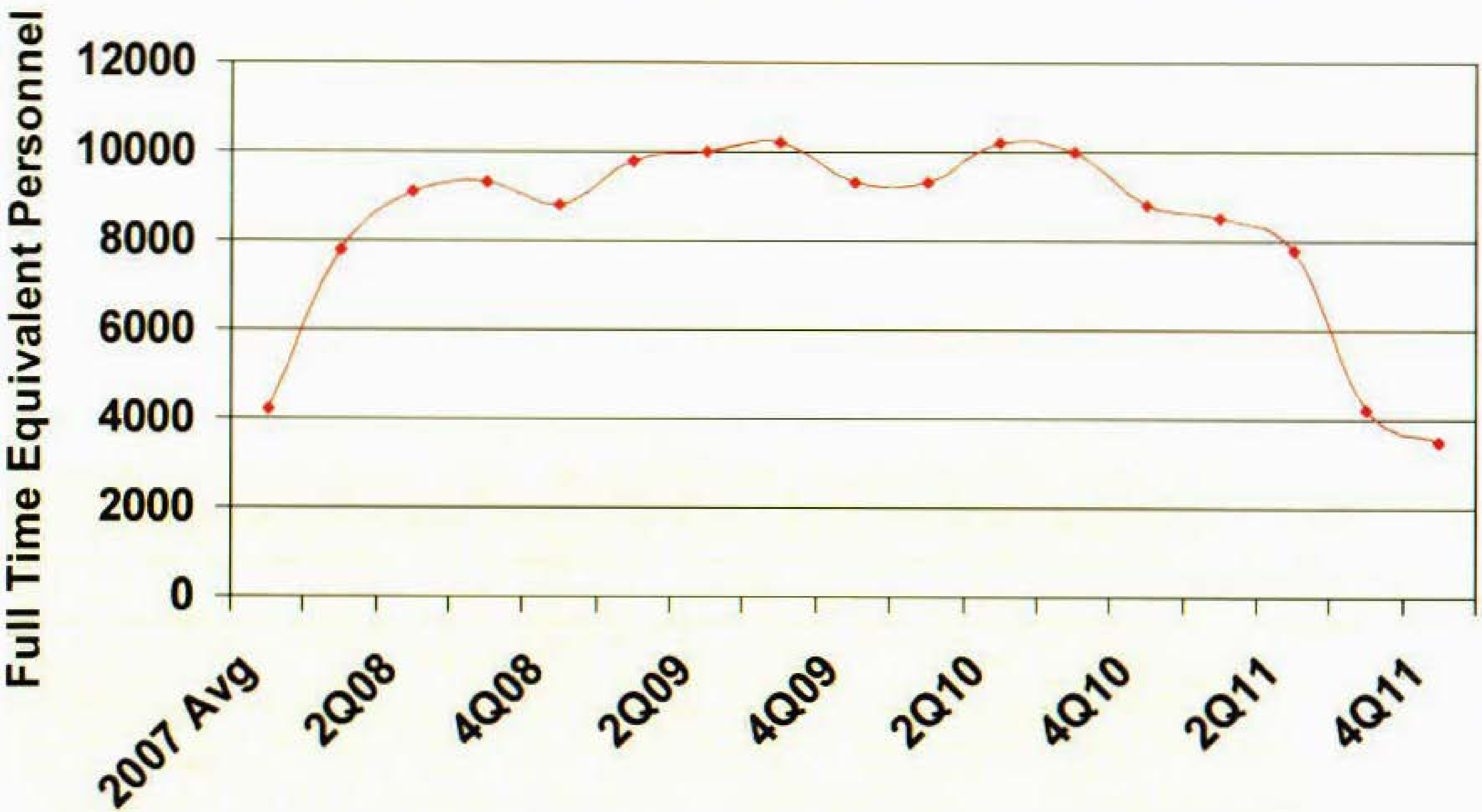
Illinois Labor Supply/Demand

(Source: Construction Labor Research Council)



