

# **The Closure of AEP's First Major Wet Fly Ash Pond: A Unique Owner-Contractor Collaboration**

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## **ABSTRACT**

As one of America's largest generators of electricity, American Electric Power (AEP) is tasked with managing 40+ fly ash, bottom ash or flue gas desulphurization by-product impoundments. Due to the nature of the impounded ash materials, the closure of a wet fly ash impoundment can be an extremely challenging endeavor that requires very specialized construction knowledge and skills. AEP utilized a unique contractor selection and procurement process to integrate its institutional knowledge with the skill sets of prospective contractors for managing overall risks in the undertaking of the company's first major wet pond closure.

Collaboration and risk sharing between AEP and their selected contractor were the overriding principals for closing the 165 acre fly ash pond. Allowing only three well-known and respected contractors to bid the project, AEP established a very open and methodical approach at the onset of the bidding process – specifically seeking input regarding contract-binding specifications, construction procedures and scheduling.

Relying on AEP's stated open approach, R.B. Jergens expended extensive resources during the bidding process to develop an overall approach that is projected to reduce the overall project cost, while enhancing safety. More than one year into the closure, the collaborative approach is hitting the desired marks and quickly becoming the model for future wet pond closures.

## **ACKNOWLEDGEMENT**

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successfully melded together to form a cohesive project team. The upfront planning and good work of the project team is attributed to many individuals, too numerous to mention herein.

## INTRODUCTION

AEP's coal combustion residual (CCR) impoundment program encompasses 40+ fly ash, bottom ash or flue gas desulphurization (FGD) by-product impoundments located at 15 power plants, in states spanning an area from Ohio in the northeast to Texas in the southwest. The impoundment structures range from large reservoirs in valleys held by dams to other earthen dam or dike impoundments and incised facilities.

AEP formed a program team in 2011 to begin planning for an anticipated federal CCR rule. The team recommended and received management approval, by the end of that year, to start an early impoundment closure program that would focus initial closure efforts on select inactive impoundments or those close to volume capacity. Work scope included all design, engineering, site investigations, permitting, and construction to close individual facilities or wet impoundment complexes consistent with permits obtained from state dam safety and water/solid waste permitting agencies and other ancillary permits. To date, three impoundments have been closed and others are in various stages of permitting, pre-construction or construction. The early impoundment closure program was expanded, ahead of the anticipated CCR rule to include facilities at power plants targeted for decommissioning or fuel repowering with natural gas.

## AMOS PLANT FLY ASH IMPOUNDMENT

The John E. Amos power plant is located between Old US Route 35 (Winfield Road) and the Kanawha River in Putnam County, West Virginia. It is owned and operated by Appalachian Power Company, a subsidiary of American Electric Power (AEP). The 2,900 MW plant consists of three units; Units 1 and 2, rated at 800 MW each and Unit 3, rated at 1,300 MW. A wet fly ash impoundment is located approximately 1.5 miles (2.4 kilometers) southwest of the power plant, north of Interstate-64 in the headwaters of Little Scary Creek (a tributary of the Kanawha River). The approximate surface area of the impoundment is 165 acres (67 hectares) at normal pool elevation of 860 feet (262 meters). The impoundment was created in the early 1970's by construction of a dam across a valley; see Figure 1. The current height of the dam as measured from the downstream toe is approximately 220 feet (67 meters). The dam was raised via conventional downstream construction methodology in three stages: Stage 1 with crest elevation of 810 feet (247 meters), Stage 2 with crest elevation of 845 feet (257.6 meters), and Stage 3 with crest elevation of 875 feet (266.7 meters). The dam was constructed as a zoned embankment with an inclined upstream impervious zone and downstream zones of earth and rock fill. The current crest of the dam at elevation 875 feet (266.7 meters) is approximately 30 feet (9.1 meters) wide and 2,000 feet (609.6 meters) long. The upstream slope of the dam ranges from roughly 2.5 to 3 horizontal to 1 vertical (H:V) and downstream slope ranges from 2 to 2.5:1 (H:V). The visible portion

of the upstream slope is vegetated, while the downstream slope is overlain with large riprap.



