Key Regulatory Actions

Coal Combustion Residuals (CCR)
- Issued December 19, 2014
- CFR Publication: April 17, 2015
- Goals
  - Groundwater Protection Benefits
  - Preventing Future CCR Impoundment Catastrophic Failures

Effluent Limitations Guidelines (ELG)
- Proposed Rules Issued April 2013
- Final Rules: Consent Decree = September 30, 2015
- Goals
  - Strengthen Steam Electric Power Plant Discharge Controls
  - Reduce Surface Water Pollutant Discharges
Regulation Focus Areas:

- Location Restrictions: Aquifer, Wetlands, Fault Zones, Seismic Zones, Unstable Areas
- Design Criteria: Lined/Unlined, Leaking/Not Leaking, Structural Integrity
- Operating Criteria: Flood Control, Fugitive Dust Control, Inspections (Weekly/Monthly/Annual)
- Groundwater Monitoring and Corrective Action
- Closure Requirements and Post-closure Care
- Recordkeeping, Notification, and Internet Posting
Coal Combustion Residuals (CCR) Ruling
Regulatory Timeline – Existing CCR Surface Impoundments

- Updated Part 257 Published to Federal Register: 04/15
- Complete Initial Annual Inspection: 10/15
- Fugitive Dust Control Plan, Weekly Inspections, Monthly Monitoring, Launch Recordkeeping, Notifications & Website: 04/16
- Install Permanent Marker: 01/16
- Complete demonstration if existing Surface Impoundments are Lined/Unlined: 10/16
- Flood Control Plan, Closure & Post-Closure Care Plans, Structural Assessment: 04/17
- Emergency Action Plan: 10/17
- Install Groundwater Monitoring System, Sampling & Analysis Program, Detection Monitoring Program: 10/18
- Complete demonstration for placement above aquifer and complete demonstrations for wetlands, fault areas, seismic zones and unstable areas: 04/19
- Initiate Closure Activity: 01/24

Timeline:
- Complete Initial Annual Inspection: 10/15
- Install Permanent Marker: 01/16
- Complete demonstration if existing Surface Impoundments are Lined/Unlined: 10/16
- Flood Control Plan, Closure & Post-Closure Care Plans, Structural Assessment: 04/17
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- Complete demonstration for placement above aquifer and complete demonstrations for wetlands, fault areas, seismic zones and unstable areas: 04/19
- Initiate Closure Activity: 01/24
### ELG Ruling
Steam Electric Main Regulatory Options

<table>
<thead>
<tr>
<th>Wastestreams</th>
<th>Technology Basis for the Main Regulatory Options</th>
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<tbody>
<tr>
<td></td>
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<tr>
<td>FGD Wastewater</td>
<td>Chemical Precipitation + Biological Treatment for units at a facility with a total wet scrubbed capacity of &gt;2000MW; Chemical Precipitation + Biological Treatment for units with a total wet scrubbed capacity of &lt;2000MW</td>
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<tr>
<td>Fly Ash</td>
<td>Chemical Precipitation + Biological Treatment</td>
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<tr>
<td>Bottom Ash Transport Water</td>
<td>Impoundment (equal to BPT)</td>
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<tr>
<td>Combustion Residual Leachate</td>
<td>Impoundment (equal to BPT)</td>
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<tr>
<td>FGM Wastewater</td>
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<td>Gasification Wastewater</td>
<td>Evaporation</td>
</tr>
<tr>
<td>Nonchemical Metal Cleaning Wastes</td>
<td>Chemical Precipitation</td>
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EPA will choose (1) of the (4) Options and issue as final in September 2015
Implications of ELG Ruling

Fly Ash Wet-to-Dry Conversions (All 4 Options)
- Remaining wet fly ash systems will be converted to dry systems
- Existing wet back-up systems will be decommissioned and will likely require additional redundancy for primary dry systems

