Coal Combustion Residual Management Services
AECOM delivers creative, sustainable, cost-effective and value-adding solutions across your whole business life cycle.
AECOM combines its coal combustion residuals (CCR) compliance expertise with a deep-rooted and intimate knowledge of power generation. Understanding CCR production allows us to find the lowest cost pathway to compliance.

AECOM is an industry leader in managing CCR. We deliver expertise in:

- Strategic Planning
- Management Studies
- Beneficial Reuse Applications
- Regulatory Compliance/Permitting
- Ash Disposal and Impoundments
- Plant Upgrades/Modifications
- Material Conveyance
- Construction and Program Management
- Operation & Maintenance
- Environmental Services/Remediation
AECOM is an industry leader in CCR management with over 35 years of experience helping power industry clients prepare and implement CCR management strategies. Strengthened regulations are presenting new challenges to the power industry. AECOM is here to help.

Our professionals have a deep reserve of expertise in planning, designing, management and closure of CCR impoundments and landfills. And the value we deliver extends to our understanding of power industry regulations. Our intimate knowledge of local, state and federal regulations, permitting requirements, and the production of CCR, allow us to deliver unique solutions that drive down the overall cost of compliance.

We evaluate all applicable drivers to deliver detailed management tools that provide our clients with clear direction and a confident approach to solving their most complex challenges. We are experienced in developing these approaches and in using the full extent of our integrated experience to assess these from every angle.

AECOM draws on specialized technical expertise to benefit each and every project. We engage local resources to meet client and project requirements. Our approach combines the benefits of a large company with the approachability and flexibility typical of a small company.

AECOM is prepared to meet all of our clients’ needs when it comes to CCR management and compliance, from initial assessment and strategy development through permitting and implementation.
Bringing you value.

- Provide full life cycle, integrated solutions
- Demonstrate consist and quality execution
- Ensure reliable performance
- Increase productivity
- Share lessons learned
- Anticipate your needs
Assessing existing CCR units

Assessing disposal units is one of AECOM’s core competencies. We have a long history of implementing projects across the country. Our professionals identify technical issues early in the process, allowing time for strategic planning and evaluation. AECOM promotes open, regular and engaging communication helping to deliver solutions that satisfy clients and regulators.

Complying with the CCR Rule presents complex challenges to utilities and independent power producers. At AECOM we work with our clients facilitating regulatory compliance, establishing costs and determining what – if any – modifications will be required for each CCR unit and when modifications must be completed.

AECOM addresses and assess CCR units that require modification, providing insight on viability, and upgrade costs for such elements as structural improvements and operating issue resolution. In the event of a required closure our professionals can evaluate options for alternative storage or CCRs use including additional landfill capacity or beneficial use applications.

1. Data Gap Review and Work Plans for CCR Rule Compliance

Challenge: Determine if client’s existing impoundments would meet new structural integrity assessments and whether the existing groundwater monitoring networks would be adequate under the new CCR Rule.

Action: Developed work plans to collect sufficient geotechnical data to address identified data gaps in order to conduct engineering analyses required to support the evaluation and reporting criteria at each CCR unit.

Result: Developed an investigation and design demonstration to verify whether all existing ponds meet the structural integrity evaluation and reporting criteria in the Rule or would need to complete closure. Information from the work plans and data collection phase is used in the closure design. Groundwater assessment will be conducted following well installation and eight sampling rounds.

2. Structural Integrity Assessment of Existing Landfill

Challenge: Assess the structural integrity of an existing landfill constructed over a closed ash impoundment (potential for liquefaction of fly ash).

Action: Performed laboratory and field investigations to determine the characteristics of the fly ash and potential for liquefaction. Using site-specific conditions, developed and conducted model exercises to evaluate the potential for ash liquefaction and the earthquake-induced deformation of the landfill.

Result: Determined that the potential for liquefaction of fly ash was lower than predicted by typical means, avoiding closure of the existing landfill.
Bringing you value.

- Ensure compliance with CCR rule
- Identify data gaps and quickly resolve
- Minimize CCR disposal through beneficial use applications
- Promote operational effectiveness
- Rectify issues uncovered during inspections
- Provide engineering solutions
Upgrade and repair existing CCR units

AECOM has a 35-year history in evaluating, designing, repairing, and permitting ash disposal ponds and related structures. We are national leaders in earth, rockfill, concrete and roller compacted concrete dams, impoundments, dikes and levees – including those associated with ash disposal. With experience on over 4,000 dam projects worldwide, we are recognized as a national leader in the area of earth, rockfill, concrete and roller compacted concrete dams, impoundments, dikes and levels, including those associated with ash disposal.