Figure 1  
Amos Fly Ash Impoundment Dam

The fly ash impoundment has a concrete principal spillway, decant riser structure and discharge piping located in original ground off the northwest end of the dam, see Figure 2.



Figure 2  
View of Decant Riser Structure and Impoundment

Piping from the decant structure originally discharged through a tunnel in the hillside into the Little Scary Creek tributary. With the conversion of Unit 3 from a wet fly ash sluicing system to a dry system in 2010, all three Amos units are operating dry fly ash handling systems; rendering the impoundment inactive. The principal spillway riser no longer controls the pool elevation; a reclaim water pump system was installed to convey flows from the ash reservoir to the bottom ash reservoir at the plant.

## CLOSURE DESIGN

The Amos impoundment is AEP's first of a number of major wet fly ash closure projects. The closure design calls for removal of free water and redistribution of existing-saturated fly ash within the impoundment to form a closure subgrade. The major aspect of the design is minimizing the use of borrow material as contouring fill. Another key aspect of the design is the use of drainage swales in the cover system to convey storm water through the site, re-establishing some of the original pre-construction flow pathways through the site. With reference to Figure 3, the conceptual rendering shows the closed impoundment with drainage swales and a storm water discharge to the Little Scary Creek tributary.

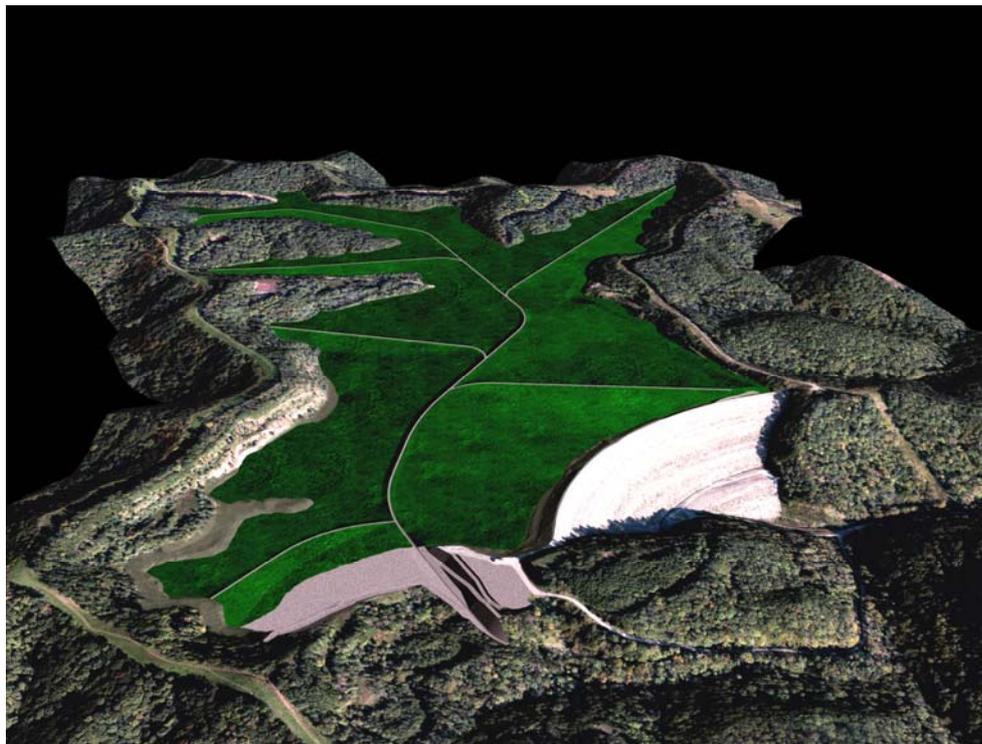


Figure 3  
Conceptual Rendering of Closed Impoundment

## KEY GOALS AND OBJECTIVES

The primary goals for the closure project also define key drivers of success, “the safe execution of a cost effective design (i.e. safety & cost).” The ultimate success of the

project will be defined by how well the project team achieves its objectives and success criteria, summarized below from among others:

- Safety – Demonstrate a Commitment to Zero concerning recordable incidents, first aid cases and near misses;
- Cost – Control scope & adjust to site conditions;
- Schedule – Adjust to site conditions for safe execution of work;
- Environmental – Perform closure work scope consistent with regulatory requirements and with no notices of violation; and
- Risk Management – Identify and manage risks & opportunities, including latent risks to achieve goals & objectives;

Safety will always trump cost in execution of the work; notices of violation are unacceptable. Closure construction over soft- saturated fly ash poses a number of safety issues; but, those issues can be managed by careful attention to execution details. Schedule adherence is important for predictability of closure costs, but it takes a secondary role, as a key driver of success due to uncertainty over how fast saturated fly ash will give up water before it can be reworked with low ground pressure construction equipment.

## OWNERS PERSPECTIVE

The contracting strategy for the closure of the impoundment is guided by the fact that AEP, in many respects, is treating the closure as a first-of-a-kind (FOAK) project. The reasons for doing so don't necessarily stem from any one or two particular reasons; it's the aggregate of a number of parameters. Significant risks (known and un-known) are inherent to FOAK projects. Owner attempts to shift liabilities of risk to contractors in FOAK projects can result in significant cost premiums, especially if the bidders are uncomfortable with the transferred risk(s).

AEP has some institutional experience closing wet fly ash impoundments. A 25-acre (10 hectare) impoundment was closed in 1988. Another impoundment was partially covered with rock borrow material in the mid-1990s and a 60-acre (24 hectare) impoundment was closed in 1999. The 25-acre (10 hectare) closure utilized a large quantity of borrow material that was bulldozed over the site, from surrounding hillsides to stabilize the subgrade for compaction of a clay cap. The 60-acre (24 hectare) closure was performed by relocating ponded ash to dredge cells that contained temporary decant riser structures, facilitating removal of free water. Use of borrow material was minimized due to use of plant produced boiler slag to help to contour the subgrade; a floating road system built from geo-grid and boiler slag also helped facilitate site access and installation of the cap cover system.

The closure design of the much larger Amos impoundment evolved based in part on the 60-acre (24 hectare) closure design and AEP's experiences. The design is expected to be cost effective relative to other more conservative closure design options that may include, installation of a dewatering system and/or utilization of large quantities of

borrow material to form a turtle back closure design. As the closure design progressed for the Amos site, it became apparent to AEP that its cost effectiveness (i.e. the owners perceived cost savings relative to other options) would depend on the experiences and risk tolerances of the bidders, notwithstanding AEP's prior experience. Some of the known cost risks and opportunities include, among others:

- Uncertain production rates for excavation/dredging of ponded fly ash to placement & re-grading across the site;
- The amount of borrow material needed to create a stabilized subgrade (e.g. need for capillary breaks, bridging over soft- unstable subgrades and actual settlements in areas of fill);
- The overall closure schedule due to weather related uncertainties (e.g. length of construction season, time needed to remove the water pool and sufficiently dry the fly ash for placement and grading); and
- Optimal means and methods for lowering the phreatic surface to allow deployment of the cap cover system directly over fly ash.

AEP's large wet impoundment closures are multi-million dollar projects spanning four or more years each. Real or perceived, the pool of available contractors with demonstrated wet- fly ash impoundment closure experience is very limited, especially for large impoundments. AEP's pre-qualified heavy civil contractors are very good at efficiently moving large volumes of material in a short period of time. The company is concerned that many of them have limited experience and understanding of the slow methodical approach believed necessary to safely execute the closure design. AEP's ideal contractor for its first large wet fly ash impoundment closure needed to be of sufficient size and financial wherewithal to execute the multi-year project with key desired attributes that include:

- A project execution culture that will emphasize safety,
- Personnel that are comfortable working with fly ash and bottom ash based on actual experience and/or demonstrated actions to become knowledgeable,
- A track record of successfully working with AEP in a collaborative manner (no first time contractors),
- Size in terms of equipment and personnel to accelerate work and/or adapt to changing weather conditions over several construction seasons, and
- A level of trust and willingness to work with AEP to manage risks and opportunities, as they reveal themselves.