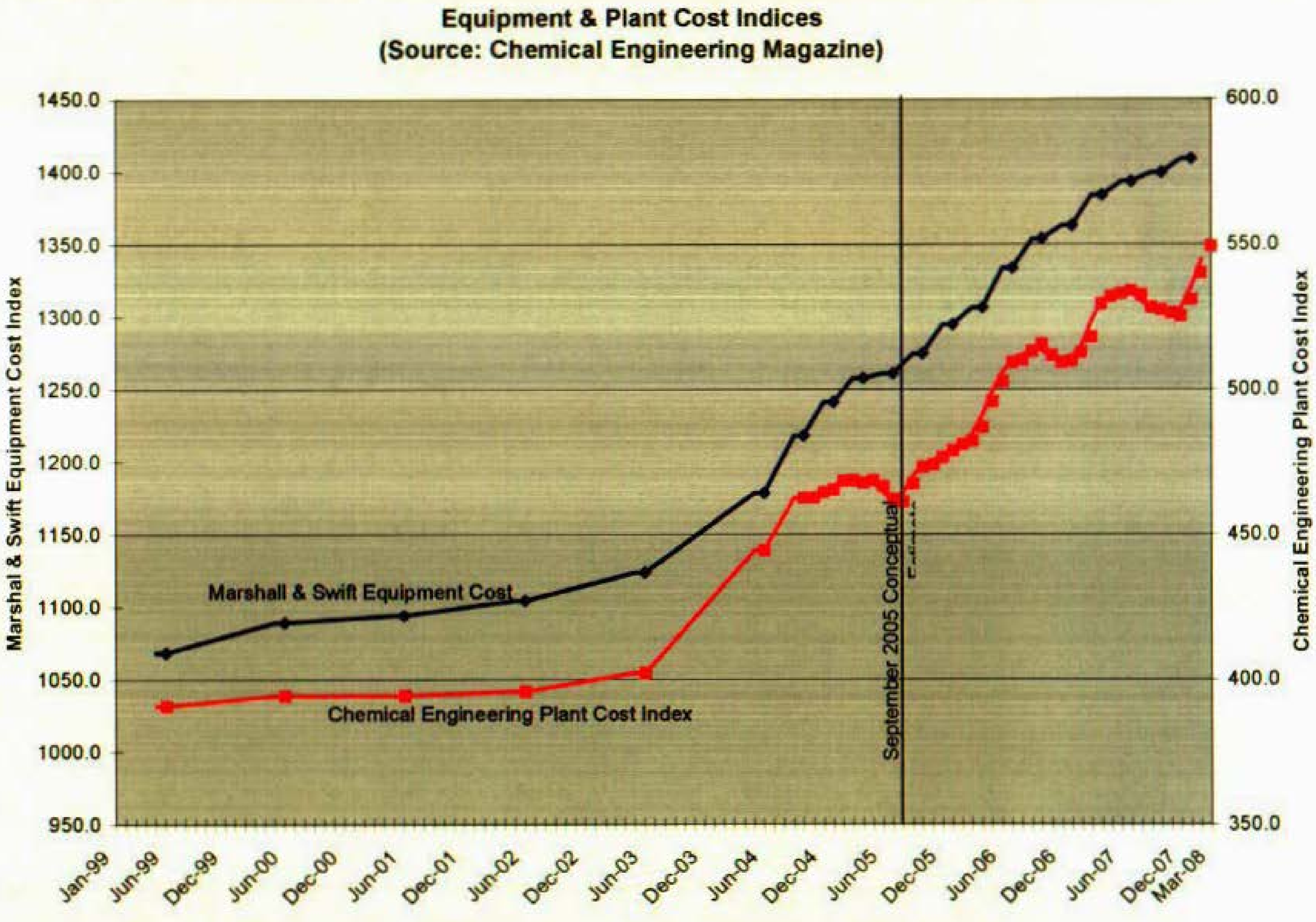
Equipment & Material Escalation

Equipment & Plant Costs

Material Escalation

