Overview of CCR Regulations and Changes in Disposal Management

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Overview of CCR Regulations
Before the Storm – What are CCPs?

Coal combustion products (CCP) affected by the change:

• Waste products from the combustion of coal and emission control systems, including:
  – Fly ash
  – Bottom ash
  – Flue gas emission control products
    • Gypsum
    • Flue Gas Desulfurization (FGD) Sludge
  – Boiler slag
  – Fluidized bed ash

Other Names for CCPs:

CCB = Coal Combustion Byproducts (outdated, replaced with CCPs)
CCR = Coal Combustion Residuals (introduced by the US EPA in 2010)
CCW = Coal Combustion Waste (used most commonly by the US EPA)
Coal Ash (common reference)
Before the Storm – CCP Management

All aspects of CCP management performed by the states - No federal programs in place

- **1976 – Resourc Conservation and Recovery Act**
- **1980 Bevill Amendment** – CCP not hazardous waste!
  - The ‘Bevill exclusion’ excludes CCP from regulation as hazardous waste under Subtitle C.
- **1993 Report**
  - Subtitle D designation upheld from Bevill Amendment.
- **2000 Report**
  - Final Rule - the agency concluded that CCP are nonhazardous (maintains exemption); also the report calls for federal disposal and reuse guidelines.
- **2002 Report**
  - EPA sponsored beneficial use summits focused on barriers to utilization of CCP within the states…Beneficial reuse (or recycling) is now on the rise.
Approaching Storm – Lightning Strikes

December 22, 2008

• TVA failure at Kingston
  – Ash dike ruptured-largest fly ash release in U.S. history
  – 5.4 million cubic yards of fly ash sludge into the Emory River and surrounding land
  – Clean up costs approaching $1.2 billion

January 9, 2009

• Widows Creek Fossil Plant Gypsum Pond
  – Water and gypsum flowed into the settling pond, which filled to capacity and then overflowed after a cap dislodged from a 30-inch standpipe
  – Some material overflowed into Widows Creek, although most of the gypsum remained in the settling pond
Latest Front – 2010 and 2011

June 2010 – EPA proposes two primary alternative regulatory paths for dealing with CCR as a “regulated” rather than “exempt” waste:

• Subtitle C
• Subtitle D
• Both necessitate transition from wet to dry disposal within 5 years
• Both require long-term closure of facilities after cessation of operation, generally within 2 years (slight differences)
• Similar impacts on major costs of disposal but Subtitle C is potentially massively more impactful to in-plant operations and re-use applications
Existing Ponds – Subtitle C

Monitoring and Inspection
- GW Monitoring
- Site Inspection

Cap System
- Minimize Infiltration

GW Well(s)

Time Line
- Stop receipt of CCRs, 5 years
- Closure, 2 years later

7 yrs.

Reporting / Long-Term Care
- Annual Reporting
- Financial Assurance
- Closure / Post-Closure Care
- Land Disposal Restrictions

Applies To (at time of closure)
- Active Ponds
- Inactive Ponds
- Closed Ponds

WWW
**Existing Ponds – Subtitle C/D**

- **Monitoring and Inspection**
  - GW Monitoring
  - Site Inspection
  - Report to EPA

- **Cap System**
  - Minimize Infiltration
  - Less Permeable Than Liner
  - 1x10^-5 CM/Sec Max
  - 6 inch Vegetative Cover

- **Time Line**
  - Stop receipt of CCRs, 5 years
  - Closure, 2 years later
  - Closure in 5 years unless 2 year extension

- **Reporting / Long-Term Care**
  - Annual Reporting
  - Financial Assurance
  - Closure / Post-Closure Care
  - Land Disposal Restrictions

- **Applies To** (at time of closure)
  - Active Ponds
  - Inactive Ponds
  - Closed Ponds
Existing Landfills – Subtitle C

Monitoring and Inspection
- GW Monitoring
- Site Inspection
- Report to EPA

Developed Existing Area
- Continue with current lined system
- Security requirements
- Operate as a Subtitle C unit (manage hazardous material)
- Cap system required

Undeveloped / Expansion Area
- New design requirements apply (including liner system)
- Operate as a Subtitle C unit
- LDR apply (siting criteria)

Leachate Management
- CCR pond closure (tanks, other)

Reporting / Long Term Care
- Annual reporting
- Financial assurance
- Closure / post-closure care
Existing Landfills – Subtitle C

Monitoring and Inspection
- GW Monitoring
- Site Inspection
- Report to EPA

Developed Existing Area
- Continue with current lined system
- Security requirements
- Operate as a Subtitle C unit ……self-implementing
  (manage hazardous material)
- Cap system required

Undeveloped / Expansion Area
- New design requirements apply
  (including liner system)
- Operate as a Subtitle C unit
- LDR apply (siting criteria) ………..other location restrictions

Leachate Management
- CCR pond closure (tanks, other)
  …But could line or build lined ponds
- Meet LDR
- GW monitoring
- Closure / Post-closure
- Stability requirements

