Alabama Power
Environmental Compliance Update

Presented to the
Alabama Public Service Commission
December 11, 2018

Topics to be covered:

- Compliance Requirements
- Environmental Program Implementation
- Compliance Costs
Compliance Requirements

Air Requirements
presented by
Mark Steele

Air Emissions Regulations

Air Quality Standards
• Ozone & PM2.5

Hazardous Air Pollutants
• MATS

Greenhouse Gases
• Clean Power Plan
• Affordable Clean Energy
Clean Air Act • Major law driving federal air regulations • Primary driver for all of our air emission control projects

Air Quality Standards • Ozone, Particulate Matter, Sulfur Dioxide, Nitrogen Dioxide, Carbon Monoxide, and Lead

Ozone • Significant revisions in 1997, 2008, and 2015 • NOx and VOCs form ground-level ozone

SCRs • Installed on 7 largest units • 88% of coal fired capacity

NOx Emissions

Alabama Power NOx Emissions Reductions

PM2.5 • Significant revisions in 1997, 2006, and 2012 • SO2 can form PM2.5 in atmosphere

Scrubbers • Installed on 9 units • 94% of coal fired capacity

SO2 Emissions

Alabama Power SO2 Emissions Reductions
Cross-State Air Pollution Rule (CSAPR)

- Interstate Transport Rules help downwind states attain standards
- NOx Budget Trading Program and Clean Air Interstate Rule preceded CSAPR
- CSAPR compliance requirements began in 2015
- CSAPR Update Rule compliance requirements began in 2017
- CSAPR Update Rule addresses 2008 ozone standard and includes more stringent ozone season NOx emission budgets
- Emissions within allowance allocations with SCRs and Natural Gas

Mercury and Air Toxics Standards (MATS)

- Applies to coal- and oil-fired electric generating units
- Does not apply to natural gas-fired units
- Emission limitations for mercury, filterable particulate matter, and acid gases
- Compliance began on April 16, 2016 for 10 affected coal-fired units
- Compliance Plan
  - Existing electrostatic precipitators, SCRs, and scrubbers
  - Baghouses, additives, natural gas, and retirements
  - All emission controls are operating very effectively
- All systems for monitoring, testing, recordkeeping, and reporting are in place
- Transitioned from 23 coal-fired electric generating units at 6 plants to 10 coal-fired units at 4 plants
MATS Litigation

- MATS rule has been undergoing judicial review
- Central issue is consideration of cost in the promulgation of environmental regulations
- Case has been held in abeyance while EPA reviews cost justification
- Proceedings have potential to clarify EPA policies for future rulemakings, particularly cost considerations and treatment of co-benefits in the development of environmental regulations
- MATS rule remains in effect pending EPA’s review and further action by D.C. Circuit

Greenhouse Gases

- In 2007, Supreme Court ruled EPA has authority under CAA to regulate GHGs
- Since that time, EPA has issued several GHG regulations, many of which have undergone judicial review
- Clean Power Plan (CPP)
  - Finalized in 2015
  - On February 9, 2016, Supreme Court issued stay
  - Requirement for state plans was suspended
  - Stay in effect until litigation is concluded
  - Litigation remains pending before D.C. Circuit
  - On October 16, 2017, EPA proposed to repeal CPP
  - On December 17, 2017, EPA solicited comments on a possible replacement
Greenhouse Gases

- EPA proposed the Affordable Clean Energy (ACE) Rule to replace the Clean Power Plan

Affordable Clean Energy Rule
- Proposed on August 21, 2018
- Would regulate CO2 emissions from existing coal-fired generating units
- States must evaluate units for heat rate improvement technologies
- States must develop an emissions standard for each unit
- States would have 3 years to submit plans after EPA rule is finalized

Compliance Requirements

Land and Water Requirements
presented by
Mike Godfrey
Coal Combustion Residuals (CCR) Rule

- EPA’s final CCR rule was published in the Federal Register on April 17, 2015 and became effective October 19, 2015.
- Remand Rule (July 2018).
- D.C. Circuit Court Opinion (August 2018).

