Big Rivers ELECTRIC CORPORATION

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Reid/HMP&L CCR Surface Impoundment

Disposal of Coal Combustion Residuals (CCR) from Electric Utilities Final Rule
CCR Impoundment 2016 Annual Inspection Report

January 10, 2017

Prepared By:

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Project ID: 160122

Big Rivers Electric Corporation
Disposal of Coal Combustion Residuals (CCR) from Electric Utilities Final Rule
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CCR Surface Impoundment Information

Name:	Reid/HMP&L CCR Surface Impoundment
Operator:	Sebree Generating Station
Address:	9000 Highway 2096 Robards, Kentucky 42452

Qualified Professional Engineer

Name:	David A. Lamb
Company:	Associated Engineers, Inc.
Kentucky P.E. Number:	17822

Regulatory Applicability

Per 40 CFR §257.83(b), annual inspections by a qualified professional engineer must ensure that the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering standards.

Annual inspections of any CCR surface impoundment must include, at a minimum: (1) a review of all previously generated information regarding the status and condition of the CCR unit, including, but not limited to, all operating records and publicly accessible internet site entries, design and construction drawings and other documentation; (2) a thorough visual inspection to identify indications of distress, unusual or adverse behavior, or malfunction of the CCR unit and appurtenant structures; and (3) a thorough visual inspection of hydraulic structures underlying the base of the CCR unit and passing through the dike of the CCR unit for structural integrity and continued safe and reliable operation.

Additionally, following each annual inspection, the qualified professional engineer must prepare an inspection report which documents the following: (1) any changes in geometry of the impounding structure since the previous annual inspection; (2) the location and type of existing instrumentation and the maximum recorded readings of each instrument since the previous annual inspection; (3) the approximate maximum, minimum, and present depth and elevation of the impounded water and CCR since the previous annual inspection; (4) the storage capacity of the impounding structure at the time of inspection; (5) the approximate volume of the impounded water and CCR at the time of the inspection; (6) any appearances of an actual or potential structural weakness of the CCR unit, in addition to any existing conditions that are disrupting or have the potential to disrupt the operation and safety of the

CCR unit and appurtenant structures; and (7) any other change(s) which may have affected the stability or operation of the impounding structure since the previous annual inspection.

Inspection Description

This is the second annual inspection report for the Reid/HMP&L CCR Surface Impoundment pursuant to the Disposal of Coal Combustion Residuals (CCR) from Electric Utilities Final Rule which became effective April 17, 2015. The inspection was conducted on November 7, 2016 by Tim Brown P.E. and Matthew Lile of Associated Engineers, Inc. of Madisonville, Kentucky. Weekly (7-day) inspections conducted by Big Rivers Electric Corporation are kept in the facility operating record.

The inspection consisted of a visual assessment of the surface impoundment, embankments and discharge; and began at the impoundment spillway and proceeded along the downstream side of the west embankment. The inspection noted thick grass thatch from mowing, longitudinal ruts from tractor and mower wheels and surficial ground cracking from dry conditions. Irregular grading, sporadic bare areas and poor vegetation/erosion were visible in some areas. As the inspection progressed to the north end of the west embankment the toe became very wet with standing water along the embankment. Other wet areas noted include a depression on the embankment slope and a saturated strip extending from the embankment toe to the adjacent ditch. There was no outflow/discharge from the embankment blanket toe drain seepage pipe into the ditch. Sporadic bare areas were visible on the inside of the crest with poor vegetation in some other areas. Rip-rap cover was good.

The inspection of the downstream side of the north embankment noted thick grass thatch from mowing and damage from equipment (ruts from tractor and mower wheels). Mowed stands of phragmites were visible in wet areas along the lower slope and embankment toe. Irregular grading, sporadic bare areas and poor vegetation/erosion were visible some areas. Generally, the north embankment exhibited an irregular ground surface below the crest in several areas and some animal disturbance/trails and burrows. Standing water and thick vegetation were visible along the toe of the east end of the embankment. A noticeable depression, possibly a previously repaired animal burrow, is located near the top of the slope. The crest of the north embankment was in good condition and the upstream side of the north embankment was over steepened in some areas with poor rip-rap and vegetative cover.