Other FGD Projects

Equipment & Plant Cost Increases



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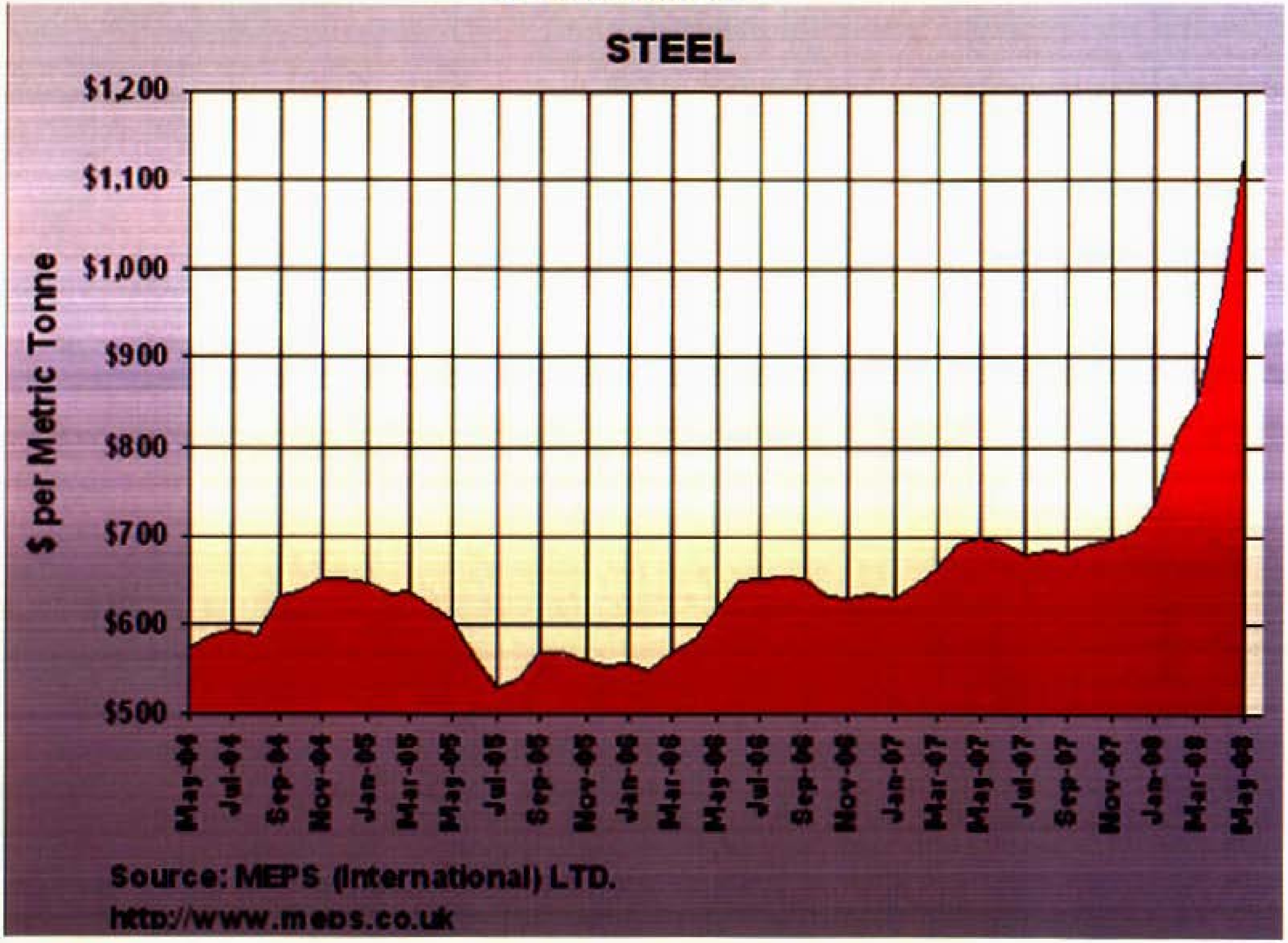
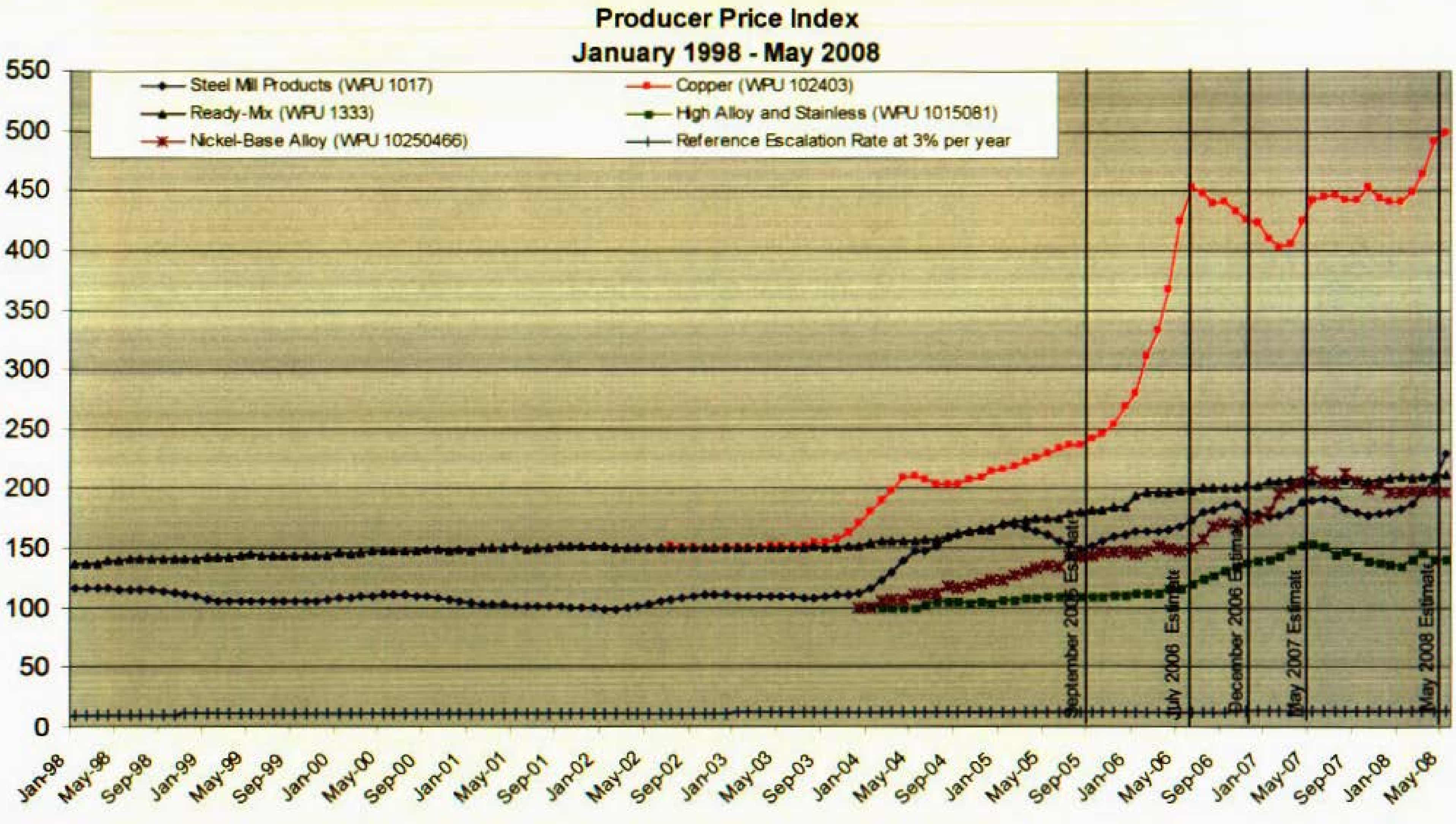
North American Composite Carbon Steel Price Increases