CCR Rule

Coal Combustion Residuals consist of:
- Fly Ash – lighter ash from burning of coal
- Bottom Ash – heavier ash from burning of coal
- Gypsum – material generated as a by-product of scrubber operation (air pollution control device)
- Baghouse Ash – ash generated from another air pollution control device

APC beneficially reuses CCRs in applications such as wallboard and concrete
**CCR Rule**

**Closure Options:**
- Two EPA approved options for closure:
  - Close in place and secure ash with an impermeable clay or geo-membrane cap
  - Close by removal and haul ash to a permitted facility
- Both methods require:
  - De-watering of existing pond
  - Implement groundwater monitoring program for 30 years

**WIIN Act**
- Amended the CCR rule to allow states to develop CCR permitting programs with EPA approval.
- ADEM’s state CCR rule was approved on April 20, 2018 and became effective on June 8, 2018.
- ADEM submitted the state program to the EPA for review.
- Permit applications for CCR facilities have been provided to ADEM.
Remand Rule

- Rulemakings in response to Petitioners and WIIN Act amendments.
- EPA intends to conduct two phases of rule revisions. On July 18, 2018, EPA announced the finalization of what is referred to as “Phase 1, Part 1” of the proposed amendments to the CCR rule. The rule was effective August 29, 2018.
- This rulemaking finalizes portions of the March 2018 proposed Phase 1, Part 1 Amendments and advances the following EPA objectives:
  - Harmonizing CCR and ELG implementation timelines;
  - Facilitating development of EPA-approved state CCR permit programs; and
  - Clarifying requirements for upcoming CCR milestones that could trigger CCR impoundment closures and remediation.

Phase 1, Part 1 Amendments

- Conditional extension of “Cease Receipt” deadlines.

- Alternative groundwater protection standards.

- State Directors can issue certifications in lieu of Professional Engineers.

- State Directors can suspend groundwater monitoring requirements under appropriate circumstances.
Phase 2 Outlook

- Phase One, Part Two
  (Pending; Final no later than June 2019)
- Adding Boron to Appendix IV
- Vegetation height on slopes
- Alternative closure provision for non-CCR wastewaters
- Risk-based corrective action
- CCR beneficial use

CCR Rule Implementation Timeframe

<table>
<thead>
<tr>
<th>Required Notices and Progress Reports</th>
<th>Inspections</th>
<th>Structural Integrity</th>
<th>Location Restrictions</th>
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<tbody>
<tr>
<td></td>
<td>Oct. 17, 2018 42 Months</td>
<td></td>
<td>Oct. 17, 2018</td>
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</tbody>
</table>

- Air Criteria
- Design Criteria
- Hydrologic and Hydraulic Capacity
- Groundwater Monitoring and Corrective Action
- Inspections - Landfills and Ponds
- Structural Integrity
- Closure and Post-Closure Care
- Stormwater Control
- Inspections - Instrumentation
- Recordkeeping, Notification, and Internet Requirements
CCR Groundwater Timeline

January 15, 2018
Identify SIs in Detection Monitoring - Triggered Assessment Monitoring

4/15/18 – 7/14/18
ASD/Confirmation Sampling

7/14/18 – 10/15/18
Establish GWPS and Compare

10/15/18 – 1/13/19
Delineation and/or ASD

1/13/19 – 4/13/19
Assessment of Corrective Measures

4/13/19 – 6/12/19
60 Day ACM Extension

October 15, 2018
Identify any Statistical Exceedances of GWPS/Closure Trigger

April 15, 2019
Deadline to Commence Closure

January 15, 2018
Identify SIIs in Detection Monitoring - Triggered Assessment Monitoring

Administrative Orders

- Based on unpermitted discharges to groundwater
- ADEM issued proposed orders on March 2, 2018
- Orders finalized August 15, 2018
- Responsive actions are underway
CCR Rule

Recent Internet Postings:
- Annual Fugitive Dust Control Report
- Report of Annual Inspection 2018
- Assessment Monitoring Program Notification
- Location Restrictions Demonstration
- Gadsden Reports

Effluent Limitation Guidelines (ELG)
- The final ELG rule was signed on September 30, 2015.
- Published in the Federal Register on November 3, 2015.
- Effective date: January 4, 2016.
Effluent Limitation Guidelines

- The Clean Water Act (CWA 1972) provides that EPA regularly review each industry category to see what technology can be applied economically toward the goal of eliminating the water discharge of pollutants.

- Many changes have occurred, in particular the addition of air pollution control systems such as limestone scrubbers.

Steam Electric Categories

- Once Through Cooling Water
- Cooling Tower Blowdown
- Coal Pile Runoff
- Bottom Ash Transport Water
- Fly Ash Transport Water
- Metal Cleaning Wastes (chemical and non-chemical)
- Low Volume Wastewater Sources
- Scrubber Wastewater
- Flue Gas Mercury Control Wastewater
Applicability

- Rule applies to discharges from existing coal-fired, gas-fired, and oil-fired generating units, as well as from combined cycle generating units (both combustion turbine and steam turbine portions).

