Demystifying the Engineering, Procurement, and Construction of a CCR Dewatering Facility

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Implementation Dates for Key Environmental Drivers

**Business Sensitive**

**CSAPR Replacement Rule**

1. **Ozone**
   - 2012
   - 2018
   - 2019
   - 2020
   - 2021
   - 2022
   - 2023
   - 2024
   - 2025

2. **GHG Emission Penalty**
   - Final GHG NSPS Rule New Sources

3. **Compliance with new effluent guidelines**
   - NOx control for 75 ppb Ozone NAAQS CAIR and CSAPR
   - NOx control required for 2015 NAAQS and SO2 Caps begin for CSAPR Replacement Rule II
   - Utility MATS with 1-year extension (control installation)
   - Compliance with CO2 permitting guidance for existing and modified sources

4. **Proposed CO2 Emission Guidance for existing and modified sources**
   - More stringent MATS Particulate Limit
   - Compliance with 316(b) (Cooling water intakes)
   - Final CO2 Emission Guidance for existing and modified sources

5. **State GHG plans submitted**
   - Threatened and Endangered Species Determinations
   - PCB equipment phase-out complete

6. **Final GHG NSPS Rule New Sources**
   - Proposed GHG NSPS Rule New Units
   - SO2 limits implemented for 2012 PM2.5 NAAQS
   - SO2 control installation required for 2018 PM2.5 NAAQS
   - Final CO2 Emission Guidance for existing and modified sources

7. **Proposed CO2 Emission Guidance for existing and modified sources**
   - State GHG plans submitted
   - Threatened and Endangered Species Determinations
   - Utility MATS with 1-year extension (control installation)

8. **Utility MATS (Hazardous Air Pollutant) Rule**
   - Final GHG NSPS Rule New Sources
   - 316(a) thermal limits at Cumberland
   - CT/CC NSPS
   - Burning boiler chemical waste in boilers prohibited

9. **Final GHG NSPS Rule New Sources**
   - State GHG plans submitted
   - Threatened and Endangered Species Determinations
   - Utility MATS with 1-year extension (control installation)

10. **Proposed CO2 Emission Guidance for existing and modified sources**
    - State GHG plans submitted
    - Threatened and Endangered Species Determinations
    - Utility MATS with 1-year extension (control installation)

11. **Proposed CO2 Emission Guidance for existing and modified sources**
    - State GHG plans submitted
    - Threatened and Endangered Species Determinations
    - Utility MATS with 1-year extension (control installation)

12. **Utility MATS (Hazardous Air Pollutant) Rule**
    - Final GHG NSPS Rule New Sources
    - 316(a) thermal limits at Cumberland
    - CT/CC NSPS
    - Burning boiler chemical waste in boilers prohibited

13. **Final GHG NSPS Rule New Sources**
    - State GHG plans submitted
    - Threatened and Endangered Species Determinations
    - Utility MATS with 1-year extension (control installation)

14. **Proposed CO2 Emission Guidance for existing and modified sources**
    - State GHG plans submitted
    - Threatened and Endangered Species Determinations
    - Utility MATS with 1-year extension (control installation)

15. **Proposed CO2 Emission Guidance for existing and modified sources**
    - State GHG plans submitted
    - Threatened and Endangered Species Determinations
    - Utility MATS with 1-year extension (control installation)

16. **Utility MATS (Hazardous Air Pollutant) Rule**
    - Final GHG NSPS Rule New Sources
    - 316(a) thermal limits at Cumberland
    - CT/CC NSPS
    - Burning boiler chemical waste in boilers prohibited

17. **Final GHG NSPS Rule New Sources**
    - State GHG plans submitted
    - Threatened and Endangered Species Determinations
    - Utility MATS with 1-year extension (control installation)

18. **Proposed CO2 Emission Guidance for existing and modified sources**
    - State GHG plans submitted
    - Threatened and Endangered Species Determinations
    - Utility MATS with 1-year extension (control installation)

19. **Proposed CO2 Emission Guidance for existing and modified sources**
    - State GHG plans submitted
    - Threatened and Endangered Species Determinations
    - Utility MATS with 1-year extension (control installation)

20. **Utility MATS (Hazardous Air Pollutant) Rule**
    - Final GHG NSPS Rule New Sources
    - 316(a) thermal limits at Cumberland
    - CT/CC NSPS
    - Burning boiler chemical waste in boilers prohibited

