CLOSURE AND POST-CLOSURE PLAN

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Bottom Ash CCR Surface Impoundment
Stanton Station
Great River Energy

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Golder Associates

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1.0 INTRODUCTION

Great River Energy (GRE) owns and operates Stanton Station (SS) located near Stanton, North Dakota. GRE manages coal combustion residuals (CCR) in multiple facilities including the Bottom Ash CCR Surface Impoundment (Bottom Ash Impoundment). The Bottom Ash Impoundment is located adjacent to the coal pile south of the SS generating units (see Figure 1).

Golder Associates Inc. (Golder) has prepared this closure plan and post-closure plan for the Bottom Ash Impoundments on behalf of GRE to serve as the written closure plan required under 40 CFR §257.102(b), and the written post-closure plan required under 40 CFR §257.104(d). The facility will be closed with CCRs left in place in accordance with the requirements of 40 CFR §257.102(d) (EPA 2015). At the completion of closure activities in accordance with the closure plan, the post-closure care period will commence.

2.0 CLOSURE PLAN

2.1 Narrative Description of Facility Closure

The Bottom Ash Impoundment consists of three cells. The north cell (approximately 3.7 acres of lined area), the center cell (3.3 acres of lined area), and the south cell (4.2 acres of lined area) combined for a total facility footprint of approximately 11.2 acres. The north and south cells are active cells used to temporarily store and dewater bottom ash and the center cell functions as a retention cell. Bottom ash is sluiced into one of the active cells until the cell reaches capacity. Once capacity is reached, bottom ash deposition is directed to the other active cell and the filled cell is dewatered by decanting water through the outlet structure to the center cell. Bottom ash remaining in the filled cell is excavated and hauled to the adjacent Bottom Ash CCR Landfill for disposal.

Prior to closure, the Bottom Ash Impoundment will be drained of free water. Portable pumps and temporary sumps excavated into CCR materials may be used to remove as much free water as practical from each cell of the Bottom Ash Impoundment in preparation for closure.

Each cell of the Bottom Ash Impoundment will be filled and closed independently by filling with dewatered CCR materials (or other permitted non-CCR materials) to final grades. At closure, the three cells will be filled so that each has a 3% to 5% crown to promote surface water drainage. Installation of final cover will occur when placement of dewatered CCR materials (or other permitted non-CCR materials) has been complete to final design grades. Future final cover will be installed in accordance with the Closure Plan in effect at the time of closure.

The primary closure activities include drainage and stabilization of CCR (as applicable), adjusting CCR grades if necessary, installing the final cover system with surface water controls, and establishing vegetation.

2.1.1 Drainage and Stabilization of CCR

Bottom ash is conveyed to the north and south cells with the center cell acting as clarifier and process water control facilities. The center cell does not directly receive CCR materials. Therefore, the center cell of the Bottom Ash Impoundment will be dewatered via passive drainage through the outlet structure and/or pumping.

Free water in the north and south cells of the Bottom Ash Impoundment will be removed by developing temporary sumps in topographically low areas and installing portable pumps. Water will either passively drain or be pumped to the center cell of the Bottom Ash Impoundment.

After dewatering, dry CCR materials (or other permitted non-CCR materials) placed in the Bottom Ash Impoundment will be spread, and compacted to achieve stable final grades.

2.1.2 Final Cover System Installation

The final cover system will be installed using conventional soil placement techniques and common earthmoving equipment, such as bulldozers, haul trucks, scrapers, motor graders, and/or compactors. Soils that are suitable for use in the final cover system will be obtained from select on-site stockpiles and borrow sources. Disruption of the integrity of the final cover system will be inhibited by compacting the underlying CCRs to establish a firm and unyielding subgrade prior to installation of the final cover system and by establishing a slope of approximately 3% to 5% across the top surface to provide positive drainage, limit ponding, and mitigate the potential effects of settling and subsidence. Final cover soil placement, moisture conditioning, compaction, and testing will be in accordance with the site construction quality assurance plan. A North Dakota Registered Professional Engineer or a person working under their direct supervision will observe the placement of the final cover. A report indicating that closure was in compliance with the Closure Plan and signed by a North Dakota-registered Professional Engineer will be prepared after the closure of the facility. The closure report will be placed into the operating record of the facility.

2.1.3 Surface Water Controls

Each cell of the Bottom Ash Impoundment will be closed with 3% to 5% slopes. The 3% to 5% slopes will promote surface water run-off, aid in preventing surface water from ponding on the final cover, and allow for maintenance of the final cover (erosion repairs, mowing, etc.). The design slopes are flat enough and/or short enough to minimize erosion of the final cover soils and existing embankments without construction of terrace channels or armored down-chute channels. The combination of soil types, grasses and surface water controls have been selected to control long-term soil loss.

2.1.4 Vegetation

Vegetation enhances evapotranspiration and reduces erosion, thus playing an important part in surface water control. Vegetation activities will include preparing the soil surface, seeding, and mulching.