New Best Available Technology (BAT) and Limits

<table>
<thead>
<tr>
<th>Wastewater</th>
<th>BAT Technology</th>
<th>BAT Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fly Ash Transport Water</td>
<td>Dry handling</td>
<td>*No discharge</td>
</tr>
<tr>
<td>Bottom Ash Transport Water</td>
<td>Dry handling or closed loop</td>
<td>*No discharge</td>
</tr>
<tr>
<td>Flue Gas Mercury Control Wastewater</td>
<td>Dry handling</td>
<td>No discharge</td>
</tr>
<tr>
<td>Scrubber Wastewater</td>
<td>Chemical precipitation plus biological treatment</td>
<td>Total Suspended Solids (TSS), Oil &amp; Grease (O&amp;G) pH, Arsenic (As), Mercury (Hg), Selenium (Se) and nitrate/nitrite as N</td>
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</tbody>
</table>

* Exception: Fly ash and bottom ash transport water can be used in the FGD scrubber and discharged after meeting the FGD wastewater limits.
Scrubber Wastewater BAT Limits

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Final Daily Max Limit</th>
<th>Final Monthly Average</th>
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<td>As</td>
<td>ppb</td>
<td>11</td>
<td>8</td>
</tr>
<tr>
<td>Hg</td>
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<td>Se</td>
<td>ppb</td>
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<tr>
<td>NO3-NO2</td>
<td>ppm</td>
<td>17.0</td>
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ELG Compliance Timing

- New limits do not apply until a date determined by ADEM that is no earlier than November 1, 2018 and no later than December 31, 2023.
- In setting the date, ADEM will consider:
  - Time to plan, design, procure, permit and install equipment;
  - Changes being made or planned at the plant in response to various air regulations as well as the CCR rule;
  - For scrubber wastewater requirements, an initial commissioning period for optimization of the treatment system; and
  - Other factors as appropriate.
ELG Compliance Timing

- EPA finalized a rule in September 2017, postponing Bottom Ash Transport Water (BATW) and FGD Wastewater compliance dates of the ELG Rule to November 1, 2020, and no later than December 31, 2023.
  - EPA will reconsider the best available technology economically achievable ("BAT") effluent limitations in the 2015 rule.

- The effluent limitations for the other wastewater streams identified in the 2015 rule will remain unchanged with an effective compliance date of November 1, 2018, and no later than December 31, 2023.

ELG Later Applicability Date Request

- Alabama Power is in the process of submitting later applicability date justification letters for its coal-fired plants.

- All four plants will request the latest applicability date of December 2023 for BATW and FGDWW.
Water Permits

- Low Volume Wastewater (LVW) Sources have been redefined and expanded with certain existing categories.
- Some LVW sources now have separate permit limitations.
- We anticipate new stringent limits in National Pollutant Discharge Elimination System (NPDES) permits upon renewal.
- New ELG limits will require additional water treatment systems and associated costs.

Interaction of MATS, CCR, and ELG Rules

- MATS controls can impact current wastewater permit limitations.
- APC is monitoring changes with an ongoing ADEM approved study plan.
- The combined effect of CCR and ELG rules precludes the future use of our existing ash ponds.
- Entirely new water treatment systems will be required.
- Dry ash handling systems are being installed.
- Water must cease going to pond before closure can begin.
Coosa River Project License

- On September 7, 2018, the D.C. Circuit officially vacated the Coosa River Project license.
- On September 10, 2018, FERC issued notice reinstating annual licenses issued in 2007, which means APC operates the projects under the previous licenses for the projects.
- The FERC notice also returned APC’s 2005 license application to pending status.
- On October 30, 2018 FERC issued a Scoping Document for the Coosa River projects as well as a Notice of Intent to prepare an Environmental Impact Statement (EIS) and soliciting comments on the scoping document. Comments were due November 27, 2018.
- There are no operational changes taking place at any of these 7 dams on the Coosa River – generation is normal, lake levels are normal, and customers have not been affected in any way.
- APC will continue to operate under the previous licenses until the process of securing a new license is complete.

Environmental Compliance Strategy

- We will continue to follow environmental regulatory developments.
- We will continue to evaluate potential compliance options, with the goal being to identify strategies that maintain system reliability and minimize costs to customers.
- We will continue to maintain flexibility to make other incremental compliance decisions as regulations evolve.
- We will continue to keep the Commission apprised of significant developments.
Environmental Program Implementation

Presented by Edward Healy

- Air compliance technologies and selected projects
- Dry ash handling technologies and selected projects
- CCR water management technologies and selected water re-route projects
- Ash pond closure projects
- ELG technologies and selected projects
- Summary
Summary of Air Compliance Technologies and Selected Projects