Reporting / Long Term Care
- Annual reporting
- Financial assurance
- Closure / post-closure care

GW Well(s)

Power

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Changes in Disposal Management – Driving Factors
Factors Driving Change

Business Drivers

• Utility fleet downsizing
• Mergers and Acquisitions
• CCP Sales

Regulatory Drivers

• Release of the new federal rules for the management of CCPs (anticipated 2014 followed by <1 year to >4 years for the rules to take effect)
• The outcome of the new rules (hazardous or non hazardous; pond closures required and period for compliance; etc.)
• Actions due to “adjacent” rules:
  – Effluent Limitation Guidelines – Expected April 19, 2014
  – MATS, etc. – Plant Decommissioning
• “Regulatory Purgatory” – Current regulatory status leads to many unknown factors in project execution, which has grown into CCP Management uncertainty.
Factors Driving Change
Observed Trends

*Proactive* – Begin projects now because of capacity needs, perception, etc.

*Responsive* – Begin projects after directions are provided (i.e., rules are draft)

*Reactive* – Begin projects when the regulations require action
### Factors Driving Change

#### Observed Trends

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<thead>
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<th>Responsive</th>
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<tbody>
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<td>Pre-Promulgated Rule Period</td>
<td>Rule Coming Into effect</td>
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<td>Ponds stop Receiving CCPs</td>
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### Standard Operating Procedure(s) – Routine tasks due to normal operations

- Pre-Promulgated Rule Period
- Rule Coming Into effect
- Initial 5 year Period
- 2 Year extension Period

### Strategic and Planning – Strategic and planning tasks to prepare

- Pre-Promulgated Rule Period
- Rule Coming Into effect
- Initial 5 year Period
- 2 Year extension Period

### Pond Closures – Pond closures

- Pre-Promulgated Rule Period
- Rule Coming Into effect
- Initial 5 year Period
- 2 Year extension Period

### Instrumentation and Monitoring – Inspection and monitoring

- Pre-Promulgated Rule Period
- Rule Coming Into effect
- Initial 5 year Period
- 2 Year extension Period

### New Capital Project(s) – New capital projects

- Pre-Promulgated Rule Period
- Rule Coming Into effect
- Initial 5 year Period
- 2 Year extension Period
Factors Driving Change
Observed Trends

**Proactive Behavior** – Begin projects now because it is right/necessary

**Responsive Behavior** – Begin projects when directions are provided (i.e., rules are draft)

**Reactive Behavior** – Begin when the regulations require action

![Diagram showing factors driving change](image)

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Factors Driving Change

Observed Trends

**Proactive Behavior** – Begin projects now because it is right/necessary

**Responsive Behavior** – Begin projects when directions are provided (i.e., rules are draft)

**Reactive Behavior** – Begin when the regulations require action

**Current Market Status**

- **Proactive Behavior**
  - Begin projects now because it is right/necessary

- **Responsive Behavior**
  - Begin projects when directions are provided (i.e., rules are draft)

- **Reactive Behavior**
  - Begin when the regulations require action

**Growing Needs**

- **Standard Operating Procedure(s)** – Routine tasks due to normal operations
- **Strategic and Planning** – Strategic and planning tasks to prepare
- **Pond Closures** – Pond closures
- **Instrumentation and Monitoring** – Inspection and monitoring
- **New Capital Project(s)** – New capital projects

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Factors Driving Change

What Options are being Considered?

• Minor modifications to plant
  – Upgrade of existing systems
  – Technology improvements

• Major modifications to plant
  – Add New Scrubbers
  – Convert to dry systems

• Repowering or closure

• Continue to operate for a period without making a decision (delay)
Factors Driving Change

Current Trends (services requested)

- Studies, budgeting, and planning
- No new ponds
- Closing existing (active and inactive ponds)
- New landfills being considered, and some permitting starting
- Plant closures – (closure of disposal units)
- Exploring beneficial reuse opportunities (steady, included in new strategies)
- Innovation options – landfills over ponds
- Groundwater issues – characterization and interception
- Water re-use/management studies

Needs are evolving!
Changes in Disposal Management – Solving the Puzzle
Solving the Puzzle
Regulatory Challenges

Challenges before the new regulations

• Cessation of sluicing may increase NPDES challenges
• Permitting process is unclear

Challenges after the new regulations

• Regulators not familiar with the engineering and operation of conversions (and new dry disposal)
• Proposed regulations have mandatory closure requirements (180 days), with limited mechanisms for extension.
For a Typical Power Station with Ponds

The following is needed prior to the start of final closure construction (i.e. before the spigot is turned off)

- Design of Final Closure
- Dry CCR Handling Infrastructure
- New Non-CCR Wastewater Treatment Facilities
- New Solid Waste Disposal Facility
Design of Final Closure

Basic Steps Required for Final Closure Design/Permitting

- Conceptual Design
- Internal Funding Allocation
- Site Investigation
- Development of Construction Work Plan
  - Design Drawings
  - Specifications
  - Contract Documents
- Permitting
  - NPDES Modifications
  - Storm Water Construction Permit (SWP3)
Design of Final Closure