The south embankment which parallels the cooling towers is the smallest embankment and occurs primarily on the southwest corner of the impoundment. The upstream side is steep-sided, thinly covered with rip-rap and covered with phragmites. There are some small sloughs and areas of erosion (nearly vertical in places). The downstream side of the embankment is well vegetated except where erosion and rip rap occur at the toe. The sand filter backwash pipe runs along the crest (south end) and exits at the discharge structure located in the southwest corner of the impoundment. The embankment crest supports an access road around the southwest, west, north and northeast perimeter of the impoundment and has good gravel cover over the entire length.

The impoundment discharge structure, consisting of a rectangular concrete drop structure with a variable height steel debris skimmer, was inspected and the pool elevation measured. The pool elevation can be controlled by adding or removing stop logs. The discharge structure connects to a 24-inch diameter smooth walled metal pipe underground conveyance. The pipe conveyance was inspected by remote camera on September 20, 2016 and found to be in acceptable operating condition.

Inspection Report Specifications

(i) CCR Surface Impoundment Geometry

The Reid/HMPL CCR Surface Impoundment is a combined incised/earthen embankment structure. The immediate watershed that drains to the CCR surface impoundment, and in which the CCR surface impoundment is considered to be located, is unnamed and 25.45 acres in size. Embankments form the north, west, south and southeast sides of the impoundment. The northeast side is incised. The original terrain on which the impoundment was constructed generally sloped toward the west. The Green River is located approximately 2,500 feet east of the structure. The embankment reaches its greatest relief of approximately 42 feet on the west side. The impoundment originally received fly ash and bottom ash, but stopped receiving fly ash in approximately 1985 when the Boothe system was placed in operation.

There have been no significant changes to the geometry of the impounding structure since the previous (2015) annual inspection. Placement of additional CCR material in the impoundment is ongoing.

(ii) CCR Surface Impoundment Instrumentation

There are five piezometers and one water level indicator associated with the Reid/HMP&L CCR Surface Impoundment.

(ii) a – Piezometers

*Maximum elevation above mean sea level (AMSL) measured at each piezometer since the 2015 annual inspection report:

Piezometer ID	Northing	Easting	Top of Casing Elevation (AMSL)	Depth to Static Water Level	Static Water Elevation* (AMSL)
P-1A	483464.43	1491086.43	428.95	11.43 feet	417.52
P-2A	483141.96	1491515.32	428.63	7.26 feet	421.37
P-3A	483772.54	1491306.43	428.75	17.77 feet	410.98
P-4	483033.84	1491399.12	396.92[+]	4.05 feet	393.39
P-5	483415.93	1490969.80	395.34	8.99 feet	386.35

[+]Well repaired 09/26/2016 (New Top of Casing Elevation = 397.44)

(ii) b – Water Surface Level Indicator

The maximum water surface elevation since the 2015 annual inspection report is 426.37 feet above mean sea level as measured at a water level indicator located adjacent to the impoundment discharge structure.

(iii) CCR Surface Impoundment Contents Depths and Elevations

The Reid/HMP&L CCR Surface Impoundment contents depths and elevations are provided below. They are based on: 1) available measured water surface elevations, 2) comparison of 2015 and 2016 flight derived topographic contours and bathymetric survey data, and 3) best available as-built design data for the impoundment prior to placement of CCR material (i.e. the Burns & McDonnell Engineering Co. October 8, 1971 design plans provided by Big Rivers Electric Corporation).

Elevations are provided as feet above mean sea level and depths are provided as height in feet above the impoundment's design bottom prior to placement of CCR material. All values are rounded off to the nearest tenth of foot.