Emission Controls Installed in Alabama Power’s Fleet

Legend
- ESP - Electrostatic Precipitator
- LNB - Low NOx Burner
- SCR - Selective Catalytic Reduction
- SNCR - Selective Non-Catalytic Reduction
- FGD - Flue Gas Desulfurization (Scrubber)
MATS Technologies Operating in Alabama Power’s Fleet

- **Plant Gadsden**
  - Unit 10: SCR
  - Units 8-10: FGD
  - Units 6-7: Retired

- **Plant Gaston**
  - Units 1-4: NG
  - Unit 5: SCR/FGD/BH/ACI

- **Plant Miller**
  - Units 1-4: SCR/FGD
  - Units 1-4: Halogen/MRCS

- **Plant Greene County**
  - Units 1&2: NG

- **Plant Barry**
  - Units 1&2: NG
  - Unit 3: Retired
  - Unit 4: ACI/DSI
  - Unit 5: SCR/FGD/Halogen/MRCS

Legend:
- SCR – Selective Catalytic Reduction
- FGD - Flue Gas Desulfurization (Scrubber)
- ACI – Activated Carbon Injection
- BH – Baghouse (Fabric Filter)
- DSI – Dry Sorbent Injection
- Halogen – Halogen Addition
- MRCS – Mercury Re-emission Control System
- NG – Natural Gas

Barry Precipitator Projects

- **Unit 47**
- **Unit 5**
Barry Unit 5 Precipitator Project

Scope of Work

- Work to be performed on the A and B precipitator casings
- Installation underway, with targeted completion by December 2018
- Scope includes:
  - Replacement of the internals
  - Upgrading of electric solenoid rapping system
  - Upgrading to high frequency power supplies
Barry Unit 5 Precipitator Project
Construction Plan

Transverse Elevation View

High Frequency Power Supplies

New Internals

Barry Unit 5 Precipitator Project – Status Photos

Work Area

“D”

“B”
Barry Unit 5 Precipitator Project – Status Photos

Barry Unit 4 Precipitator Project
Scope of Work

- Work to be performed on the A and B precipitator casings
- Installation planned for the fall 2019 scheduled outage
- Scope includes:
  - Replacement of the internals
  - Upgrading of mechanical rapping system to electric solenoid
  - Will retain existing high voltage support system
Barry Unit 4 Precipitator Project

Barry Unit 4 "A" Precipitator
Barry Unit 4 "B" Precipitator

Dry Ash Handling Technologies and Selected Projects
Ash Pond is a COLLECTION BASIN, RESERVOIR, and TREATMENT PROCESS.
**CCR/ELG Technology Requirements**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Barry</th>
<th>Gadsden</th>
<th>E.C. Gaston</th>
<th>Gorgas</th>
<th>Greene Co.</th>
<th>Miller</th>
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<td>Dry Bottom Ash Conversion</td>
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<td>CCR Wastewater Management Projects</td>
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<td>Pond Closure</td>
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**Dry Fly Ash Handling Diagram**
Plant Barry – Dry Fly Ash Handling

OxBlue Construction Video of Loadout Silo Area

Dry Bottom Ash Handling

Pneumatic Ash Extractor (PAX)
(Total dry handling)

Remote Submerged Chain Conveyor (RSCC)
(Closed loop, wet bottom)
**Pneumatic Ash Extractor (PAX) System**

**Total Dry Bottom Ash System**

**System Components:**
- A dry hopper where the ash is collected, crushed and fed to the vacuum system
- A vacuum system for dry ash removal and conveying
- A storage bin and unloading equipment for final disposal

*Courtesy: United Conveyor Corp*

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**Plant Miller PAX Bottom Ash System**

**New Dry Hoppers with Dedicated Clinker Grinder**

*Courtesy: United Conveyor Corp*
Remote Submerged Chain Conveyor
Closed Loop, Wet Bottom Ash System

- Located remote from boiler area
- Usually can keep existing sluice system as-is
- Minimal outage time for installation
- Dewater ash to 15%-25% moisture
- Clarifies transport water

Chain travel in submerged section

Drive Unit
Dewater Incline
Bulk Storage Zone
Particulate Settling Zone
Water flow
Transport Piping
Chain Tensioner

Courtesy: Allen Sherman Hoff
Gaston – Remote Submerged Chain Conveyor
Closed Loop, Wet Bottom Ash System

Barry – Remote Submerged Chain Conveyor
Closed Loop, Wet Bottom Ash System
Plant Barry – Dry Bottom Ash Handling
OxBlue Construction Video of Remote Submerged Chain Conveyor Area