We apply our extensive knowledge and real world expertise to evaluating existing CCR units. Our analysis takes assessing and repairing deficiencies and other issues into account to determine the cost effectiveness of unit repair and upgrading vs. closure and replacement. We determine the potential for compliance by evaluating:

- Operational changes
- Pond lowering
- Internal ditching
- Dike reconfiguration
- Slope flattening
- Internal slope buildup
- Buttressing
- Reverse graded filters

**Project Examples**

1. Ash Pond Design Review and Potential Failure Mode Analysis Workshop

**Challenge:** Conduct a site reconnaissance of an active pond, to assess, prioritize, provide rough order of magnitude costs and implement repairs of the ash dike or roadway embankment that are not a dam safety risk, but are recommended for repair to maintain the long-term functionality of the associated civil systems.

**Action:** Conducted inspections, reviewed engineering calculations, performed hydrologic evaluations of the active ash basin and current spillway systems, confirmed process flows through the pond and reviewed long-term operation plans that could impact process flows, plans for dredging, and basin volume.

**Result:** Conducted a potential failure mode analysis with the client’s environmental services staff and several other decommissioning contractors to delineate impacted areas for soil/groundwater remediation. AECOM developed a targeted remediation plan with oversight and reporting, primarily consisting of excavation removal activities, for areas of the site with impacted soil/groundwater.

2. Fleetwide Intermediate Remedial Stability Measures

**Challenge:** Assist utility evaluate immediate stability/seepage concerns at their ponds and stacks across their fleet while maintaining or improving quality of discharged water and progressing towards long-term closure of the impoundments.

**Action:** Prepared mitigation/remediation designs and construction work plans for the interim remedial measures including rock toe buttresses with and without reverse graded filters, deep seepage trench, and use of drainage and slope improvements including under drains and use of sluicing pipes. Provided construction support services.

**Result:** Implemented interim remedial measures resulted in increased factors of safety while reduction the immediate stability/seepage concerns.
Bringing you value.

- Increase project cost efficiency
- Promote operational effectiveness
- Provide comprehensive planning and monitoring
- Apply innovative tools and permitting experience
- Verify design and performance
- Demonstrate intimate knowledge of CCR rule
- Use high-end analytical tools
- Provide design, permitting and construction services
Bringing you value.

- Implement critical stability and seepage repairs
- Select most suitable closure option
- Allow capital to be expended over longer duration
- Reduce annual fill material needs
- Allow gradual operational transition
- Encourage sequenced construction outside of winter months
AECOM’s experience with developing and closing disposal facilities is current and relevant. We use our deep bench of expertise to seek cost effective and innovative solutions within the bounds of regulatory constraints.

AECOM begins the pond closure process by developing a strategy that includes determining the closure type – in place, clean, hybrid or faced. We then assess existing conditions and associated challenges to determine material needs and cap design that will satisfy regulatory and post-closure requirements. We use creative closure methods such as surface water management and material balance to meet project objectives and minimize costs.

Our professionals have significant experience in using conventional and innovative approaches to siting landfills that are adjacent or regionally located to power plants. We developed the Opti-Site process which combines geographic information system mapping with decision analysis and detailed criteria development to identify viable candidate sites and ultimately arrive at a primary landfill location.

AECOM has permitted and designed landfills throughout the United States. We have a track record for incorporating operational features into designs that result in ease of construction and operation. We also have the experienced personnel and resources necessary to construct new landfills on a subcontract or direct hire basis.

**Project Examples**

1. **Pond Closings Consistent with Dam Safety Requirements**

**Challenge:** APS constructed ash pond 6, a 163-acre pond with lined embankments, to be used for management and storage of hydraulically-deposited fly ash and scrubber sludge. The embankments were regulated as jurisdictional dams by the Dam Safety Division of New Mexico Office of the State Engineer, requiring the closure design to evaluate the technology developed consistent with Mexico Administrative Code Closure—Tailings Facility.

**Action:** Provided services including geotechnical exploration and evaluation, dewatering feasibility evaluation and pilot test, engineering data evaluation and design, development of the closure plan and specifications, and cost estimating.