21. **Final GHG NSPS Rule New Sources**
    - State GHG plans submitted
    - Threatened and Endangered Species Determinations
    - Utility MATS with 1-year extension (control installation)

22. **Proposed CO2 Emission Guidance for existing and modified sources**
    - State GHG plans submitted
    - Threatened and Endangered Species Determinations
    - Utility MATS with 1-year extension (control installation)

23. **Proposed CO2 Emission Guidance for existing and modified sources**
    - State GHG plans submitted
    - Threatened and Endangered Species Determinations
    - Utility MATS with 1-year extension (control installation)

24. **Utility MATS (Hazardous Air Pollutant) Rule**
    - Final GHG NSPS Rule New Sources
    - 316(a) thermal limits at Cumberland
    - CT/CC NSPS
    - Burning boiler chemical waste in boilers prohibited

25. **Final GHG NSPS Rule New Sources**
    - State GHG plans submitted
    - Threatened and Endangered Species Determinations
    - Utility MATS with 1-year extension (control installation)

26. **Proposed CO2 Emission Guidance for existing and modified sources**
    - State GHG plans submitted
    - Threatened and Endangered Species Determinations
    - Utility MATS with 1-year extension (control installation)

27. **Proposed CO2 Emission Guidance for existing and modified sources**
    - State GHG plans submitted
    - Threatened and Endangered Species Determinations
    - Utility MATS with 1-year extension (control installation)

Legend:

1. Timing varies by State Implementation Plan (SIP) approval dates.
2. EPA will revise CSAPR Replacement in conjunction with each future NAAQS reduction (i.e., CSAPR II, III, etc.).
3. On a site-specific basis, up to 2, 1-year extensions from the closure date may be granted.
4. EPA is under settlement agreement to promulgate guidance for existing and modified sources (Deadlines set by Presidential Memorandum to EPA).
5. USFWS determinations on 251 species.

Business Sensitive
Commitments

- TVA has a commitment to close all wet ponds containing Coal Combustion Residue (CCR). This commitment requires a conversion from wet sluicing to a dry disposal process.

- The main driver for TVA’s ash handling conversion program is the stability of our wet impoundments (gypsum & ash ponds). These projects are critical components to the effort to improve the safe operation and stability of CCR facilities.

- The dewatering of bottom ash & gypsum allows for the implementation of a more stable operational practice for stacking and handling.

- Conversion to dry handling for fly ash is more practical in existing facilities.

- Project baselines revisited to align with the environmental outlook document.
To meet the commitment to convert all wet CCP operations to dry operations, TVA established this 5-step strategy.
Wet to Dry Conversion Process

DFA Conversion
- Completed Kingston
- Completed Bull Run

Gypsum Dewatering
- Gypsum Dewatering KIF

Bottom Ash & Gypsum Dewatering
- Construction Complete at Bull Run
- Currently in commissioning phase
Engineering, Procurement and Construction (EPC) contracts are a common type of contracting agreement within the construction industry.

Under an EPC contract, the contractor designs the installation, procures the necessary materials and builds the project, either directly or by subcontracting part of the work.

In some cases, the contractor carries the project risk for schedule as well as budget in return for a fixed price, depending on the agreed scope of work. In such cases, the EPC contractor is weighted with many cost risk and control factors such as liquidated damages associate with delay, performance, and defects liability while the Owner faces less risk.
The turnkey EPC model, by definition, tends to go a step further than Design and Build. The owner specifies what he wants by way of the completed project, leaves the contractor to design and build the entire project, commission it and hand over the key to the owner to commence commercial operations.

Owners must be aware that an EPC approach is better utilized when a substantial amount of up-front engineering work has been performed. Preliminary engineering is required to clearly define the contractor’s scope of work.

The intention here is that an owner’s involvement during delivery of the project is minimal, project risk is shifted almost entirely onto the contractor.

A turnkey EPC contract should be the informed choice for an owner who wants price certainty, schedule certainty and limited interaction with the contractor while the project is being designed and built.
Key Benefits
Is EPC the right contract strategy?

Cost Certainty for Budget Planning
If utilized with an appropriate contracting strategy and a good understanding of the project’s scope, cost and critical path, EPC contracts are an effective and contractually certain means of successfully delivering projects.

Overhead Transference
Utilizing EPC contractors to supply major projects allows owners to successfully implement large capital improvements without significantly increasing their employee headcount.

Risk Mitigation
In an EPC contract, many of the logistical risks associated with projects are transferred to the contractor in the standard course of business.

