Preparation of Coal Ash Disposal Facilities to Comply with the CCR Regulations
Most CCR impoundments & reservoirs were constructed decades ago when there was little regard for environmental consequences.

Impoundment construction techniques vary from engineering design to an excavation extended until groundwater was encountered.

Reservoirs are typically designed by an engineer in order to address the large volumes of water retained by the structure.
Most coal burning plants are located adjacent to surface water bodies. Accordingly, the majority of Ash Disposal Impoundments are situated in close proximity to surface water bodies for which there may be groundwater interconnection.

Ash Disposal Reservoirs are often located a mile or more from the generation plant due the area required for construction.
On December 22, 2008, an 84-acre impoundment at the TVA’s Kingston Fossil Plant ruptured releasing approximately 5.4 million CY’s of Fly Ash into the Clinch River.

In response, the EPA issued their Proposed Rule for CCR’s on May 4, 2010 under which the agency provided co-proposals for CCR management under:
- RCRA Subtitle D or RCRA Subtitle C

On December 19, 2014, the EPA issued the final “Disposal of CCR’s from Electric Utilities” rule under which they are addressing CCR management under:
- RCRA Subtitle D

The final rule was published in the Federal Register on April 17, 2015 and is effective on October 14, 2015.
Final Rule: Disposal of Coal Combustion Residuals from Electric Utilities

On this page
- Rule Summary
- Rule History

The EPA Administrator, Gina McCarthy, signed the Disposal of Coal Combustion Residuals from Electric Utilities final rule on December 19, 2014, and it was published in the Federal Register (FR) on April 17, 2015.

- Read the final rule in the Federal Register
- View the redline version of the final rule

http://www2.epa.gov/coalash/coal-ash-rule
CCR Regulations – Subtitle D Requirements

**New CCR Surface Impoundments**

- **Landfills**
  - Siting (New Landfills) – Minimum distance above groundwater– 2 feet; Not located within 200 ft of Holocene fault, not located in wetlands, flood plains or seismic impact zone, not located above a 100 GPM aquifer, 10,000 feet of airport, proximity to property lines, etc.

- **New Landfill and Surface Impoundments**
  - Composite Liner – Two feet of clay recompacted to $1 \times 10^{-7}$ cm/sec permeability, 30 mil flexible membrane liner (or 60 mil HDPE), leachate collection system.

- **Surface Impoundments**
  - Closure Cap – Cover designed to minimize infiltration and erosion & have permeability $< or \leq$ to bottom liner or no $> 1 \times 10^{-5}$ cm/s (May vary per State)
    - 18-inch infiltration layer
    - 6-inch erosion layer to support native plant growth
  - Environmental Compliance – Groundwater monitoring
  - Post Closure Monitoring – Groundwater monitoring, annual engineering inspection, maintenance
**Requirements to be completed**

**Timeline**
- 42 mos.
- 18 mos.
- 8 mos.
- 16 mos.
- 24 mos.
- 6 mos.
- 18 mos.

*Effective October 14, 2015*

**Location Restrictions**
- Uppermost Aquifer Demonstration for placement above uppermost aquifer
- Demonstration for wetlands, fault areas, seismic impact areas and unstable areas

**Design Criteria**
- Documentation of lined/unlined impoundment
- Prepare Fugitive Dust control plan
- Install Permanent Marker
- Compile Construction History
- Initial hazard potential classification assessment, initial structural stability assessment, initial safety factor assessment
- Emergency Action Plan development

**Structural Integrity**
- Prepare initial inflow design flood control system

**Air**
- Prepare Fugitive Dust control plan

**Hydrologic & Hydraulic Capacity**
- Prepare initial inflow design flood control system

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**Existing CCR Surface Impoundments**