**Result:** As Owner/Engineer AECOM prepared the procurement packages for construction bidding, provided recommendations for the best value bidder, and provided oversight of the construction process, resulting in pond closure prior to the effective date of the Final CCR Rule, using an alternative cap design taking advantage of the high evapotranspiration rates at the fossil station.

2. **Deep Soil Mixing Wall allows Closure of Dredge Cell**

**Challenge:** Evaluated technology and application of a deep soil mixing (DSM) wall as part of the closure of a previously failed dredge cell at a Midwest utility. Assess contractor presentations on their ongoing use of the technology and experience building a DSM wall, and develop the RFP documents to ensure performance and safety standards.

**Action:** Observed the use of this technology in the rebuilding of the New Orleans East Levee, incorporated certain safety and design considerations in the RFP documents, assisted in the review of the submitted bid proposals, provided ongoing technical support during the bench scale testing and test wall sections built by the successful contractor and provided on-site technical support related to the haul road and DSM wall upon request.

**Result:** Incorporated the safety and performance specifications into the bid documents to meet the structural performance requirements of the wall. AECOM subsequently designed the fly ash and gypsum dewatering system and is currently developing an interim ash disposal staging area.
Bringing you value.

- Assess site characterization
  - Surveys, aquifer testing, fate and transport modeling

- Facilitate groundwater monitoring
  - System design and installation, data evaluation and reporting, and assessment planning

- Provide soil and groundwater remediation
  - Source control, extraction systems, and dewatering studies

- Facilitate regulatory negotiations
AECOM provides groundwater services for initial and ongoing monitoring to evaluate contamination, in response to permit issues, discharge permits, special agency requests, and as voluntary actions.

We provide inspections services to document and train plant personnel on routine inspection requirements. Our CCR recordkeeping services encompasses maintaining publicly accessible internet sites where data records are posted.

AECOM’s capabilities include:
- Groundwater monitoring system design/installation/testing
- Detection/assessment/compliance monitoring
- Data evaluation and statistical analysis
- Reporting/web posting
- Groundwater assessment
- Historic data collection and evaluation
- Groundwater flow/fate and transport modeling
- CCP source evaluation
- Hydrogeologic surveys
- Groundwater corrective action
- Regulatory negotiations
- Financial optimization of site life cycle strategy

**Project Examples**

1. **Wastewater Quality Monitoring and Improvement Study**

   **Challenge:** Quantify concentrations of mercury, selenium, arsenic, and total dissolved solids in a series of waste streams at a utility, develop a water balance model for current operations, evaluate technologies designed to remove/control specific substances found in the waste streams and develop preliminary schedules and costs to implement the technologies.

   **Action:** Developed a sampling and analysis plan to accurately characterize the various inputs and outputs of the flue gas desulphurization (FGD) system from the coal feed to the boiler and from other inputs, through the various processes in the FGD purge streams through the ponds to the National Pollutant Discharge Elimination System (NPDES) discharge. A water balance model was used in mass balance calculations for the wastewater and clear water ponds, to evaluate how mercury and other trace elements move through the system.

   **Result:** Identified and evaluated the top ten technologies for the potential to reduce COCs at the source stream or outfall, capital and operation and maintenance cost elements, suitability for the utility’s station such as process compatibility, space requirements, schedule limitations, etc. as well as the potential for regulatory and/or public acceptance. AECOM designed and the Client constructed the preferred treatment system.

2. **Fleetwide Groundwater Monitoring, Assessment and Remediation**

   **Challenge:** Assess whether existing groundwater monitoring systems are adequate to meet the requirements of the state administrative codes and implement active remediation programs when needed across four power stations in Ohio and Kentucky.

   **Action:** Conducted hydrogeologic studies, prepared site-specific groundwater monitoring plans, conducted ongoing groundwater monitoring at 10 waste handling facilities, implemented an active remediation program, groundwater assessments, demonstrations and risk assessments at select stations and waste handling facilities.

   **Result:** Long term monitoring team had good understanding of the local hydrogeologic site conditions and issues concerning the client and regional, state, and local agencies.
AECOM provides global remediation services addressing the full business life cycle of project needs, from planning to operation to sustainable long term follow through. Our world class environmental professionals have the experience and knowledge to provide current, as well as best in class, technical solutions, but also smart, cost effective results, which support the social responsibilities and regulatory obligations of the entire project.

