MISSOURI PUBLIC SERVICE COMMISSION

STAFF'S CONSTRUCTION AUDIT AND PRUDENCE REVIEW OF TAUM SAUK PROJECT FOR COSTS REPORTED AS OF OCTOBER 31, 2010

UNION ELECTRIC COMPANY,
d/b/a Ameren Missouri

FILE NO. ER-2011-0028

Jefferson City, Missouri
February 8, 2011

**** Denotes Highly Confidential Information ****

NP

STAFF'S CONSTRUCTION AUDIT AND PRUDENCE REVIEW OF TAUM SAUK PROJECT FOR COSTS REPORTED AS OF OCTOBER 31, 2010

STAFF'S CONSTRUCTION AUDIT AND PRUDENCE REVIEW OF TAUM SAUK PROJECT FOR COSTS REPORTED AS OF OCTOBER 31, 2010

I. Background

As part of this Staff Construction Audit, engineers in the Utility Services Division, Engineering and Management Services Department, and the Utility Operations Division, Engineering Analysis Section of the Energy Department, monitored the progress of the project during construction by making periodic field visits to the Taum Sauk Project site.

The 1960 Project Description, Design, and Construction

The original purpose for the construction of the Taum Sauk pumped storage generation facility was to allow extra generation capacity for the Ameren Missouri service territory during periods of peak demand. This additional generation would allow the Company an opportunity to delay construction of an expensive base load facility. It was contemplated that by construction of Taum Sauk an expensive base-load electric production facility would not be necessary for a decade or two as the Union Electric system continued to grow and build capacity to meet the electrical load growth. In his description of the development of the Taum Sauk pumped storage hydroelectric plant, George P. Gamble, Executive Vice-President of Union Electric Company in *Power Engineering* magazine, November 1960 provides explanation for the economic assumptions that were undertaken to invest in a straight earth-fill dam to achieve pay out on a pure pumped storage project. Operational inefficiencies are discussed as being mitigated due to additional low-operating cost generation becoming available; to the extent that the facility would eventually achieve a pure reserve status for the system.

A pumped storage facility provides an electric utility with the ability to essentially store electricity. This stored electricity provides several advantages. Coal-fired power plants operate most efficiently at a specifically designed production level. Electric demand generally tapers off at night when people are sleeping. Taum Sauk provided a facility that would take the power from the coal-fired plants at night, when it is not needed, to pump water to fill the upper reservoir to store it for later use during the day.

The 1960-design Taum Sauk facility was the largest pure pumped storage facility built to date. The project encompassed building of roads, clearing and grubbing of the construction area

atop Proffit Mountain and other relevant locations, excavation of hard fine grained rhyolite rock,[1] reprocessing of the rock for construction purposes,[2] and the construction of a course rock filed concrete lined ring dike dam[3] with a parapet wall.[4] Simultaneously, work was undertaken to develop and build the power site. This included excavation into the mountain side for the power station and tail race or canal[5] to carry water to and from the East Fork of the Black River. A near horizontal tunnel was excavated into the mountain at the power site that connects with an excavated vertical shaft leading up to the upper reservoir. This tunnel acts as a pipe to carry water from the upper reservoir to the Taum Sauk power site and then after flowing through the pump/generators flows down the tail race to and from the lower reservoir on the East Fork of the Black River. The lower reservoir was constructed by building a run-of-river[6] dam at a select location to allow retention of just enough water to fill the upper reservoir. This dam prevents the flow of water on the East Fork of the Black River from being diminished when the lower reservoir was filled. The normal flow of water in the river is maintained by opening and closing a gate in the dam or during periods of extreme rain fall the dam was designed to simply allow the water to flow over the top of the dam without causing damage to the lower dam.[7]

All the project components of the 1960 Project were tested and completed and the facility was placed into commercial generation December 20, 1963.

---

[1] This rhyolite is a very hard and brittle rock that had to be removed for excavation and production of the upper reservoir. "The bottom of the reservoir had been badly shattered by overshooting (drilling and blasting below the required depth), which was done to facilitate excavation and minimize secondary drilling and blasting." *Hydro-Review*, Summer 1985, Searching for Leaks: Repairing the Taum Sauk Reservoir, by Edward C. Wulf

[2] The reprocessing for construction involves the crushing, grinding, grading or sizing of the stone, removal of fine particles and then the recombining of the graded materials to achieve the prescribed concrete mix design(s).

[3] A ring dike dam is a structure or embankment for controlling or holding back fluids by surrounding the area upon which the fluids are stored.

[4] Normally a parapet wall is a wall placed at the top of a dike or dam to stop wave action from allowing water to overtop the structure and cause erosion or other problems on the downstream side of the structure.

[5] tailrace - a watercourse that carries water away from a mill or water wheel or turbine waterway, watercourse - a conduit through which water flows

[6] A run-of-river dam does not alter the rate of water flow in the river.

[7] The operation of the lower reservoir dam remains the same as it was before the breach.

The Breach

On December 14, 2005 the upper reservoir failed. Water was inadvertently pumped over the reservoir parapet wall. The water level measurement system had failed. Had the dike been constructed as planned the failure of the upper reservoir due to overtopping should not have occurred

Damage caused by the failure of the upper reservoir was extensive. Not only did it destroy the Taum Sauk facility's ability to operate, it literally scoured the side of Proffit Mountain down to the bedrock, altered the course of the East Fork of the Black River, and injured a family of five.[8] The breach caused the filling of the Johnson Shut-Ins State Park with debris, destroyed most park buildings and transformed the unique wet fen area into a dry fen area. Ameren Missouri also received considerable damage to the very property it owns, the lower reservoir was filled with debris along with the tail race and damage to the power sites lower water intakes.