The seedbed should be roughened to a depth of 4 to 6 inches by scarifying, disking, harrowing, or equivalent methods. Rows should be spaced a minimum of 12 inches apart. Immediately prior to seeding in areas that have been heavily compacted by trucks or equipment, the topsoil surface should be ripped and scarified. All areas to be seeded should be dozer-tracked prior to seeding. The seedbed should not be prepared prior to completion of earthwork activities and no more than 2 weeks prior to planting.

Seed rates should be applied by broadcast or drilled methods, or by the hydraulic seeding method and are to be applied as directed in the facility's Operations Plan (Stone & Webster 1994b). If broadcast or drilled, seed should be buried by harrowing, chain dragging, or other scarification measures. Equipment and procedures should be appropriate for the seed as recommended by the seed supplier. A suitable native species seed mix and application rates shall be selected at the time of final cover placement.

Straw mulch should be applied immediately after seeding at a rate of 2 tons per acre. To prevent dispersal or removal of straw by wind, mulch should be anchored using a crimper run perpendicular to the prevailing wind direction. A disc should not be used for crimping. The mulch should be applied over the seed in a separate application. At least 50% of individual straws should be 6 inches or greater in length.

2.2 Final Cover System

The federal CCR rule requires the final cover system to meet the requirements of §257.102(d)(3) with a minimum 18-inch infiltration layer and 6-inch erosion layer. The permeability of the final cover system must be less than or equal to the permeability of any bottom liner system or natural subsoils present, or a permeability no greater than $1x10^{-5}$ cm/sec, whichever is less.

The bottom liner system for each cell of the Bottom Ash Impoundment consists of 2 feet of compacted clay rich material with a hydraulic conductivity of $1x10^{-7}$ cm/sec, overlain with a 60-mil high-density polyethylene (HDPE) geomembrane liner. The sideslopes of the Bottom Ash Impoundment cells consists of a 3-foot compacted clay material with a hydraulic conductivity of $1x10^{-7}$ cm/sec, overlain with a 60-mill HDPE geomembrane liner (Stone & Webster 1994a).

2.2.1 Alternative Final Cover System

An alternative cover design utilizing an evapotranspiration (ET) cover has been previously permitted by the North Dakota Department of Health (NDDH) for GRE's Coal Creek Station located approximately 10 miles northeast of SS based on both modeling and test plot instrumentation. The ET cover design consists of the following layers (from the top down):

- 6 inches of topsoil (erosion layer) that is capable of sustaining native plant growth.
- 30 inches of clay-rich, plant root zone soil (growth medium/infiltration layer), being compacted between 80% and 95% of the maximum dry unit weight as determined by ASTM D698 (standard Proctor).

GRE intends to update the alternative cover demonstration previously done to show that the cover system described above is in compliance with the requirements of §257.102(d)(3) and is applicable for soil resources available at Stanton Station. If this demonstration cannot be made, GRE will adjust the cover design as required. No final cover will be placed until either the demonstration is made or the cover design is adjusted to meet the requirements of §257.102(d)(3).

2.3 Closure Estimates

2.3.1 Maximum Inventory of CCR

The maximum inventory of CCR in the Bottom Ash Impoundment is approximately 275,100 cubic yards: 90,600 cubic yards in the north cell, 83,500 cubic yards in the center cell, and 101,000 cubic yards in the south cell.

2.3.2 Largest Area Requiring Final Cover

The three cells of the Bottom Ash Impoundment will be closed separately. The area requiring final cover is approximately 3.7 acres for the north cell, 3.3 acres for the center cell, and 4.2 acres for the south cell. The current maximum area requiring final cover is approximately 11.2 acres.

2.4 Closure Schedule

Within 30 days after the last receipt of waste (either CCR or any non-CCR waste stream) permitted for disposal, the closure plan will be implemented. Notification of intent to close the facility will be placed in the operating record prior to the commencement of closure activities. The NDDH will also be notified in accordance with the engineering design and operations plan for the facility.

Stanton Station is expected to cease generation in 2017. Once SS is no longer generating CCRs, the Bottom Ash Impoundment will be dewatered via pumps. Once drained, the cells will be filled with waste to reach design grades with CCRs or approved non-CCR materials, which is anticipated to occur in 2018. The duration of filling to reach final waste grades is subject to change depending upon plant operation and the use of the other CCR facilities at SS.

Closure activities will be completed in accordance with the closure plan within 5 years after commencing closure activities, or as allowed through a closure extension demonstration in accordance with §257.102(f)(2)(i). Closure activities to be completed during this time include regrading of CCR materials and permitted non-CCR materials to final grades, preparation of bid documents and solicitation of contractor's bids, installation of the final cover system, and preparation and submittal of as-built documents and certifications as required under §257.102(f)(3) and the engineering design and operations plan for the facility (Stone & Webster 1994a and Stone & Webster 1994b). An extension of the closure timeframe may be pursued in accordance with §257.102(f)(2)(i).