AEP established a very open and methodical approach at the onset of the bidding process – specifically seeking input regarding contract-binding specifications, construction procedures and scheduling. The project was timed to acquire lessons learned ahead of other large wet impoundment closures. Engineering & design for Amos project was completed at the end of 2012; dewatering and subgrade contouring activities were initiated in the late 2013 - early 2014 timeframe.

## **CONTRACTOR'S PERSPECTIVE**

R.B. Jergens is a well-established heavy civil contractor based in Southwestern Ohio. For more than 20 years, Jergens has been a regional leader in waste facility construction – working for all the major private waste disposal companies as well as most public entities in their area. In addition to their specialized earthwork group, Jergens is also a well-respected public improvement contractor certified by ODOT for very large-scale projects. With six in-house Engineers, and several more construction management professionals, R.B. Jergens possess a significant range of experience and capacity in the heavy civil construction industry.

In 2007, Jergens established a working relationship with AEP and began bidding AEP's landfill construction projects. Being cautious with initial bidding opportunities, Jergens was awarded their first project with AEP in 2008 primarily due to their construction approach with respect to a large-scale excavation of cemented ash. Jergens' approach was the only one submitted that eliminated the need to blast the cemented ash – significantly reducing risks and costs. During the exhausting 3 ½ hour post-bid review meeting, AEP challenged Jergens' ability to meet its demanding standards relative to safety, cost control, cost tracking and scheduling. Affirming their abilities and desire to meet AEP's challenges, Jergens was awarded the five year project – but only after demonstrating their intended construction procedure to AEP, more than six weeks after the bid submission. By developing an 'out of the box' solution to an ash excavation problem and by committing to exceed AEP's project execution standards, a mutually beneficial relationship between R.B. Jergens and AEP was born.

During the first year of Jergens' first project with AEP, additional opportunities allowed Jergens to demonstrate their combined technical and construction expertise. For example, when asked to provide costs for dust suppression chemicals, Jergens presented AEP with a binder of information for 10 potential dust suppression products, categorized by effectiveness and cost. AEP's senior construction personnel were impressed with the thoroughness of the work. In addition, Jergens worked diligently with AEP's chief scheduler to develop a Level 3 schedule that tied 100% of the project costs to work tasks within the schedule – a task that other contractors had not been able to complete. The combination of these items, along with a dedicated, approachable and professional field staff, propelled Jergens forward quickly.

With the first AEP project underway, more projects quickly followed for Jergens. With each new project bid, Jergens worked diligently to present themselves as 'unique'. Though they didn't secure award of every project they bid, Jergens strengthened their relationship with AEP by supporting competing contractors and by presenting alternate construction techniques and/or timelines that were mutually beneficial to the owner and the contractor. Within two years of their initial project, Jergens was frequently being asked for opinions regarding specific AEP project issues. Then, in 2011, AEP utilized Jergens' experience and openness to start discussions relative to wet pond closures. While internal restrictions prevented 'sole sourcing' such work to one contractor, during this timeframe AEP began establishing the framework for their pond closure procurement process – and R.B. Jergens was on the short list.

Although the first AEP wet pond closure project was not bid until 2013, Jergens targeted and secured a 'dry' pond closure with AEP in 2012. This small 'dry' impoundment was managed by AEP's recently established pond closure team and included collaboration elements during project execution; strengthening Jergens' relationship with AEP's pond closure team and demonstrating that success that can be realized by working collaboratively.