Major Risks – Typically identified in a risk register, can be transferred as well but typically involve financial penalties/rewards for management and/or mitigation.
If not utilized with an appropriate contracting strategy and a good understanding of the project’s scope, cost and critical path, EPC contracts can be the source of significant commercial dispute.

Owners often assume that they have absolved themselves of most risks via an EPC lump sum strategy. Yet contractors make mistakes, they bid too low and they underestimate what is required by a contract and the circumstances in which it is to be completed.

Experience has shown that transferring all of the risk in a project to a contractor often drives the wrong types of behaviors and can lead to distressed project with poor performance and poor outcomes including:

- insufficient quality,
- cost and schedule overruns,
- claims pending or other legal action
- contractors facing insolvency.
• Even in an EPC context, an owner must accept the fact that he has certain risks that he himself must manage, and manage them to the best of his ability or appoint others to do so for him.

• A poorly defined scope for a large project will have consequences that affect all categories of risk. If unforeseen scope items or existing plant conditions are discovered after contract signing, the cost of the additional work is difficult to control, and achieving the scheduled startup date may become a problem. Consequently, the contractor may be forced to take shortcuts in their design, procurement and construction processes in order to meet the schedule, which will likely have consequences on quality and cost. Perhaps the most important consequence of a poorly defined scope is the risk premium the contractor assumes due to scope uncertainty.
Planning Stages

Scoping
- Identification of CCR Process Streams for Dewatering
- Environmental Regulations, Constraints, Permits & Outlook Documents
- Owner constraints, internal processes & procedures
- Developing Project Scope of Work
- Resource Identifications, Contracting Review

Division of Work – Contract Strategy
- Development of Performance Based Specification for EPC Contract
- Balance of Plant (BOP) Division of Work (DOW) and Contract Specifications
- Team Process Used
- Lessons Learned
01 Sluiced bottom ash will be directed to a new dewatering facility that will produce dry bottom ash suitable for transport and storage in landfill.

02 BOP Scope
Installation of modifications required to route existing sluiced bottom ash to a dewatering facility (provided by EPC Contractor) and maintain provisions for regulatory changes in effluent guidelines.

03 EPC Scope
Bottom ash slurry will dewater in a submerged flight conveyor and discharge to a clarifier where entrained fines will further be removed. The clean effluent waters recovered in the bottom ash dewatering process will be collected in a surge tank and recirculated to provide the bottom ash sluice water for the powerhouse or discharged.
04 Sluiced gypsum slurry will be directed to a new dewatering facility that will produce disposal-grade gypsum.

05 EPC Scope
Gypsum will sluice to hydroclones and discharge into a thickener to become settled solids. Polymer will be added to thicken & settle fine particles. The gypsum process equipment waste streams will be routed to horizontal belt filters for dewatering into a solid cake. The dewatering facility will be designed and constructed to meet the requirements stipulated in the BRF Bottom Ash and Gypsum dewatering facility specification(s).
Our Project
Bull Run Bottom Ash & Gypsum Dewatering Site
5/16/13
Bull Run Bottom Ash & Gypsum Dewatering Site
9/16/13
Site Progress
10/2013

Bottom Ash Thickener Tanks A & B
Gypsum Stack-Out Conveyors / Bents # 1, #2, & # 3
Hydrazine A & B
HBF – Horizontal Belt Filters A & B
BA Dewatering SFC’s & Storage Bunkers
VFD Building
BA Dewatering Sump
BA Recirculation Tank
Gypsum Thickener Tanks A & B
Gypsum Dewatering Building

BA Bunker Wall Formwork Ops.
SFC’s Conveyor Erection Ops. (2-B & 2-A)
Foundation Reinforcement Ops. – BA Dewatering Tank (7-B)
Support Steel Erection – Hydrazine (6-D)
Bull Run Bottom Ash & Gypsum Dewatering Site
11/4/13
Submerged Flight Conveyor (SFC)
1/21/14
Project Status
2/24/14
Submerged Flight Conveyors (SFC)
Submerged Flight Conveyors (SFC)
Submerged Flight Conveyors (SFC)
Submerged Flight Conveyors (SFC)
Gypsum Conveyor, Clarifiers + Recirculation Tank
Recirc + Gypsum Effluent Pumps
Ash Collection Tanks
Bottom Ash Pipe Trench to SFCs
Bottom Ash Pipe Trench to SFCs
First Gypsum Pile
Beauty is in the eye of the beholder
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Thank you
Please contact us for more information

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