Lessons learned as a result of the water level measurement system failure and over topping of the dam are incorporated in the new replacement upper reservoir structure and operating parameters.

Staff Expert/Witness: Guy C. Gilbert, MS, PE, PG

II. Taum Sauk Rebuild

The 2007 Project Description, Design, and Construction

Ameren Missouri did not consider rebuilding the upper reservoir in anything other than essentially the same size and shape as originally constructed. Had the Company considered other than a similar size and shape structure there was concern that the whole licensing process would have become open to public debate. Ameren Missouri did not engage in any analysis for alternative electric production resources. Had the Company considered other than to replace the upper reservoir structure, proceeds from the insurance payment would have been greatly reduced.

The upper reservoir failed December 14, 2005. On April 19, 2006 Paul C. Rizzo Associates, Inc., (Rizzo) provided Ameren Missouri a proposal with four different structure

[8] The breach did not result in any fatalities. The construction work on the rebuild project did include one fatality.

rebuild designs. Ultimately a hybrid of those proposals was adopted, which included the more robust concepts of Rizzo's proposals.

On August 15, 2007 FERC granted Ameren Missouri the authority to rebuild the upper reservoir with specific oversight from a Board of Consultants (BOC), an Independent Panel of Consultants (IPOC), and the FERC staff. In addition to these overseers, Ameren Missouri retained Rizzo as its managing engineer. Beginning on August 15, 2007 and ending February 28, 2010, detailed construction progress reports were produced on a monthly basis. A total of thirty primary reports were produced during construction of the upper reservoir along with several other subproject specific reports and support documentation.

In addition to the two site visits shortly after the breach, Staff conducted 19 site visits beginning with construction of the first sections. Staff also observed ash recovery from Meramec Station that was used for the ash cementing properties on the Taum Sauk upper reservoir rebuild.[9] Staff's last and most recent visits to Taum Sauk were to verify that the Taum Sauk power station was able to meet the in service criteria that Staff and the Company developed for the Taum Sauk facility.

Site visits primarily consisted of observing the quarterly status meetings attended by the BOC, the IPOC, the FERC staff, Rizzo staff, and Ameren Missouri staff. During these meetings project status and productivity were reviewed and participants undertook field visits to the construction area. Following the status reports and field visits, group discussion was undertaken to determine resolution or changes necessary to address problems or shortcomings in the construction process. Topics ranged from how much material should reasonably be excavated from certain areas to obtain a solid bedrock footing, to some problems with early mix cracking, to the addition of more water stops, the mix design and concrete mix placement parameters.

Other projects at Taum Sauk unrelated to the upper reservoir rebuild included refurbishment of the tunnel that carries water to and from the upper reservoir, new controls for the power plant, fire suppression, replacement of the personnel building, communications, and numerous other smaller projects.

As approved by the FERC and at the recommendation of the BOC, IPOC, and Rizzo several enhancements to the rebuild of the upper reservoir were incorporated. Design

[9] Coal ash from the Illinois Basin Herrin #6 coal seam can be used to provide pozzolanic action in the concrete mix with a reduced heat of hydration that allows more massive concrete placement while limiting heat stress cracking.

enhancements began with the foundation of the upper reservoir and continued throughout the project.

The excavation, washing and cleaning of the bedrock foundation was meticulous. The foundation area was mapped by geologists in ten foot square sections. Holes were drilled and a bore hole camera was inserted to provide better characterization of the underlying geology. Recommendations were made if it was necessary to undertake additional excavation of the area if not the appropriate dental work was prescribed for the area. This involved applying special concrete mixes to any cracks or crevices as deemed appropriate.

Once the foundation had been properly prepared the water stops and forms were set for the dam to be built. The dam is constructed of a combination of specially designed concrete mixes. The core of the dam, which makes up the majority of its volume is a type of concrete specifically developed to use the processed materials of the old dam along with recovered ash from the Meramec Power Station, Portland cement and water. This is known as roller compacted concrete or RCC. The core is covered and protected by a shell constructed of more durable conventional design limestone concrete. This combination provides a low heat of hydration,[10] due to the Meramec ash and a reduced cost of construction that allowed for more rapid completion.[11] Extensive testing was done throughout the pouring of the dam and any batches of concrete that did not meet specifications were removed and replaced with new concrete.[12] These tests and procedures are very similar to those the Federal Highway Administration requires.

Staff Expert/Witness: Guy C. Gilbert, MS, PE, PG

---

[10] A low heat of hydration is the result of a slowing of the exothermic reaction that occurs as the pozzolanic or cementing chemical reaction occurs. In conventional concrete reaction, the heat can become great enough in large quantities of freshly poured concrete to damage the concrete as a result of heat cracking.

[11] This low strength, low cost, slow set time is economically beneficial for these types of large volume concrete projects where time is available for curing. As a general rule of thumb, the longer and slower the set, the better the concrete will be.

[12] As the monthly production records indicate, on certain occasions concrete material had to be removed and replaced when design specifications were not obtained. This is to be expected in a project involving millions of cubic yards of concrete.