Closed Loop Water Circuit
Closed Loop, Wet Bottom Ash System

Dewatering Bins
Sludge Pumps
Settling Tank
Recycle Pumps

Courtesy: Allen-Sherman-Hoff
Barry - Closed Loop Water Circuit
Closed Loop, Wet Bottom Ash System

Conical Bottom Settling Tanks

Barry - Closed Loop Water Circuit
Closed Loop, Wet Bottom Ash System

Conical Bottom Settling Tanks
CCR Water Management Technologies and Selected Projects

Current Ash Pond Utilization

CCR Land
- Fly Ash - Dry
- Bottom Ash - Dry
- or Close Loop

Focus Area
For Pond Closure

Various Low Volume Waste Water Streams

CCR Water

Ash Pond

Regulated Discharge

Recycle Water

Ash Pond is a COLLECTION BASIN, RESERVOIR, and TREATMENT PROCESS
Ready to Initiate Ash Pond Closure

Water Management Concept Development

1. Identify all waste streams entering ash pond
2. Characterize waste streams
3. Evaluate existing discharges
4. Evaluate existing treatment processes
5. Assign streams to existing treatment and discharges
6. Add treatment and discharge if necessary
Water Stream Relocations

Low Volume Waste Water Treatment

Combined Water Treatment Pond
(aka Low Volume Waste Water Pond)

Ballasted Clarifier

Courtesy: Evoqua Water Technologies
Greene Co – Combined Water Treatment Pond

Gaston – Combined Water Treatment Pond
Miller – Low Volume Water Treatment Plant
Miller – Low Volume Water Treatment Plant
OxBlue Construction Video of Low Volume Water Treatment Plant Area

Ash Pond Closure Projects
Ash Pond Closure Steps

- Removal of Water
- Excavate and Reduce
- Additional Protection
- Permanent Closure & Ongoing Monitoring

Plant Gadsden Ash Pond Closure
Plant Barry Ash Pond

Plant Barry Ash Pond Closure Design
ELG Technologies and Selected Projects

Woodchip Treatment System
Pilot Biological Treatment

- Evaluated biological reactors with integrated ultrafilter for selenium and mercury removal – 2017 (Miller)
- Evaluated two different advanced membrane processes for FGD wastewater treatment – 2018 (Barry)
- Evaluated biological reactors with simplified physical/chemical treatment for FGD wastewater treatment- 2018 (Gaston)
- Build process flow/rainwater statistical model of FGD system to aid in design for various rainwater and capacity factor scenarios - 2019 (Barry)
Miller – Planned FGD Waste Water Treatment
Physical/Chemical Treatment

Miller – Planned FGD Waste Water Treatment
Biological Treatment System
Miller – Planned FGD Waste Water Treatment

Construction Progress

In Summary
Environmental Program Implementation

- Air compliance technologies and selected projects
- Dry ash handling technologies and selected projects
- CCR water management technologies and selected water re-route projects
- Ash pond closure projects
- ELG technologies and selected projects

Compliance Costs

Presented by Wendy Hoomes
2018 status
  - Plant in service
  - Operation & maintenance (O&M)

Estimated capital expenditures (2019-23)

Estimated closure costs for CCR Rule (2019-23)

Estimated plant to be placed in service (2019)

Estimated O&M expenses (2019-23)
Environmental Compliance Plan
2018 Operation & Maintenance Expenses (Millions of Dollars)

- Updated 2018: $135
- Estimated 2018: $144

Environmental Compliance Plan
Estimated 2019 – 2023 Capital Expenditures (Millions of Dollars)

- Total 2019: $273
- Total 2020: $104
- Total 2021: $198
- Total 2022: $189
- Total 2023: $138

Legend:
- Air
- Land
- Water
Environmental Compliance Plan
Estimated 2019 – 2023 Closure Costs for CCR Rule (Millions of Dollars)

Environmental Compliance Plan
2019 Estimated Plant to be Placed in Service (Millions of Dollars)
To date, Alabama Power has invested over $5.1 billion in environmental controls to maintain reliable electric service for its customers.

- Additional capital investment is required for CCR and ELG compliance.
- Prospect for future environmental regulations remains.
- Company will continue to employ a disciplined approach to decision making.
Governmental Mandates

• Rate CNP-C will operate in 2019
  • 3.8% adjustment
  • Additional revenue requirement of approximately $205 million

• Governmental Mandate Adjustment Drivers
  • Coal Combustion Residual (CCR) Projects
    o Dry Bottom Ash
    o Dry Fly Ash
    o Waste Water Management
  • Effluent Limitation Guidelines (ELG) Projects
    o ELG Waste Water Management/ELG Scrubber Return Water
    o Biological Treatment System