- **Conceptual Design / Site Investigation**: 6 to 9 months
- **Construction work plan development**: 6 to 12 months
- **Bidding / Procurement**: 1 to 3 months
- **Permitting**: 3 to 6 months

**Total Project Length**: 1 to 2 years

**Dry CCR Handling Infrastructure

- Design of Final Closure
- Non-CCR Wastewater Treatment
- New Solid Waste Disposal Facility
Dry CCR Handling Infrastructure

Fly Ash
- Pneumatic handling and ash silos
- Conveyors
- Trucks

Bottom Ash/Slag
- Hydrobins
- Chain conveyors
- True dry bottom ash handling very complex and would require very significant changes to the boiler – assume not required under Subtitle D Option

Gypsum Dewatering
- Thickeners
- Water recycle
- Fly ash blending
Dry CCR Handling Infrastructure

- **Feasibility Study**: 6 to 12 months
- **Detailed Design**: 6 months
- **Fabrication / Delivery**: 12 months
- **Construction**: 6 months

**Total Duration**: 2 ½ to 3 years

**Steps**:
- Design of Final Closure
- Dry CCR Handling Infrastructure
- Non-CCR Wastewater Treatment
- New Solid Waste Disposal Facility

End of wet disposal
Non-CCR Wastewater Treatment

Reduction in dilution/ residence time

New dedicated wastewater facilities needed

- Non CCR wastewater may require conventional wastewater treatment facilities
- High-load wastewaters may require additional treatment
  - zero liquid discharge,
  - membranes, etc.

Recycle/reuse may reduce treatment needs but must be balanced with other costs

- reuse FGD blowdown for cooling tower make up
- reuse to moisture condition CCR material for landfilling
Non-CCR Wastewater Treatment

**Total Duration**

- Feasibility Study: 6 to 12 months
- Detailed Design: 6 to 12 months
- Fabrication / Delivery: 9 to 12 months
- Construction: 6 to 12 months
- Permitting: 18 to 24 months

**JAN**
- Design of Final Closure
- Dry CCR Handling Infrastructure
- Non-CCR Wastewater Treatment
- New Solid Waste Disposal Facility

**DEC**
- End of wet disposal

**Total Duration:** 3 to 4 years
New Solid Waste Disposal Facility

Management of CCRs in an existing Subtitle D landfill (MSW) is economically unfeasible due to:

- high volume wastes,
- high transportation costs, and
- high tipping fees

A dedicated (new) dry landfill for final disposal will be needed

Prior to the start of final pond closure, a new dry landfill will need to be...

- sited,
- permitted,
- constructed, and
- begin operation
New Solid Waste Disposal Facility

Total Duration
3 ½ to 5 ½ years

- Siting Study: 6 to 12 months
- Hydrogeological/geotechnical investigation: 6 to 18 months
- Permitting - Solid Waste, NPDES, Air, etc.: 18 to 24 months
- Construction of initial phase and associated infrastructure: 6 to 12 months

Design of Final Closure
Dry CCR Handling Infrastructure
Non-CCR Wastewater Treatment
New Solid Waste Disposal Facility

End of wet disposal
Overall Dry CCR Conversion/Pond Closure Process

- **Design of Final Closure**: 1 to 2 years
- **Dry CCR Handling Infrastructure**: 2 ½ to 3 years
- **Non-CCR Wastewater Treatment**: 3 to 4 years
- **New Solid Waste Disposal Facility**: 3 ½ to 5 ½ years

End of wet disposal

Federal regulations will require pond closure to be COMPLETE in 5 to 7 years!

*The time to begin is...NOW!!!*
Solving the Puzzle
Management Challenges

Securing funds

- Include all projects required to convert from wet CCR operations to dry:
  - Wastewater treatment facilities,
  - Dry fly ash handling,
  - Gypsum dewatering, etc.

- Must phase costs over as long period of time

- Planning and careful budgeting is key
Solving the Puzzle
Management Challenges (Continued)

Planning for dry handling

• Shifting to dry CCR management will require the need for dry landfills
  – Needed in service before pond closure
  – Approach is very involved (site, design, permit, and construct)
• Consider alternative conveyance methods – rail, barge, or conveyor
• Evaluate capacity of ash silos/bottom ash storage bins

Management of Non-CCR Wastewater

• Currently minor wastewater streams may become significant and controlling streams for a new wastewater facility
• New treatment technologies may be required, with potential higher levels of O&M
Summary

Solving a complicated puzzle for pond closures:

• Requires careful planning as well as considerations for multi-step processes
• Requires overcoming challenges which
  • Leads to other challenges
  • Requires a systematic approach
• Avoid the learning curve (for all phases of the project)
• Includes more than just pond closures (that may take precedence)
  • Landfills,
  • Dewatering facilities,
  • Wastewater treatment, etc.
• It is a lengthy process…. 