III. Audit Objectives, Risk Assessment and Audit Scope

A. Audit Objectives

Determine whether the Taum Sauk Upper Reservoir Rebuild (Taum Sauk Project) contains any charges that are imprudent, unreasonable, inappropriate, and/or not of benefit to Missouri ratepayers. If any such charges are found, then develop adjustments to remove those cost from the Taum Sauk addition to rate base.

B. Risk Assessment

The Audit Staff reviewed documentation provided by Ameren Missouri (Company). The Audit Staff conducted an examination of all charges related to the rebuild including enhancements.

C. Court Rulings and Consent Judgment

The State of Missouri, along with the Missouri Department of Natural Resources (MDNR), the Missouri Conservation Commission (MCC), and the Attorney General (AG) entered into a Consent Judgment with AmerenUE, since re-named Ameren Missouri, in regards to the Taum Sauk reservoir breach. According to the Consent Judgment, Ameren Missouri had to pay several fines for the damages or loss of income due to the breach. (See chart below). These fines are not included in the final project cost amount. These costs were absorbed by shareholders of Ameren Missouri and are not included in Ameren Missouri's requested rates nor in Staff's cost of service calculation.

continued on next page

Party Paid	Reason for Payment	Date Paid	Amount Paid
State of Missouri	Natural Resource Damages		$ 84,156,000
State of Missouri	Parks Earnings Fund	within 30 days of entry of Consent Judgment	$ 11,875,000
State of Missouri	Natural Resources Protection Fund Damage Subaccount	within 30 days of entry of Consent Judgment	$ 4,281,000
State of Missouri	Conservation Commission Fund	within 30 days of entry of Consent Judgment	$ 6,000,000
	Natural Resource Monitoring		$ 2,000,000
	Tourism & Economic Development Trust Fund Account		$ 7,000,000
Ameren Missouri	Credit - Natural Resources Damages - Land Ameren Missouri owns - Church Mountain		$ (33,000,000)
	46-mile section of railway right-of-way between Windsor and Pleasant Hill		$ 15,000,000
Missouri Department of Natural Resources	Construction of KATY Trail Extension		$ 18,000,000
State of Missouri	Reynolds County School Fund	within 30 days of entry of Consent Judgment	$ 2,000,000
Reynolds County	Educational Enrichment Fund	1/2/2008	$ 3,000,000
Ameren Missouri	Credit - Construction of structures and facilities that did not exist at the time of the breach		$ (15,000,000)
State of Missouri	Parks Earnings Fund	within 30 days of entry of Consent Judgment	$ 2,000,000
State of Missouri	Response Costs		$ 2,000,000
Environmental Emergency Response Unit	MDNR - 6 environmental emergency response vehicles		$ 1,194,000
State of Missouri	MDNR - Clean-up, remediation & restoration work		$ 51,000,000
State of Missouri	MDNR - Clean-up, remediation & restoration work		$ 52,000,000
State of Missouri	MDNR and MCC for ongoing maintenance	within 30 days of entry of Consent Judgment	$ 2,000,000
State of Missouri	Property Taxes for years 2007-2010	Yearly	$ 2,400,000
State of Missouri	Taum Sauk Tourism and Economic Development Non-Profit Entity	within 30 days of entry of Consent Judgment	$ 7,000,000
		Fines Ameren Missouri Must Pay	**$ 224,906,000**

D. Audit Scope

Staff's first step in determining the audit scope was to determine the time period that would be reviewed for purposes of Staff's construction audit and prudence review. In a Report and Order issued by the Commission in Case No. ER-2011-0028, a true-up was ordered through the period ending February 28, 2011. However, the latest information available to the Audit Staff for purposes of this filing includes costs incurred and paid for, for the Taum Sauk Project through October 31, 2010. Once the updated costs through February 28, 2011 are received, the

Audit Staff will audit and review this data to determine if any imprudent, unreasonable, inappropriate, and/or not of benefit to ratepayers charges are included in the additional cost.

Historically, the Audit Staff has disallowed costs not adequately identified and explained by utility companies. For purposes of this filing, the Audit Staff will identify adjustments for imprudent, unreasonable, inappropriate, and/or not of benefit to ratepayer charges incurred through the period ending October 31, 2010, reserving the right to upwardly adjust this disallowance as new information for the period ending February 28, 2011 is received. Disallowances identified by the Audit Staff in this proceeding will be discussed later in this report.

As part of its audit scope, the Audit Staff reviewed the cost and schedule controls utilized by Ameren Missouri and its project managers in order to gain familiarity with the policies and procedures in place to control costs and mitigate risks for the Taum Sauk Project. The Audit Staff also reviewed the following documents during the audit process:

1. Board of Directors Minutes for Ameren Missouri
2. Internal Procedures and Policies for Ameren Missouri
3. Meeting Minutes for the Board of Consultants (BOC) and Independent Panel of Consultants (IPOC)
4. FERC Investigation Report
5. Quality Control and Inspection Program (QCIP)
6. Final Design and Construction Report
7. Consent Judgment from the Circuit Court of Reynolds County
    - Case Number 07RE-CC00005
8. Change Order Requests (CORs) and Requests for Work Order Extensions
9. Purchase Order Summaries
10. Internal/External Audit Reports and Findings
11. Company Direct Testimony of Mr. Mark C. Birk and workpapers
12. Company Direct Testimony of Mr. Paul C. Rizzo and workpapers

The Audit Staff also:

1. Reviewed approximately 1,400 invoices related to the Project (**Staff is still waiting for Ameren to provide the invoices. Once reviewed, there may be future adjustments that need to be made.)**

Staff Expert/Witness: Erin M. Carle

IV. Audit Procedures

In this proceeding, the goal of the Audit Staff was to determine if costs charged to the Taum Sauk Project are prudent, reasonable, appropriate, and/or of benefit to Missouri ratepayers. To make this determination, costs must be adequately supported and explained. Staff's procedures included, but were not limited to: (1) Personnel Interviews; (2) Contract Evaluation; (3) Cost Evaluation; and (4) Invoice Evaluation.

