

BOTTOM ASH REUSE

INCREASED CCR RESALE VALUE USING DRY SYSTEM

- Bottom ash must be dewatered before resale.
- Dry system decreases bottom ash saturation.
- Dry bottom ash can be resold at higher value.
- Applications include concrete, land-fill, and asphalt.

BENEFITS OF BOTTOM ASH REUSE

- Can be reused in a variety of forms.
- Avoids disposal or storage needs and costs.
- Decreases negative environmental impact.
- Minimizes the energy consumed when handling.
- Can become a steady source of revenue.

POTENTIAL FUTURE RESEARCH

- Patents and advanced technologies for bottom ash handling can be further explored.
- Wastewater management solutions in other industries.
- Impact of clean coal technology on proposed solutions.

CCR SOLUTIONS TEAM



Top from left: Shana Burnett, Andrew Gardener, Graeme Port, Daniel Kipp, Joseph Sanchez, & Robert Herman

Bottom from left: Susan Rafalko, Sheena Enriquez, Nicole Firnbach, & Chad Parker

Not Pictured: Jennifer Agosto, Professor Myron Gottlieb, & Professor Don Tjunelis

Majors of Team Members: Business (4), Architecture (2), Computer Science (1), Humanities (1), Mathematics (1), Electrical Engineering (1), Civil Engineering (1)

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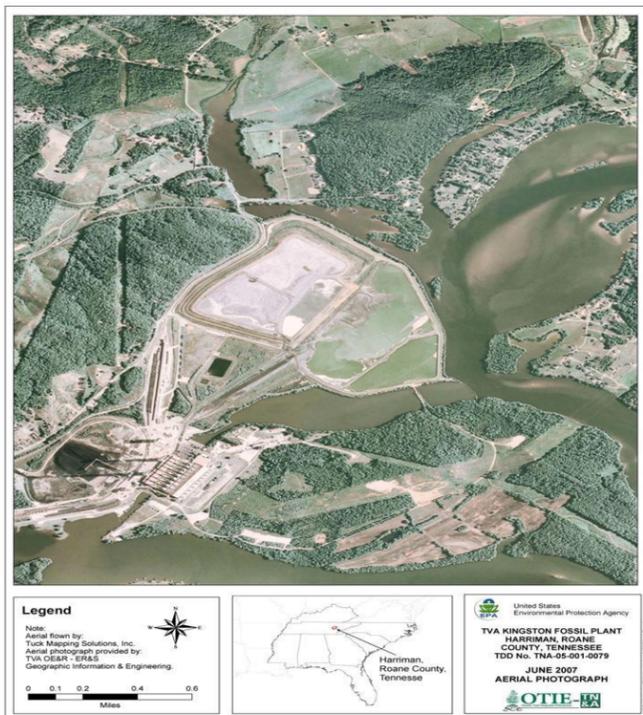
Your Inside Look Into

IPRO 302

coal combustion residual solutions

Problem Statement:

Evaluate the impacts of eliminating ash storage pond from a power plant to meet pending EPA regulations and avoid future ash pond disasters.



BACKGROUND INFORMATION

- On December 22, 2008 a dike burst at the Kingston ash pond impoundment, spilling an estimated one billion gallons of coal ash containing toxic metals into the surrounding Emory River.
- The Tennessee Valley Authority's Kingston coal plant dumped an estimated 140,000 pounds of arsenic into the Emory River in 2008.
- These toxic chemicals are harmful to fish, wildlife, the natural ecosystem, and are extremely hazardous to human health.
- As a result, the EPA is proposing significant changes to coal ash classifications that may force many plants to close their existing ash pond containment facilities.

PROJECT OBJECTIVES

To Determine:

- Current and pending coal combustion residual (CCR)/ wastewater regulations.
- CCR disposal and reuse alternatives.
- Waste water treatment and disposal alternatives.
- Pond closure and outsourcing opportunities.
- Costs and environmental implications of unlined ash pond.

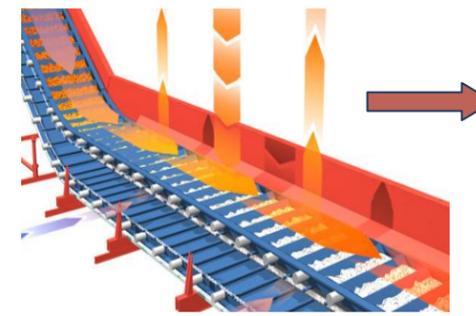
RECOMMENDED STEPS

1. Convert to dry ash handling system.
2. Establish a ground water monitoring zone. (GMZ)
3. Outsource wastewater treatment and disposal.
4. Cap ash pond using geo-synthetic membrane cover.