Bottom Ash Wet-to-Dry Conversions
- Under 3 of 4 regulatory options, utilities will have to determine if existing impoundments can meet BPT requirements (TSS, oil and grease)
- Utilities will also have to weigh BA WTD conversion costs against CCR Subtitle D requirements: “Must remove solids and retrofit with a composite liner or cease receiving CCR’s within 5 years of effective date and close the Unit”
- For Option 4a, all generating units >400 MW will have to implement BA WTD conversions; generating units <400 MW will have to evaluate BA WTD conversion costs against BPT requirements
Discussion Overview

Regulatory Update / Implications / Compliance Timeline

Bottom Ash Handling Technical Alternatives
Bottom Ash Wet-To-Dry Conversions
Technical Alternatives

**Submerged Flight Conveyor – SFC™**
- Long-Term Economical Choice (Low O&M Costs)
- Simple Solution if Space is Available

**Re-Circulating Hydraulic System (3 Options)**
- No Changes Under Boiler, Uses Existing Hopper
- Minimizes Outage Requirements

**Dry Hopper Pneumatic Conveying – PAX™**
- No Water, Returns Heat Back to Boiler
- Easiest 100% Dry Option to Move Ash Out of Boiler Building

**Mechanical Bottom Ash Conveying**
- No Water, Returns Heat Back to Boiler
- Continuous Removal of Bottom Ash
Bottom Ash WTD Conversion Alternatives
Under Boiler Submerged Flight Conveyor (SFC)

- Continuous Removal of Ash
- Low Power Consumption
- Easily Incorporates Mill Rejects
- Industry Standard on New Units for past 30 years
Bottom Ash WTD Conversion Alternatives
Submerged Flight Conveyor (SFC)
Bottom Ash WTD Conversion Alternatives

Conventional Dewatering & Recirculation System

- Minimal Outage Time for Conversion
- Continue to Use Existing Bottom Ash Hoppers
Bottom Ash WTD Conversion Alternatives
Settling and Surge Tanks
Bottom Ash WTD Conversion Alternatives
Continuous Dewatering & Recirculation System (CDR) with Remote SFC’s

- CDR System with Remote SFC’s
- Combines SFC Technology with Conventional Recirculation System
Bottom Ash WTD Conversion Alternatives
Continuous Dewatering & Recirculation System (CDR) with Remote SFC’s
Bottom Ash WTD Conversion Alternatives
Bottom Ash Dewatering and Clarification System with Remote SFC’s
Bottom Ash WTD Conversion Alternatives
Bottom Ash Dewatering and Clarification System with Remote SFC’s
Bottom Ash WTD Conversion Alternatives
Bottom Ash Dewatering and Clarification System with Remote SFC’s
Bottom Ash WTD Conversion Alternatives
Bottom Ash Dewatering and Clarification System with Remote SFC’s
Bottom Ash Dewatering Basins
Design/Performance Considerations

Medium and fine particulates may not achieve desired moisture content of 15-20% in basins.

Ash may have to be moved and spread to achieve the moisture content suitable for landfill compaction.
Must consider potential plugging of dewatering screens
Per CCR requirements, basins will still require subsurface liner system and groundwater monitoring system, and must be 5 ft. above uppermost aquifer.
Risk Analysis must consider relative proximity to local waterways/flood plain for potential migration of ash wastewater and solids during a peak storm event, particularly relative to pending ELG requirements.
Dry Bottom Ash – PAX System

- Proven Technology
- Easily Retrofitted Around Structural Barriers
- Provides Improved Heat Recovery
- Does Not Require Water for Conveying
Dry Mechanical Bottom Ash

- Space for Inclined Ramp
- Secondary Conveyor(s) [Mechanical Shown]
## Criteria for Determining Technology Selection

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<tr>
<th>Criteria</th>
<th>Scale</th>
<th>WT</th>
<th>SC</th>
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<td>Water Usage/Availability</td>
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<td>Outage Time Limited</td>
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<td><strong>Weighted Total Score</strong></td>
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## Technology Alternatives

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<td>Under Boiler Drag Chain (Mechanical)</td>
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## Decision Analysis Process

1 = Worst, 5 = Best

Weighted Total Score: 88
Rules will likely drive dozens of WTD ash conversion, pond closure, dry landfill and wastewater treatment projects

Potential to test the capacity of Utilities, AE Firms, Technology Providers & Installation Contractors
Questions ?