Staff Expert/Witness: Erin M. Carle

V. Findings

A. Project Management Overview

Project management "best practices" have been purported to define the following as key elements of a capital project plan:

- Scope of Work
- Safety Plan
- Quality Plan
- Roles & Responsibilities
- Project Controls Plan
    - Schedule
    - Costs & Performance Measurement
    - Management of Change
    - Payment Process
- Procurement Plan
- Contracts Plan
- Engineering Plan
- Construction Management Plan
- Facilities Commissioning Plan
- Interface Management Plan
- Project Reporting Plan
- Risk Management Plan
- Document Management
- Lessons Learned
- Current Pictures of Work In Progress
- Other Required Plans

[Source: Project Management for Utility Capital Projects Using Project Management Best Practices for Success, Presented by PMCC, Inc. (a consulting firm in Houston, TX) in association with EUCI.]

Ameren Missouri's capital project appeared to use a capital project plan; however, some inefficiency in Ameren Missouri's capital project plan was identified during internal and external audit reviews conducted by Ameren Services and Ernst & Young during the course of the construction project. These inefficiencies will be discussed in greater detail later in this Report. Reports received by Ameren Missouri throughout the course of the construction project included:

- Program Costs Status – relating to estimated costs at completion
- Project Summary – relating to cost and schedule performance
- Bills of Materials Cost Management – relating to costs incurred, committed costs, and estimated costs at completion for specific work packages. Work packages are defined as the scope of the work at the lowest level of the work breakdown structure (WBS) for a project. The WBS defines all components of the project. These components include: cost, schedule, risks, documentation, future change orders, and reflects the contract deliverables. Work packages are primarily used for cost management of the project. (Source: www.pmi.org, "Guide to Project Management Body of Knowledge" (PMBOK))
- Variance Reports – intended to allow early detection of significant variances requiring corrective actions

Key Contractors

1. **Paul C. Rizzo Associates, Inc.**
   Paul C. Rizzo Associates, Inc. ("Rizzo") was hired to provide professional engineering and related support services as required by Ameren Missouri for the Taum Sauk Project.

2. **Ozark Constructors LLC, a Fred Weber-ASI Joint Venture**
   Ozark Constructors LLC, a Fred Weber-ASI Joint Venture ("Ozark") was hired to rebuild the upper reservoir and provide labor, materials and equipment as necessary at Taum Sauk to reinstate Ameren Missouri's plant to full operation.

3. **Additional Personnel for the Taum Sauk Project**
   Following the Taum Sauk breach and through the construction process, Ameren Missouri created different programs and boards to oversee progress. One program was the Dam Safety Program. This program included a Chief Dam Safety Engineer and a Quality Management Department. This program resulted in substantial additional training in a variety of areas for Ameren Missouri Generation employees.

Ameren Missouri also created a Board of Consultants (BOC) that worked with the Federal Energy Regulatory Commission's (FERC) counterpart, the Independent Panel of Consultants (IPOC). Both panels were made up of hydroelectric engineers and industry experts. Ameren Missouri also had a Dam Safety and Hydro Engineering Department that worked closely with the BOC and IPOC. These panels worked with Rizzo and personnel from various FERC regions, to oversee the overall design and construction progress of the rebuild. (Source: Company response to Staff Data Request No. 225 – Consent Judgment). Veritas Advisory Group also worked with Rizzo in the approval process of change orders and to ensure that the design and construction process was acceptable as it related to the contract with Ozark. (Source: Company response to Staff Data Request No. 234) Ameren Missouri stated that it believed it was necessary to utilize the services of Veritas to ensure that the project was staying within the limits of the insurance claim. Although it was not a formal requirement from the insurance companies, it was more of an informal recommendation. Veritas is an advisory group that is made up of CPAs, financial analysts, construction and engineering professionals, and information management experts. They focus on supporting their counsel with resolution of disputes and other business problems. (Source: www.veritasag.com/about.html).

The Missouri Conservation Commission (MCC), the Missouri Department of Natural Resources (MDNR), and the Missouri Attorney General (AG) have also been involved in the Taum Sauk Project to some degree. The MCC and the MDNR oversaw the rehabilitation of the surrounding lands and waterways after the breach. The AG has sought to ensure that costs incurred by Ameren Missouri as a result of the breach would not be borne by the Ameren Missouri ratepayers.