With numerous projects under their belt and a strong relationship with AEP in hand, Jergens was selected to be one of only three companies authorized to bid AEP's first large wet ash impoundment closure project. During the extensive pre-bid meeting, Jergens asked numerous questions, rarely receiving definitive answers. Although many questions could not be answered, AEP reinforced the overriding theme of the pre-bid meeting, which was trust and fairness (on both parts – the owner and contractor).

While contractors have often heard the noble profession of 'fairness' when bidding new projects, many contractors have rarely seen it in action. The difference in the Amos closure project, however, was the strong relationships between the owner and the contractor. Over the course of the previous six years, AEP had demonstrated that they valued relationships with their key contractors and that really were 'fair' with respect to contracting issues. This fairness is not to be construed as 'easy' – no, far from it. Jergens would certainly profess that AEP is anything but 'easy'. They're more like a tough coach, or a tough father – they'll treat a contractor as fairly as a contractor deserves, or as fairly as a contractor's own actions demonstrate. But, like a tough coach or a tough father, AEP will support companies that work diligently to meet their high expectations and they will thrust those companies forward. These principals were evident at the onset of the Amos project.

Jergens accepted the challenge to bid the first large-scale, wet ash impoundment with eagerness. They expended significant resources reviewing the project plans and visiting the site numerous times. Jergens put their best people on the bidding opportunity and poured more man-hours into the project than any bid before, or since. At the heart of this effort was the strong belief that AEP would be fair with Jergens. Proposed construction techniques, costs and efforts would be held by AEP in confidence and Jergens would be given a fair shot to complete the work. Without the culture that had been created by AEP and without the specific procurement and execution team put in place, Jergens would not have been as confident. However, the long-term relationships and previous project experience culminated in Jergens' approach to be bold and challenge specific project execution plans.

Jergens' proposal for the Amos project was centered on stabilizing a large up gradient area very early in the project. In addition, Jergens challenged themselves and AEP by creating a shared cost savings opportunity with respect to stabilizing a 70+ acre wet ash excavation area. Following the bid submission, Jergens prepared and presented a 56 slide Power Point presentation to AEP's staff and the design engineer. At the heart of Jergens' proposal were options and shared opportunities to control costs and/or risks.

AEP followed through with the project approach and culture described during the bidding phase by awarding the project to Jergens and allowing Jergens to execute the work as originally envisioned.

At the onset of the field work, Jergens followed through on their commitments to collaborate with AEP by making investments. Jergens has procured specialized equipment including amphibious personnel vehicles, floating excavators, specialized pumps and unique rock processors. In addition, Jergens invested in the equipment and technology required to survey semi-solid ash surfaces and ash that is under water. Jergens has also invested in alternate road-building geosynthetics and techniques. Being a heavy equipment based company on the leading edge of wet impoundment closures, Jergens has committed to continue to procure the specialized equipment and technology required to successfully complete the Amos project. This specialized equipment and technology has allowed work to be completed safely, efficiently and timely.

At this point in the Amos project, all project objectives have been met. With nearly 1/3 of the wet ash surface stabilized, the synthetic capping activities are set to begin as soon as weather allows. The large pool of free water is under control, and the next 1/3 of the wet ash surface is on track to be stabilized in the next 12 months. The entire project is slated to be completed before the end of 2017.

Though the project is far from over, AEP and Jergens continue to collaborate as the project evolves in an open manner with shared goals. Both companies approach project obstacles from a position of finding win-win solutions, demonstrating the effectiveness of collaboration. Solutions to project challenges are being shared with others outside of the project using a 'lessons learned' format for the benefit of all.

## SUMMARY

More than one year into the closure project, the collaborative approach is a win-win proposition for both AEP and Jergens, hitting the desired marks; and quickly becoming the model for future large wet impoundment closures. Experience gained to date has allowed AEP and Jergens to gain a better understanding of construction means and methods and associated productivity, including management of risks and opportunities. Both companies are positioned to carry forward lessons learned, process improvements and exemplary practices to their future projects.

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