Material Price Increases



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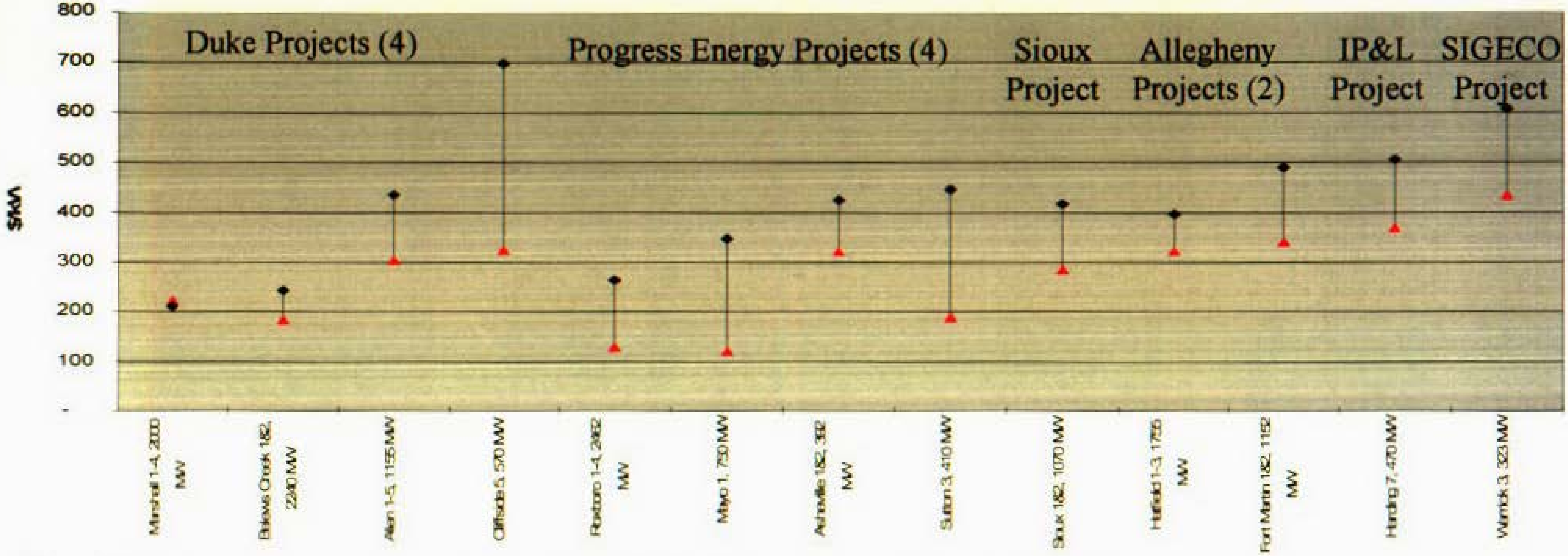
FGD Retrofit Cost Experience – July 2008



- Duke
  - Started Procurement in 2002
  - 95% Sulfur Removal
  - Medium Sulfur Coal
  - Spray Towers
- Progress Energy
  - Started Procurement in 2002
  - 95% Sulfur Removal
  - Medium Sulfur Coal
  - Spray Towers
- Sioux Project
  - Started Procurement in 2005
  - 99% Sulfur Removal
  - Medium Sulfur Coal
  - Spray Towers
- Allegheny Projects
  - Started Procurement in 2006
  - 95% Sulfur Removal
  - High Sulfur Coal
  - Spray Towers
- SIGECO
  - Started Procurement in 2003
  - 98% Sulfur Removal
  - High Sulfur Coal
  - Spray Towers
- IP&L
  - Started Procurement in 2003
  - 97% Sulfur Removal
  - High Sulfur Coal
  - Fountain Sprays

Triangle - Original estimate.
Diamond - Most recent estimate.
Costs exclude AFUDC

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Source: Various Rate Cases Filings& publications.

Schedule MCB-E3

This Schedule is

Considered

Highly Confidential

In its

Entirety