B. Cost and Schedule Management

Ameren Missouri utilized numerous methods for cost and schedule management during the course of the Taum Sauk Project. Ameren Missouri Policy No. AMN-08-06 and Procedure No. AMN-ADM-4006 relate to budgeting and forecasting. This procedure and policy provides guidance for monitoring and controlling project costs. According to Ameren Missouri's response to Staff Data Request No. 215, on a monthly basis, all variances from O&M and capital budgets were reviewed at the department levels and the annual forecast was updated as necessary. The Ameren Missouri generation function managers met monthly to discuss the results of the review. (Source: Company response to Staff Data Request No. 215)

Another program utilized by Ameren Missouri to oversee the project was the Quality Control and Inspection Program (QCIP). The purpose of QCIP was to verify that any changes to the requirements or design of the Taum Sauk Project were appropriately reviewed, approved and controlled. Rizzo was responsible for implementing the QCIP. Rizzo was also responsible for

monitoring, inspecting, and testing activities independently of similar services provided by Ozark. (Source: Company response to Staff Data Request No. 222)

Ameren Missouri constructed the Taum Sauk Project outside the parameters and benefits of a Regulatory Plan, such as the Kansas City Power & Light Company Regulatory Plan, where specific objectives were prescribed that had to be met to satisfy Regulatory Plan requirements. In addition, Ameren Missouri customers did not pay higher rates during the construction period for the Taum Sauk Project, as was the case under KCPL's Regulatory Plan Iatan Project.

C. Internal and External Audit Reviews

Internal audits were performed by Ameren Missouri. The Internal Audit Department performed two audits and one Post Audit Review. In the first audit, dated 9/3/2008, the Internal Audit Department did not find any problems or concerns with the completeness or accuracy of the work order procedures. As such, no recommendations were made as a result of that audit. During a second audit dated 1/6/2009, the Internal Audit Department found four areas of concern and identified opportunities for improvements. These areas were:

1. Cost and Schedule Management
2. Risk Management
3. Policies and Procedures
4. Document Management and Storage

For the Cost and Schedule Management, the Internal Audit Team discovered that the Project Management Team (PMT) did not prepare a consolidated report that describes the project cost and schedule status. The PMT focused its cost management efforts on Ozark, since it was expected to be responsible for approximately 70% of the total forecasted project cost. There were no published project reports for the non-Ozark scope of the project. The Estimates at Completion (EAC) for the non-Ozark scope were not developed to a similar level of detail as the Ozark EAC. The PMT does not include the growth of project cost and corresponding trends in the overall Project Report. The Internal Audit Team also discovered that there was minimal documentation of a detailed and standard approach for invoice reviews. In response to this audit finding, Ameren Missouri's management agreed to produce a monthly project progress report that is supported by accurate and complete backup information, define detailed roles and responsibilities for cost and schedule management, establish the frequency and scope of monitoring, re-forecasting, and reporting of project updates, establish relevant baselines and use

of trend analysis, further document the invoice and payment analysis and approval process, and define the process for contingency determination and usage. (Source: Company response to Staff Data Request No. 236)

As regards to risk management, the Ameren Corporation Internal Audit Team discovered that the PMT did not have a documented risk management plan. The PMT created a table of identified risks that is included in the Executive Leadership Team (ELT) Report, however, the table does not include a probability and relative financial risk for each item. This may affect the assessment of the distribution of contingency funds in relation to the risks they have identified on the project. The PMT does have action plans to respond to identified project risks. However, the project risks are not consistently documented or systematically monitored. Although the PMT maintains documentation for delay claims/notices, time extension requests and time impact analysis reports, they are not monitored in an overall project report. In response to the Internal Audit Team findings, Ameren Missouri's management decided to develop a guidance document or procedure that describes how project risks are to be captured, mitigated, and reported. This procedure will capture complete listings of known risk items; create a risk register that will be part of the overall project reporting package; and link the specific project risks contained in the risk register to project contingency. (Source: Company response to Staff Data Request No. 236)

The Internal Audit Team discovered that PMT does not have policies and procedures for some key project management processes. In response to the Audit Team findings, Ameren Missouri management decided to develop a listing of required/desired project documentation or templates and determine which of the documentation or templates are project specific and which ones require company level sponsorship. (Source: Company response to Staff Data Request Response 236).

For document management and storage, the Internal Audit Team discovered that the PMT does not have a document control or a records management and retention procedure. This can make it difficult for PMT or other personnel to access project records. In response to the Internal Audit Team findings, Ameren Missouri's management developed guidance for records management and document control. In addition, the PMT created a document control plan and inventory that describes the types of documents and records including the storage locations for each. (Source: Company response to Staff Data Request No. 236).

The post audit review performed by the Internal Audit Team dated 1/5/2010 reviewed all issues recommended for improvement in the audit review dated 1/6/2009 to determine if Ameren Missouri had followed through with their commitments. For the cost and schedule management issues noted in the 1/6/2009 audit findings, the Internal Audit Team confirmed the PMT completed all actions that were agreed upon. The Internal Audit Team stated that the defined process to determine and use contingency guidelines could have been more specific. For the Risk Management, the PMT completed all actions that were agreed upon. For the Policies and Procedures, the PMT completed all actions that were agreed upon. For the Document Management and Storage, the PMT completed all actions that were agreed upon. The Audit Team did not find any major concerns or problems with the actions of the PMT. (Source: Company response to Staff Data Request No. 236).

D. Procurement Process

When the engineering design was nearing 90% complete, Ameren Missouri approached four contracting companies to bid the rebuild project. The four companies were Kiewit, Barnard, Alberici, and Ozark (Ozark is a partnership between ASI and Fred Weber). Kiewit declined to place a bid stating it had too much work. Alberici was not qualified in the area of dam building, so Ameren Missouri did not believe that it would be a good fit for the rebuild. That left Barnard and Ozark as the possible contractors. (Per conference call on 1/31/11 with Mr. Mark Birk and Mr. Tom Byrne).