Our vast capabilities and experience enable us to bring together all the necessary disciplines and tools to complete and implement soil and groundwater remedial designs. AECOM engineers and scientists evaluate site conditions to identify the most appropriate means of attaining each client’s remediation goals. We develop new innovative remediation technologies and also use existing “tried and true” methods and tools. We also handle all types of remedial solutions. Specific CCR remediation technologies include physical and chemical barrier systems, hydraulic containment/removal and treatment, and natural attenuation remedies as well as other innovative solutions that may be unique to a site.

AECOM also provides a variety of site visualization tools, including our environmental sequential stratigraphy technology, and concise and accurate cost estimates using industry-accepted technology standards (RACER™). Our professionals provide local resources at the project site and the best knowledge from our global team at their fingertips. Our established relationships with remedial amendments vendors and cutting edge technologies round out our complete toolkit for each individual project.

AECOM provides design and build, operations and maintenance, and monitoring resources, geotechnical services, groundwater modeling, risk assessment, and numerous other innovative and established tools.

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**Project Examples**

1 Corrective Action During Decommissioning of Coal Plant

**Challenge:** Perform assessment and delineation for a variety of potential contaminants in soil and groundwater during busy plant decommissioning activities. Coordinate safe work around scheduled demolition activities. Provide results to client in a timely manner to drive key decisions regarding the sequence and schedule of the decommissioning and demolition.

**Action:** Screening-level assessment identified the key contaminants as PAHs associated with fuel oil. Subsequently, AECOM developed and executed a delineation sampling to define the extent of impacts to soil and groundwater.

**Result:** Worked closely with client’s environmental services staff and several other decommissioning contractors to develop a targeted remediation plan, primarily consisting of excavation removal activities, for areas of the site with impacted soil/groundwater. AECOM will oversee the remediation project and reporting to State regulatory agencies in 2016.

2 Corrective Action of Soil and Groundwater

**Challenge:** Conduct an initial soil and groundwater assessment for Entergy Louisiana Station, identify remediation areas, which require selection of remedial alternatives and submit corrective action plans to the Louisiana Department of Environmental Quality for each identified area.

**Action:** Excavated approximately 13,800 tons of material and disposed of at a permitted Subtitle D Landfill, while the second area was remediated using in-situ soil mixing techniques and constructing a clay cap with a vegetated cover.

**Result:** Remediated impacts to groundwater with the soil removal. After the initial remediation, AECOM developed a soil management plan so Entergy staff could deal cost effectively with affected soil if encountered during site construction activities.
Bringing you value.

- Provide site characterization and data visualization
- Identify remedial alternatives and feasibility evaluations
- Implement internal bench and pilot-scale testing to optimize remedial technology implementation
- Provide remedial design, construction and O&M
- Prepare risk assessment
- Facilitate regulatory and community relations
- Ensure cost and schedule optimization
- Promote long term site stewardship
AECOM’s extensive experience in designing and modifying coal fired power plants puts us in a unique position to address needed “balance-of-plant” concerns. Our proven capabilities include assessing and implementing ash conversions and CCR dewatering systems. We know that in many instances the best solution is site specific and apply our knowledge of boiler and air quality control system operations to arrive at the optimal design.

CCR generation and management is currently in a state of change. AECOM is strongly positioned to support these adjustments. Our professionals understand the CCR rule and revised effluent limitation guidelines and are well-versed in modifications and requirements for coal ash and FGD handling and disposal.

The vast majority of bottom ash and fly ash handling systems will need to operate as zero liquid discharge processes. To facilitate this change, many power producers will look to convert to dry handling systems.

Wet FGD processes that currently discharge slurry to settling ponds will likely have to convert to a process that generates a byproduct suitable for beneficial use or storage in a landfill. For those producing a stabilized product suitable for landfills, drivers could exist to reduce the amount of waste requiring disposal.

Wastewater associated with conveying ash or operation of the wet FGD process may require treatment and/or reuse. The same may apply to free water present in existing surface impoundments requiring closure.

AECOM professionals use their capabilities to drive down cost and schedule requirements through:

- Regulatory impact assessments
- Wastewater characterization
- Plant water balance studies and development
- Water chemistry/systems modeling
- Cost benefit analyses
- Optimum technology selection
- Laboratory and pilot-scale testing
- Preliminary and detailed design
- Balance-of-plant engineering
- Procurement and construction services
- Operation and maintenance planning

Project Examples

1. TVA Kingston Fossil Plant, Gypsum Dewatering Facility

**Challenge:** Dewater the gypsum slurry generated in two flue gas desulfurization (FGD) absorber modules that was being sent to a settling pond from approximately 30 wt% solids to no less than 85% solids.

