Advanced and Hybrid Closures of CCR Impoundments: Methods for Faster and Less Expensive Alternatives to Standard Clean Close and Cap in Place

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ABSTRACT

The CCR rule has provided guidance for two closure options which include clean closure or removal of all CCR or a cap–in-place approach which leaves the material in place if specific criteria are met. Great Lakes Environmental & Infrastructure (Great Lakes E&I) has been working with several clients and technical groups to provide the technical approach and different dewatering applications on the final placement.

Great Lakes E&I has a wide arsenal of very specific skill sets that allow for an advanced clean closure, up to two times faster than standard dig and haul proposals and to provide a hybrid closure which effectively clean closes a large section of the impoundment and places the removed dewatered CCR onto a stabilized platform of the remaining CCR impoundment. Both the “Advanced Closure” and “Hybrid Approach” will meet or exceed the CCR rules requirement and due to our vast capacity to move and dewater materials, Great Lakes E&I can significantly decrease closure time (advanced closure) and complete closure with significant cost reductions.

The benefits are significant to the utility and to the local residents as most or all CCR materials will not leave the site for final disposition. This competitive effective approach(s) reduces risk to the populace from environmental impacts of dusting, spills and accidents by truck or rail. This approach also provides significant protection against public relations concerns and litigation due to environment impact outside of the utility property.

Hybrid and Advanced CCR Pond closure (consolidated approach) is a very favorable approach to large CCR pond closures as some limited companies such as GL E&I possess the complete turnkey skillsets required to perform these specialized applications and sequenced steps for closure. This method significantly faster than a dig and haul proposition and will save significant money for the utility and rate payers.
The typical project should be one that contains large surface area, a dewatered or shallow target area and enough water volume to support hydraulic dredging operations. The size, depth and CCR volume will dictate GL E&I’s selection of dredging and dewatering equipment to meet the desired result.

The designed dry storage area will selected to match the volume of removed and dewatered ash and placed in the dry storage area and should also be large enough continue to accept CCR from continued plant operations if so desired.

The storage area will be dammed off utilizing several available applications which one will be approved by the design engineers. The dam will be installed to cordon off the storage area from the reaming pond. Once the dam is installed, the residual water is remove and treated to return to existing water way or remaining pond. The base CCR will be stabilized by trenching, well points or ISS if needed and prepped for continued dry ash placement.

Finally, a slurry wall would be installed around the site to insure that no leachate could egress or ingress the new dry storage area and also installed around the remaining clean pond to further mitigate any risk.

The typical sequence GL E&I would take for each project follow the protocol and methodology as outlined:

1. Site evaluation
2. Create dam structure or barrier for stabilized platform
3. Dewatering of placement/stabilized storage area, several methods
   a. In Situ Solidification (ISS) - deep and shallow
   b. Berm stability
   c. Effluent Limitation Guidelines (ELG) requirements
4. Site preparation for CCR deposition/storage area
5. Dredging
6. Dry placement and continued use
7. Slurry and Permeable Reactive Barrier (PRB) walls
COAL COMBUSTION RESIDUAL (CCR) HYBRID CLOSURE & ACCELERATED CLOSURES

SOLUTIONS

TYPICAL WET IMPOUNDMENT CLOSURES USED TO MEET CCR REGULATORY PROTOCOLS

"Clean Close" or "Cap in Place"

ACCELERATED CLOSURE is a HYBRID APPROACH of "Clean Close" & partial "Cap in Place"

GREAT LAKES E&I

GREAT LAKES RIVERS & LAKES EXPERIENCE and EXPERTISE

BENEFITS...

• Significantly reduces closure time
• Significantly decreases cost structure
• Mitigates risks of off-site transportation
• Favorable for use on large volume sites where larger capacity equipment can rapidly evacuate CCR

EACH IMPOUNDMENT IS UNIQUE.

Site evaluation

Create dam structure or barrier for stabilized platform

Dewatering of placement/stabilized storage area - several methods

Site preparation for CCR deposition/storage area

- In Situ Solidification (ISS) - deep and shallow
- Berm stability
- Effluent Limitation Guidelines (ELG) requirements

Dredging

Dry placement continued use

Slurry and Permeable Reactive Barrier (PRB) walls

Map site and retrieve samples for analysis:

• particle size analysis
• pH-pore water
• halide and chemical analysis
• moisture content, optimum moisture

Standard construction review for site topography, distance of material movement, disposal/storage area

SITE & SAMPLE EVALUATION

• Cofferdam
• Sheetpile
• Earthen Dams
• Dewatering Tubes

CREATE PLATFORM STRUCTURE

Floating roads - geosynthetic material and bottom ash

• pore pressure transducers
• vane shear testing

Rim ditching, well points and wick drains

Dewatering tubes

DEWATERING

Base stabilization: ISS

• deep soil stabilization: auger
• shallow stabilization: bucket
• berm stabilization: ISS deep/columns

ELG water control structures

SITE PREP FOR CCR STORAGE AREA

Pre-dredge surveys

Dredging (Hydraulic/Mechanical)

Dewatering/stabilization, application and performance analysis, Quality Control/Quality Assurance

Final survey to determine dredging efficacy

DREDGING

SEQUENCING STEPS

SLURRY & PERMEABLE REACTIVE BARRIER (PRB) WALLS

• Final advanced-technique closure preventing the leaching of Constituents of Concern
• Ensures the CCRs cannot contaminate water or soil

DRY PLACEMENT CONTINUED USE

Prepared Cells for Placement Finished Capped Cell

PRE-DREDGE SURVEY

SITE VISIT TO DETERMINE OR PERFORM:

• Topographical features
• Confined disposal area
• Staging/support area
• Dewatering areas to develop
detailed project planning documents
• CCR samples for characterization
• Bathymetric survey
• Ash depth/thickness
• Hydrographic survey
• Vibracoring
• Sub-bottom profile

Specialized equipment receives initial flow directly from dredge removing oversized debris
The remaining slurry pumped to hydro-cyclone/shaker units for sand fraction removal
Solids remaining in hydro-cyclone overflow and screen underflow flow through tilted plate baffle section of V-Tank
Remaining solids settle and conveyed to pump suction of recycle pumps and through additional sets of hydro-cyclone/shaker units for additional removal of solids

DEWATERING/STABILIZATION APPLICATION/PERFORMANCE ANALYSIS & DE-SANDING

AUTOMATED FILTER PRESS & ITS ADVANTAGES

• Fully Automated
• Skid mounted for portability
• Capable of 60 tons per cycle per unit

CLARIFIER

• Effluent overflow from de-sanding is treated with polymer and pumped to Clarifiers where remaining solids are removed to produce high-density underflow
• Overflow from clarifier is sent back to pond and high-density underflow is sent to Confined Disposal Area, Filter Press, or Horizontal Vacuum Belt Filter

Our goal is to exceed EPA's CCR Closure Rule requirements

Cost effective
Schedule friendly
Value-added benefits to the utility and community

Sequenced program mitigates risk to utility and environment

ADVANCED-HYBRID CLOSURE APPROACH

SUMMARY

FINAL SURVEY & CONFIRMATION of DREDGING

• Dredge has removed ash to pre-prescribed depths
• Post dredge bathymetric survey performed to verify dredge has achieved desired grade
• Multi-beam echo sounder backscatter used as a hydro-acoustic method to determine the floor composition when properly calibrated with CCR standards with ground-truthed sample collection

Less than 30% moisture content of CCR filter cake material is near the typical optimum moisture for Class F ash under Standard Proctor D698.

OUR GOAL >> allow direct placement and compaction without the need for ISS reagents.