A Contract Development Team, the Dam Safety Group, Ameren Strategic Source, and Ameren Legal reviewed the bids. Ozark was selected because of the dam construction experience of ASI, plus Fred Weber's proven ability on Ameren projects to provide high quality personnel and equipment to crush rock and perform concrete work.

The contract with Ozark is not a fixed price contract. Ameren Missouri did not get any of the contractors to agree to a fixed priced contract with the rebuild project because of the size of the project and the unknowns, such as weather, foundation quality, and the tear down of the old reservoir).

Ozark procured heavy equipment through Fabick. Due to Ozark's working relationships with heavy equipment dealers, they were able to negotiate a better price than Ameren Missouri would have (per conference call with Mr. Mark Birk and Mr. Tom Byrne on 1/31/11). Ozark also provided some of the heavy equipment. On the equipment that was supplied by Ozark,

Ameren Missouri paid rental fees each month up to the amount the company originally paid for the equipment. For example: if a piece of equipment was valued at $10,000, Ameren Missouri would pay rent each month until the amount of rent paid over time was equal to the $10,000. Once the value of the equipment was paid in rent, Ameren Missouri no longer had to pay rental fees. Ameren Missouri thus purchased the heavy equipment for the project, and then resold the equipment at auction after project completion. The auction proceeds are an offset to the project costs.

Staff Expert/Witness: Erin M. Carle

E. Project Cost and Reimbursements

There were several sources of costs incurred in the rebuild of the reservoir. In compliance with the Consent Judgment, Ameren Missouri was only allowed to collect the costs of "allowed costs" through rates. The allowed costs are, "enhancements, costs incurred due to circumstances or conditions that are currently not reasonably foreseeable and costs that would have been incurred absent the breach." (Source: Direct Testimony of Mr. Mark Birk at page 31, lines 22-24 and page 31, Line 1). All other costs were either covered by insurance monies or were absorbed by Ameren Missouri in compliance with the Consent Judgment.

The chart below shows the monies that were spent and where they came from, whether it be monies received through Ameren Missouri's insurance claims, internal funds provided by Ameren Missouri, or through future rates anticipated to be collected from ratepayers. (Source: Company response to questions posed by Mr. Robert E. Schallenberg in June 2010, Question No. 5).

The Consent Judgment states, in part:

> AmerenUE acknowledges that it will not attempt to recover from ratepayers in any rate increase any in-kind or monetary payments to the State Parties required by this Consent Judgment or construction costs incurred in the reconstruction of the Upper Reservoir Dam (expressly excluding, however, "allowed costs," which shall mean only enhancements, costs incurred due to circumstances or conditions that are currently not reasonably foreseeable and costs that would have been incurred absent the Occurrence as allowed by law), and further acknowledges the audit powers of the Missouri Public Service Commission to ensure that no such recovery is pursued. In the event that Ameren intends to seek recovery for allowed costs, it shall notify the State Parties in writing at least seven (7) business days in advance of its initial applications for the recovery of these costs. If AmerenUE fails to provide

the required notice, it shall forfeit whatever legal right it has to seek such recovery.
(Consent Judgment, page 4, section 3 – Ratepayer Protection)

The following tables are is Highly Confidential in its entirety.

**

**

Staff Expert/Witness: Erin M. Carle

NP

F. Enhancements Made at Taum Sauk

Ameren Missouri made various enhancements to the Taum Sauk reservoir during the rebuild. The Audit Staff reviewed the enhancements made at Taum Sauk. The chart below lists the enhancements made as well as the associated costs.

The following table is Highly Confidential in its entirety.

**

:		

**

Staff Expert/Witness: Erin M. Carle

NP

Enhancements cont'd

To provide increased confidence and facilitate operations, the entire circumference of the interior of the dam can be accessed by a tunnel, known as the drainage gallery. Here joints and internal drains of the dam can be accessed and monitored. Instrumentation has also been installed throughout the structure to measure forces on the dam. Another measure undertaken to better minimize any leakage was the installation of a grout curtain. The grout curtain was a predesigned pattern of holes drilled around the inside perimeter of the dam. The pattern and depth of holes is dependent upon the geology underlying the various portions of the dam. Each hole is pumped full with a designed mix of grout to a prescribed pressure. The grout design in this instance had a relatively high viscosity and extended set time. The grout program compliments the integrity of the dam structure by impeding the flow of water under the dam.

As with the old dam a ramp to the top of the dam and roadway has been provided that allows vehicle access around the entire top of the structure. Unlike the old dam this road is much wider and concrete paved providing safe vehicle access. This roadway also provides easy access for dam inspection and to the instrumentation building. At the instrumentation building the water level can be physically observed, watched on closed circuit television, measured by pressure, measured by electric circuit, and measured by radar. The instrumentation for these devices is protected from the elements by this building. The water level for the upper reserve can also be controlled from this building.

The spillway can be physically observed from the instrumentation building atop the reservoir. The top of the spillway is also part of the roadway so that it can be easily accessed and inspected. The spillway is also known as the overflow release structure. The spillway has sensors to indicate when water flows down the spillway. A spillway was not present in the old dam. The new overflow release structure is designed to dissipate the energy of the water released from an overflow event to minimize flooding and damage down the mountain.