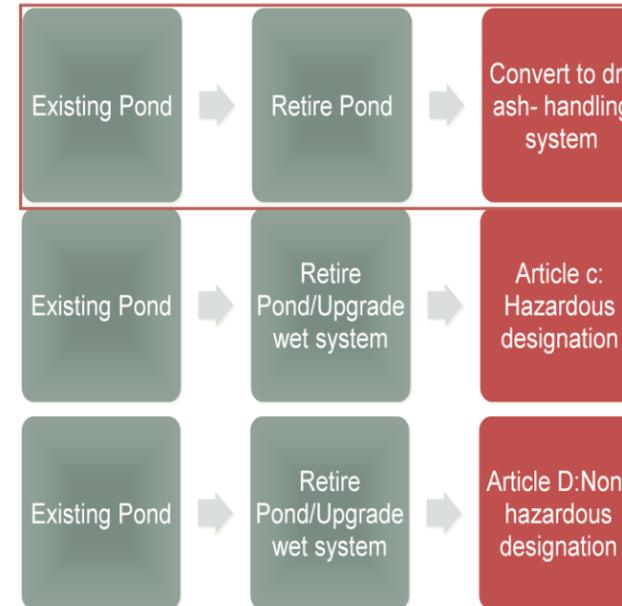
BENEFITS OF DRY ASH HANDLING

- No water requirements.
- Improved boiler efficiency.
- Full compliance with EPA regulations.
- Improved bottom ash reuse.

Dry Bottom Ash Conveyor: *DRYCON*



THREE CASES



IMPLICATIONS OF THREE CASES

The Implications of Dry Ash Include:
Effectively eliminates ash pond, no water required (eliminates water-based systems), unaffected by any new regulations passed, regardless if Article C or Article D, and low operating costs.

Major Implications for Article C Include:
Ash designated "Special Waste", ash ponds must be phased out in 7 years, monitoring of all ash dumps is required, and ash generation, storage, transportation, and disposal of coal ash are regulated.

Major Implications for Article D Include:
Ash designated non-hazardous, ash ponds must be upgraded, utilities not required to monitor dumps, and regulations only for disposal.

Recommended Option:

Retire Pond/Use Dry Ash Technology

PHASE 1

Convert to Dry Ash Handling System:
SELECTED DRY SYSTEM: DRYCON

- Dry ash conveyor system
- Clunkers minimized by grinders
- Air pressure cools ash
- Highly customizable
- Low maintenance

PHASE 2

Establish a Ground Water Monitoring Zone

BASIC GMZ REQUIREMENTS:

- GMZ required for successful ash pond closure.
- EPA must approve GMZ before implementation.

GMZ IS A CRITICAL ASPECT OF PLAN:

- Required to manage on-site contamination.
- System monitors groundwater contaminants within area.
- Promotes secure treatment and disposal of wastewater.
- System can be managed on and off-site.
- Various combinations of technology can be used.

PHASE 3

Begin Secure Wastewater Treatment and Disposal

WASTE WATER REMOVAL SYSTEMS:

- Chemical solutions and extraction wells both considered.
- Extraction wells pose a risk of long term seepage.
- Chemical removal systems are not cost effective.

WASTE WATER DISPOSAL SOLUTION:

- Best option is to outsource task to wastewater specialists.
- Charah is an experienced CCR solutions specialist.
- Estimate of costs for complete wastewater removal and disposal: \$600,000.

PHASE 4

Cap Ash Pond Using Geo-Synthetic Membrane Cover

ASH POND WILL BE CAPPED

- Excavation of ash pond would cost roughly \$200 million.
- Geo-membrane, compacted clay, and layered earth caps.
- Capital costs range between \$7.5 - \$13.7 million.
- Best option is a geo-synthetic membrane cover.

GEO-SYNTHETIC MEMBRANE

- Current technology is safe and readily available.
- Porous membrane will allow for natural ground flow.
- 2 feet of soil and vegetation will cover the membrane.
- Estimated capital cost for cover is \$11.2 million.

TVA/KINGSTON Ash Pond Breach