**Action:** AECOM, through its joint venture Advatech, was the Owner’s Engineer, subcontract administrator and construction manager for the dewatering facility.

**Result:** A vacuum belt filter and conveyor system was successfully installed that could handle 65 tph of gypsum, while minimizing the future cost of retrofit associated with handling over a 60% increase in solids loading.

2. TVA Bull Run Fossil Plant Kingston Fossil Plant, Gypsum Dewatering

**Challenge:** Owner’s Engineer for the BRF Bottom Ash and Gypsum Dewatering project and performed the detailed design of the balance of plant facilities which included the tie-ins for both feed and effluent for both systems, including a recirculation system for the BA effluent which required extensive modifications to the water systems in the powerhouse basement.

**Action:** Performed a study to evaluate blending thickened FGD slurry with landfill fly ash to produce a dry stable product suitable for disposal in a landfill.

**Result:** Since 2010, AECOM was instrumental in providing continuity on the design through phase 1 preparation of the EPC specification, phase 2 detailed design and phase 3 construction support through project completion in 2015.
Bringing you value.

- Identify bottom ash and fly ash conversions
- Assess flue gas desulphurization (FGD) byproduct dewatering and/or fixation
- Prepare wastewater management and reuse studies
- Provide wastewater treatment
- Bring engineering, procurement and construction capabilities
Without change there is no innovation, creativity or incentive for improvement. Change calls for innovation, and innovation leads to progress. ~ Anonymous

With the promulgation of the CCR rule, the coal fired utility industry is facing many changes and challenges ahead. As your partner, AECOM provides you with the experience needed to understand changes within the industry. We are on the forefront of innovation and deliver cost effective solutions to our clients.

Since the early 1970s, AECOM has provided technology research, development, demonstration, commercialization, and implementation of technologies for the power and industrial market sectors. Our customers benefit from our ability to evaluate competing technologies based on technical, economic and operating variables.

AECOM is experienced in balancing opportunities for innovation with practical, low cost and value added solutions. We continuously conduct research and development to provide best-in-class technologies, strategies, and innovation to solve current and future regulatory challenges. From stabilization, dewatering and modeling technologies to construction and execution innovations, our incentive for improvement is you!

### Project Examples

1. **WFGD Waste Stabilization**

   **Challenge:** Avoid the high cost associated with opening a new pond as a result of a western power plant approaching the capacity limit.

   **Action:** Developed a conceptual design and cost estimate for blending thickened FGD slurry with landfill fly ash to produce a dry, stable product suitable for disposal in a landfill. The condition of existing equipment, tanks, buildings, piping, etc. were evaluated for re-use to reduce the cost and time to implement.

   **Result:** Determined that the FGD slurry and fly ash can be blended to produce a stable landfill product, thus avoiding the need for a new pond. Execution of the engineering and equipment procurement phase has been completed with the construction phase soon to follow.

2. **Orlando Utilities Commission Stanton Solar Project**

   **Challenge:** Evaluate the alternative end uses exist for a closed CCP landfill at the Stanton Energy Center that will increase the output of the Orlando Utilities Commission (OUC)’s current solar generating capacity.

   **Action:** AECOM is serving as Owner’s Engineer for OUC which will generate 10 MW PV power. AECOM provided early stage feasibility and preliminary design, assistance in drafting RFP technical content, evaluation of proposals received, technical assistance during contract negotiations, project development and construction process.

   **Result:** Used the existing interconnection facilities at the site and more than doubled OUC’s current solar generating capacity.
Bringing you value.

- Identify integrated, innovative solutions
- Ensure full compliance from plant to pond
- Facilitate process and execution optimization
- Provide research and development
- Prepare technology evaluation
- Provide turnkey solutions
About AECOM
AECOM is built to deliver a better world. We design, build, finance and operate infrastructure assets for governments, businesses and organizations in more than 150 countries. As a fully integrated firm, we connect knowledge and experience across our global network of experts to help clients solve their most complex challenges. From high-performance buildings and infrastructure, to resilient communities and environments, to stable and secure nations, our work is transformative, differentiated and vital. A Fortune 500 firm, AECOM companies have annual revenue of approximately US$19 billion. See how we deliver what others can only imagine at aecom.com and @AECOM.

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