As an additional safety measure a series of surveyor's markers or monuments have been located on and around the upper reservoir to act as reference points during periodic surveys and measurements to determine if there has been any movement of the reservoir.

Due to the robust nature, state of the art design, and technology, the new upper reservoir has a very conservative design life of eighty years.[13]

There are economic benefits from the rebuild that have resulted in increased electric production performance. Due to an increase of the slope on the more vertical face of the interior wall of the ring dike dam and a change in seasonal operating parameters there is more volume to store more water. This increase in water volume allows for roughly an additional 54,500 MWh per year of electric production. Over the life of this facility the value of this benefit is speculative depending on demand, market forces and pricing. However it is a positive asset and does facilitate a more economical operation of the asset.

Additional projects that were not budgeted as part of the upper reservoir included new measurement and control equipment and software at the power site, a battery backup for the controls, a hydraulic oil cleaning system and a fire suppression system. These projects also improve the efficiency and economic viability of the Taum Sauk facility.

Ameren Missouri is requesting an additional $89 million be added to the rate base for the new upper reservoir and level control systems. The opportunities provided by restoration of the upper reservoir along with the replacement value of this system far exceed that amount. Replacement of the upper reservoir structure alone was $491 million. The engineering Staff did not undertake a review of the costs or change orders associated with rebuild and enhancements of the Taum Sauk facility. The project was in essence based on cost plus. There were no fixed price bidders. Variations in the geology of the dam base, RCC materials and weather conditions throughout the construction process are unknown until encountered at which time the appropriate corrective action was undertaken. The FERC, IPOC, BOC, and Rizzo would influence the project outcomes.

Staff Expert/Witness: Guy C. Gilbert, MS, PE, PG

G. Disallowances

At this time, the Staff does not have any adjustments to address the enhancements made at the Taum Sauk Project.

[13] As a result of this reconstruction effort the future liability for deconstruction will be far greater than had the Company chosen to simply retire the facility. Initial retirement may have been achieved by requesting permission to reclaim the site to the same standards as in Mine Reclamation Act and donating the land to the state.

Once updated costs incurred for the Taum Sauk Project are provided for the period ending February 28, 2011, Staff will analyze the information and make adjustments as necessary, if necessary, based on a thorough examination of the documentation requested by the Staff and provided my Ameren Missouri.

Staff Expert/Witness: Erin M. Carle

1. Costs Related to Project Delays

During the construction phase, Ameren Missouri encountered project delays. Given the location and duration of the construction project, the construction crews encountered what Ameren Missouri characterized as unforeseeable circumstances.

> 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 evens also challenged the site professionals. During excavation of the foundation, geological 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.
>
> (Per Mr. Birk's direct testimony, page 29, lines 16-23 and page 30, lines 1-14)

Staff is not recommending disallowance of these costs.

Staff Expert/Witness: Erin M. Carle

2. Audit Review of Invoices

Staff has requested and will review a sample of invoices when they are received from Ameren Missouri. The invoices have been requested in Staff Data Request No. 376, which was due on 2/3/11, however, Ameren Missouri has not yet provided this information.

Staff Expert/Witness: Erin M. Carle

H. Pictorial Review

The photograph above shows a location where the parapet wall was overtopped by water erosion which occurred at several locations around the perimeter of the upper reservoir.