Notification that closure of the Bottom Ash Impoundment has been completed will be placed in the operating record within 30 days of the completion of closure activities. This notification will include certification by a qualified professional engineer that closure has been completed in accordance with the closure plan. Following closure of the Bottom Ash Impoundment, GRE will record a notation on the deed to the property (or another instrument that is normally examined during title search) that will notify potential purchasers of the land that the land has been used as a CCR impoundment/landfill and its use is restricted under post-closure care requirements. Within 30 days of recording the notation, notification will be placed in the operating record.

3.0 POST-CLOSURE PLAN

During the post-closure care period for the Bottom Ash Impoundment, GRE will implement inspection, maintenance, and monitoring programs to maintain the integrity of the final cover system, maintain the groundwater monitoring system, and monitor groundwater in accordance with the requirements of §257.90 through §257.98. The post-closure care period will be 30 years in duration. If GRE is operating under assessment monitoring in accordance with §257.95 at the conclusion of the post-closure care period, GRE will continue to conduct post-closure care until it can return to detection monitoring in accordance with §257.95. Within 60 days following the completion of the post-closure care period, GRE will prepare a notification certified by a qualified professional engineer that post-closure care has been completed in accordance with the post-closure plan and will place the notification in the operating record.

3.1 Inspection

Regular inspections will be conducted during the post-closure care period to help ensure that the integrity of the Bottom Ash Impoundment is maintained. The final cover system will be inspected for signs of settlement, subsidence, erosion, and other damage or deficiency. Surface components of groundwater monitoring wells will be inspected for damage.

Inspections will be conducted on an annual basis (typically between late spring and early fall) to facilitate inspection of the final cover vegetation. Inspection forms will be completed to document each inspection. Completed inspection forms will be maintained in the operating record. To maintain consistency in the inspection process, trained GRE employees or contract employees will conduct the inspections. Issues identified during the inspections will be reported to the person responsible for compliance with this post-closure plan as soon as practical.

3.2 Maintenance

GRE will oversee post-closure maintenance of the Bottom Ash Impoundment, using appropriate internal resources and/or third-party personnel and equipment. Post-closure maintenance of the Bottom Ash Impoundment will include making necessary repairs to the final cover system to maintain its integrity and effectiveness. Earthen fill will be placed as needed to correct the effects of settlement, subsidence, and

erosion and to prevent run-on and run-off from eroding or otherwise damaging the final cover system. The final cover system will be reseeded in areas that have been repaired and where additional vegetation is needed to effectively limit erosion and promote transpiration of soil moisture. GRE will control noxious weeds and unwanted trees and shrubs from becoming established on the Bottom Ash Impoundment.

3.3 Monitoring

Groundwater monitoring will be conducted during the post-closure care period in accordance with the requirements of §257.90 through §257.98. Groundwater samples will be collected and analyzed in accordance with the sampling and analysis program for the Bottom Ash Impoundment. Results of the analyses will be placed in the operating record.

3.4 Contact Information

The post-closure contact for the Bottom Ash Impoundment will be:

Attention: Manager, Regulatory Services
Great River Energy – Coal Creek Station
2875 Third Street SW
Underwood, North Dakota 58576
Phone: (701) 442- 3211
Email: Environmental@GREnergy.com

3.5 Planned Property Usage

The closed Bottom Ash Impoundment will be designated as open space during the post-closure period and will be controlled via fence and/or signage. No agricultural, recreational, public, or otherwise active uses are planned for the facility during the post-closure care period. There will be no grazing or feeding of farm or domestic animals at the Bottom Ash Impoundment during the post-closure care period.

4.0 CERTIFICATION

The undersigned attest to the completeness and accuracy of this closure and post-closure plan, and certify that the plan meets the requirements of 40 CFR §257.102(b) and 40 CFR §257.104(d).

GOLDER ASSOCIATES INC.

Todd Stong, PE
Associate and Senior Engineer

Craig Schuettpelz, PE
Senior Project Engineer

TS/CS/rjg

5.0 REFERENCES

EPA. 2015. Environmental Protection Agency, Code of Federal Regulations Title 40 Part 257: Hazardous and Solid Waste Management System; *Disposal of Coal Combustion Residuals from Electric Utilities*. April.

Stone & Webster. 1994a. *Design Report – Stanton Station Ash Pond Modifications.* April.

Stone & Webster. 1994b. *Plan of Operations – Stanton Station – Bottom Ash Surface Impoundment and Bottom Ash Landfill*. June.

FIGURE

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STANTON STATION
CCR FACILITIES

FIGURE 1

At Golder Associates we strive to be the most respected global group of companies specializing in ground engineering and environmental services. Employee owned since our formation in 1960, we have created a unique culture with pride in ownership, resulting in long-term organizational stability. Golder professionals take the time to build an understanding of client needs and of the specific environments in which they operate. We continue to expand our technical capabilities and have experienced steady growth with employees now operating from offices located throughout Africa, Asia, Australasia, Europe, North America and South America.

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