**CCR Regulations - Subtitle D Compliance Schedule**
## CCR Regulations – Subtitle D Compliance Schedule

### Existing CCR Surface Impoundments (Cont.)

<table>
<thead>
<tr>
<th>Requirements to be Completed</th>
<th>Timeline*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INSPECTIONS</strong></td>
<td></td>
</tr>
<tr>
<td>• Initiate weekly inspection of the CCR units</td>
<td>6 mos.</td>
</tr>
<tr>
<td>• Initiate CCR unit instrumentation monthly monitoring</td>
<td>6 mos.</td>
</tr>
<tr>
<td>• Complete initial annual inspection of CCR units</td>
<td>9 mos.</td>
</tr>
<tr>
<td><strong>GROUNDWATER MONITORING &amp; CORRECTIVE ACTION</strong></td>
<td>30 mos.</td>
</tr>
<tr>
<td>• Install groundwater monitoring system</td>
<td></td>
</tr>
<tr>
<td>• Develop sampling &amp; analysis plan; implement detection/assessment monitoring</td>
<td></td>
</tr>
<tr>
<td>• Initiate corrective action for statistically significant increases over the groundwater protection standards</td>
<td></td>
</tr>
<tr>
<td><strong>CLOSURE/ POST-CLOSURE</strong></td>
<td></td>
</tr>
<tr>
<td>• Prepare written Closure &amp; Post-Closure plans</td>
<td>18 mos.</td>
</tr>
<tr>
<td><strong>RECORD KEEPING, NOTIFICATION &amp; INTERNET REQUIREMENTS</strong></td>
<td>6 mos.</td>
</tr>
<tr>
<td>• Perform required record-keeping</td>
<td></td>
</tr>
<tr>
<td>• Provide required notifications</td>
<td></td>
</tr>
<tr>
<td>• Establish CCR Website</td>
<td></td>
</tr>
</tbody>
</table>

* Effective October 14, 2015
# CCR Regulations – Subtitle D Compliance Schedule

## Existing CCR Landfills

<table>
<thead>
<tr>
<th>Requirements to be Completed</th>
<th>Timeline*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LOCATION RESTRICTIONS</strong></td>
<td></td>
</tr>
<tr>
<td>• Complete demonstration for unstable area</td>
<td>42 mos.</td>
</tr>
<tr>
<td><strong>AIR</strong></td>
<td></td>
</tr>
<tr>
<td>• Prepare Fugitive Dust control plan</td>
<td>6 mos.</td>
</tr>
<tr>
<td><strong>RUN-ON/ RUN-OFF CONTROLS</strong></td>
<td></td>
</tr>
<tr>
<td>• Prepare initial Run-On/Run-Off control plan</td>
<td>18 mos.</td>
</tr>
<tr>
<td><strong>INSPECTIONS</strong></td>
<td></td>
</tr>
<tr>
<td>• Initiate weekly inspection of the CCR units</td>
<td>6 mos.</td>
</tr>
<tr>
<td>• Complete initial annual inspection of CCR units</td>
<td>9 mos.</td>
</tr>
<tr>
<td><strong>GROUNDWATER MONITORING &amp; CORRECTIVE ACTION</strong></td>
<td></td>
</tr>
<tr>
<td>• Install groundwater monitoring system</td>
<td>30 mos.</td>
</tr>
<tr>
<td>• Develop sampling &amp; analysis plan; implement detection monitoring</td>
<td></td>
</tr>
<tr>
<td>• Initiate corrective action for statistically significant increases over the groundwater protection standards</td>
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* Effective October 14, 2015
**Requirements to be Completed**

<table>
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<tr>
<th>Requirement</th>
<th>Timeline*</th>
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<tbody>
<tr>
<td><strong>Closure/ Post-Closure</strong></td>
<td>18 mos.</td>
</tr>
<tr>
<td>• Prepare written Closure &amp; Post-Closure plans</td>
<td></td>
</tr>
<tr>
<td><strong>Record Keeping, Notification &amp; Internet Requirements</strong></td>
<td>6 mos.</td>
</tr>
<tr>
<td>• Perform required record-keeping</td>
<td></td>
</tr>
<tr>
<td>• Provide required notifications</td>
<td></td>
</tr>
<tr>
<td>• Establish CCR Website</td>
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*Effective October 14, 2015*
The EPA’s CCR rule applies to electric utilities and independent power producers.

The initial rule will not apply to non-utilities burning coal although the agency will consider potential actions after the CCR rule is promulgated.
The May 2000 determination that exempts beneficially reused CCRs from regulation as a hazardous waste under Section 3001(b)(3)(A) of RCRA will not be changed by the EPA. The EPA will continue to allow placement of CCRs in mine and non-minefill applications.
The thrust of the new regulations is to switch from slurry to dry handling of CCR waste. As such, impoundments are to be closed or retrofitted with a composite liner. Most impoundments are anticipated to be closed. With the anticipated closure of the impoundments, the need for landfill disposal capacity will increase. Provided below is a summary of steps for compliance with the CCR regulations, the discussion of which forms the basis for the balance of this presentation:

- Assessment of Existing Disposal Facilities
  - Landfills and Impoundments
    - Landfills
      - Lateral/vertical expansion or new facility
      - Siting Criteria
    - Impoundments & Reservoirs
      - Website database
      - Assessment of existing facilities
      - Retrofit
      - Closure Options
- Groundwater Monitoring Program
- Post-Closure Obligations
Assessment of Existing Disposal Facilities – *Landfills & Impoundments*

- Future plant disposal needs
- Existing composite liner
- Feasibility of impoundment retrofit
- Landfill – feasibility for new construction or expansion
- Geotechnical & environmental integrity of existing facility
- Siting criteria
- Cost analysis
Landfills – New & Expansions

- Capacity to meet future disposal requirements
- Siting Criteria – Engineering, geotechnical, environmental, geological/hydrogeological parameters such as:
  - Wetlands, seismic areas, karst topography, abandoned mines, sole source aquifer, etc.
  - Spatial aspects such as proximity to property lines, Holocene faults, airports, culturally significant sites, etc.
  - Vertical Constraints – Vertical expansion elevation
- Mitigation of non-compliant siting parameters
- Maximizing usage of existing infrastructure
- On-Site natural resources for use in construction
- Constructability
The CCR regulations require a website to be established for public access which provides all information related to the impoundment or reservoir closure; this includes:

- Engineering, Environmental, Geological
- Annual reports
- Inspection reports
- Agency correspondence

As new data is developed it will be posted to the website database.
Impoundments & Reservoirs—
Assessment of Existing Facilities

- Review all available data – Design drawings, inspection reports, agency files, environmental data, speak to long-time employees agency files, etc.
- Dike Conditions (Visual) – erosion, seeps, stressed vegetation
- Geotechnical Field Investigation – If engineering data gaps exist as to dike integrity, perform fieldwork necessary to make sound engineering decisions
- Geologic/Hydrogeologic – Perform field investigation to support development of groundwater monitoring program
Impoundments & Reservoirs – Retrofit Potential

Feasibility:

- Is the impoundment imperative to plant make-up water?
- Is there an alternate, temporary disposal option to facilitate installation of a composite liner with leak detection?
- Adequate for future disposal needs?
- Existing facility geotechnical integrity sufficient for proposed future usage?
- Existing facility groundwater quality concerns; may this effect potential retrofit?
Impoundments & Reservoirs – *Closure Options: Close in Place*

- Closure cap of approximately $1 \times 10^{-5}$ cm/sec permeability (may vary per state)
- Utilize existing dikes and onsite material for closure cap construction
Impoundments & Reservoirs – Closure Options: Landfill Layover

- Partial berm removal for pond closure & landfill construction material
- Leachate collection/Composite Liner system
Reservoirs are subject to the same closure criteria as impoundments; however, they can be far more complex to close due to:

- Construction typically consists of earthen dam in mountainous terrain.
- Significant surface acreage – often exceeding 100 acres
- Complex cap closure design
- Minimal soil material to use in closure capping
What is “Clean Closure?”

- Removal of all waste material, minimizes need for future maintenance, residual constituent concentrations are below levels that may pose a risk to human health & the environment (52 FR 8704, March 19, 1987)
- Confirmation requires extensive testing of soil, bedrock (potentially) & groundwater to determine whether remaining material meets established geochemically acceptable standards for compliance
- Risk analysis/fate & transport modeling may be required
- Corrective measures for those chemical constituents not readily removed to acceptable concentrations
Groundwater Monitoring Program

- Compilation of available data

- Field investigation – subsurface investigation to develop:
  - Cross-sections, aquifer properties, structural aspects, lineament delineation, groundwater flow direction, etc.

- Develop Groundwater Monitoring Program
  - Monitor well locations
  - Detection monitoring
  - Statistical analysis plan
  - Assessment monitoring
  - Assessment of corrective measures
  - Corrective action
Groundwater Monitoring Program – 
*Surface Impoundment*

- Upgradient/Downgradient Monitoring Wells
Groundwater Monitoring Program – *Surface Impoundment*

- Relatively level topography – near river

Note – During river flood stages groundwater flow may reverse
Groundwater Monitoring Program – Reservoir

- Typically located in mountainous terrain

Note:
- Higher topography surrounds reservoir
- Lower elevation below dam structure
Groundwater monitoring, annual engineering inspection reviews, and site maintenance are to be accordance with 40 CFR Part 258 (Subtitle D of RCRA) for 30 years.

A reduced monitoring period may be considered if the owner/operator can demonstrate the site is no longer a potential concern to human health & the environment.
Thank You / Questions?

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