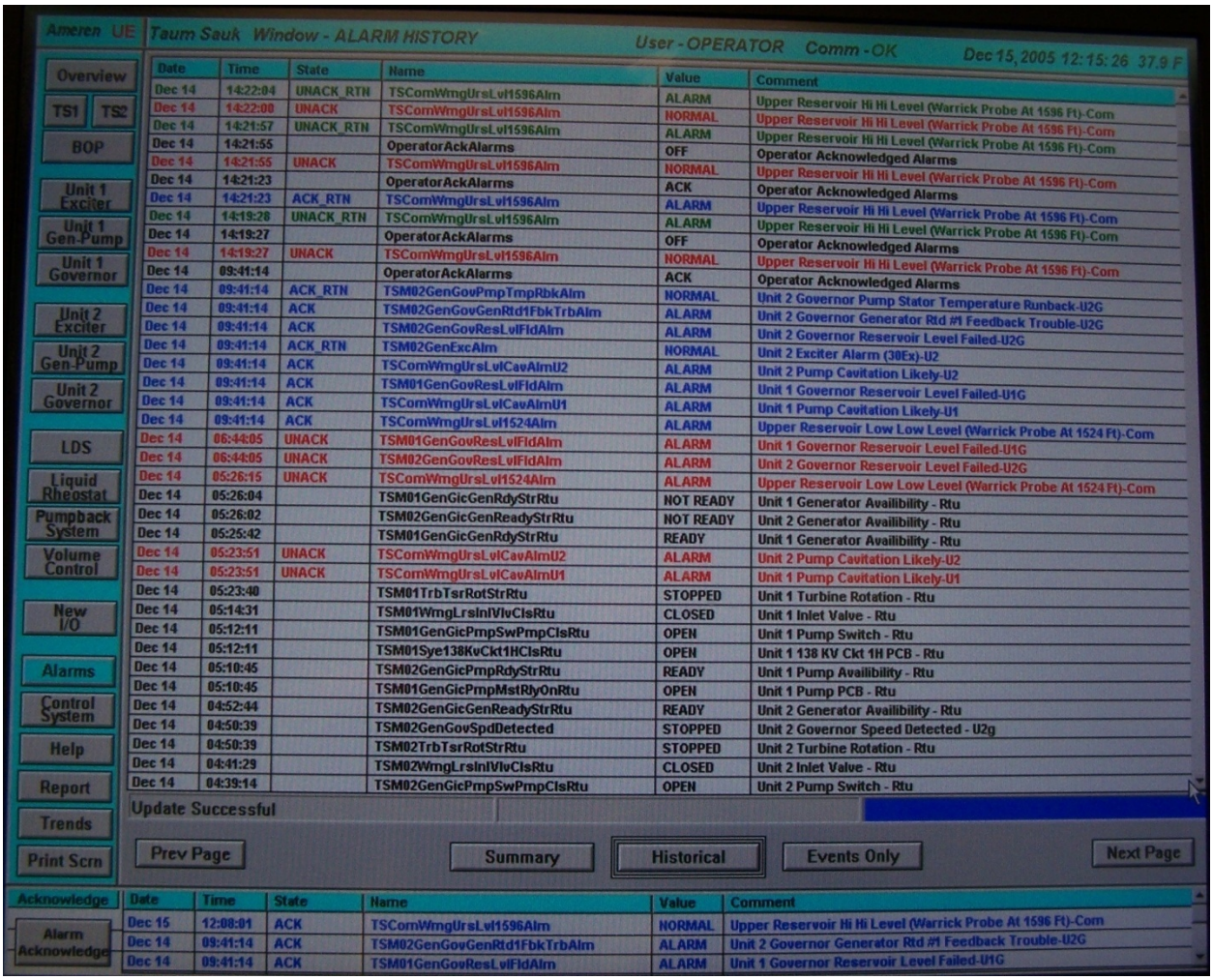
continued on next page

The photograph above is of the tail race to the lower reservoir. The debris in the water is a result of the breach.

continued on next page

The photograph above shows the lower run of river dam the day after failure of the upper reservoir.

continued on next page



The photograph above indicates the sequence (reading up the page) of events associated with the breach:

1. Pumping had stopped at 05:14:31 (5:14 AM) as shown in the second column from left,
2. Water floods up the canal or tail race into the pump/generators causing cavitation alarms to sound at 05:23:51 (5:23 AM),
3. At 05:26:15 an alarm indicates the upper reservoir is drained below the lowest water level sensor.

continued on next page

This photograph shows the displacement of the water level measurement sensors (the four black tubes) and the location of the water shaft used for draining and filling the upper reservoir.

continued on next page

The above photograph is in the tunnel that carries water to the power plant at the location where the steel liner within the tunnel begins.

continued on next page

The above photograph is of the power site and the blue cylinders are the tops of the pumps/generators.

continued on next page

The drainage gallery in the photograph above allows internal inspection of the dam and facilitates controlled drainage within the structure.

continued on next page

The photograph above shows the cleaning and mapping process.

continued on next page

The photograph above shows a cross section of the ring dike dam. The smooth face (right) is of the upstream or interior side of the dam. The downstream or exterior of the dam is to the left and is stair stepped, allowing for more economical concrete form work. The drainage gallery tunnel is also visible in the photograph.

BEFORE THE PUBLIC SERVICE COMMISSION

OF THE STATE OF MISSOURI

In the Matter of Union Electric Company d/b/a AmerenUE's Tariff to Increase Its Annual Revenues for Electric Service	)))	File No. ER-2011-0028

AFFIDAVIT OF ERIN M. CARLE

STATE OF MISSOURI)
) ss.
COUNTY OF COLE)

Erin M. Carle, of lawful age, on his or her oath states: that he or she has participated in the preparation of the foregoing **CONSTRUCTION AUDIT AND PRUDENCE REVIEW TAUM SAUK CONSTRUCTION PROJECT FOR COSTS REPORTED AS OF OCTOBER 31, 2010** in pages 6-17, 19 and 20; that he or she has knowledge of the matters set forth in such Report; and that such matters are true to the best of his or her knowledge and belief.

Erin M Carle
Erin M. Carle

Subscribed and sworn to before me this 8th day of February, 2011.

Nikki Senn
Notary Public

NIKKI SENN
Notary Public - Notary Seal
State of Missouri
Commissioned for Osage County
My Commission Expires: October 01, 2011
Commission Number: 07287016

BEFORE THE PUBLIC SERVICE COMMISSION

OF THE STATE OF MISSOURI

In the Matter of Union Electric Company d/b/a AmerenUE's Tariff to Increase Its Annual Revenues for Electric Service	)))	File No. ER-2011-0028

AFFIDAVIT OF GUY C. GILBERT, MS, PE, RG

STATE OF MISSOURI)
) ss.
COUNTY OF COLE)

Guy C. Gilbert, of lawful age, on his or her oath states: that he or she has participated in the preparation of the foregoing **CONSTRUCTION AUDIT AND PRUDENCE REVIEW TAUM SAUK CONSTRUCTION PROJECT FOR COSTS REPORTED AS OF OCTOBER 31, 2010** in pages 1-5, 18 and 19; that he or she has knowledge of the matters set forth in such Report; and that such matters are true to the best of his or her knowledge and belief.

Guy C. Gilbert, MS, PE, RG

Subscribed and sworn to before me this 8th day of February, 2011.

Notary Public

NIKKI SENN
Notary Public - Notary Seal
State of Missouri
Commissioned for Osage County
My Commission Expires: October 01, 2011
Commission Number: 07287016