Minimum depth of impounded water = Not available[1]
Minimum elevation of impounded water = 425.5

Minimum depth of CCR material = 10.6
Minimum elevation of CCR material = 409.2

Maximum depth of impounded water = Not available[1]
Maximum elevation of impounded water = 426.4

Maximum depth of CCR material = 39.3
Maximum elevation of CCR material = 428.5

Present depth of impounded water = 17.0[2]
Present elevation of impounded water = 426.2[2]

Present depth of CCR material = 39.3[3]
Present elevation of CCR material = 428.5[3]

[1]Depth not available due to absence of bathymetric survey data at times of minimum and maximum pool elevations
[2]At location of maximum impounded water depth
[3]At location of maximum CCR material depth

(iv) CCR Surface Impoundment Storage Capacity

The Reid/HMP&L CCR Surface Impoundment storage capacity is approximately 91,355 cubic yards (if CCR can be placed to the elevation of the spillway). This volume is based on: 1) available measured water surface elevations, 2) 2016 flight derived topographic contours and bathymetric survey data, and 3) best available as-built design data for the impoundment prior to placement of CCR material (i.e. the Burns & McDonnell Engineering Co. October 8, 1971 design plans provided by Big Rivers Electric Corporation).

(v) CCR Surface Impoundment Contents Volumes

The Reid/HMP&L CCR Surface Impoundment contents volume of impounded water is approximately 91,355 cubic yards and volume of CCR material is approximately 716,175 cubic yards. These volumes are based on: 1) available measured water surface elevations, 2) 2016 flight derived topographic contours and bathymetric survey data, and 3) best available as-built design data for the impoundment prior to placement of CCR material (i.e. the Burns & McDonnell Engineering Co. October 8, 1971 design plans provided by Big Rivers Electric Corporation).

(vi) CCR Surface Impoundment Structural, Operational, and Safety Items

No deficiencies were observed during the annual inspection.

(vii) CCR Surface Impoundment Changes

There have been no significant changes to the Reid/HMP&L CCR Surface Impoundment (or impounding structure) since the previous (2015) annual inspection that may have affected the stability or operation of the CCR surface impoundment.

BIG RIVERS ELECTRIC CORPORATION

Reid/HMP&L CCR Surface Impoundment
2016 Annual Inspection Aerial Photo

Project Number:	16-0122
Date:	12/12/2016
Scale:	NOT TO SCALE
Drawn By:	A.E.I.

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BREC Final Rule CCR Impoundment 2016 Annual Inspection Checklist

Operator:	Sebree Generating Station	Weather:	Clear
CCR Surface Impoundment:	Reid/HMP&L	Temperature (Degrees F):	65 (average)
Date:	November 7, 2016	Inspector/Qualified Person:	Tim Brown P.E. & Matthew Lile (AEI)

	ITEM	STATUS			OBSERVATIONS
		YES	NO	N/A	
1	**TOP OF DAM**				
	Visual settlement	☐	☒	☐	
	Misalignment	☐	☒	☐	
	Cracking	☐	☒	☐	
	Access road deterioration (potholes, rutting, etc.)	☒	☐	☐	Few small potholes
2	**UPSTREAM SLOPE**				
	Any erosion	☒	☐	☐	
	Longitudinal cracks	☐	☒	☐	
	Transverse cracks	☐	☒	☐	
	Adequate vegetative cover	☐	☒	☐	Sporadic bare areas & invasive species monocultures where not rip-rapped
	Are trees growing on the slope	☐	☒	☐	
	Adequate riprap/slope protection	☐	☒	☐	Adequate where rip-rapped; other areas exhibit bare areas
	Visual depressions	☐	☒	☐	
	Visual settlement	☐	☒	☐	
	Any stone deterioration	☐	☒	☐	
	Debris or trash present	☐	☒	☐	
3	**DOWNSTREAM SLOPE AND TOE**				
	Any erosion	☒	☐	☐	
	Longitudinal cracks	☒	☐	☐	Minimal surficial cracking from dry conditions
	Transverse cracks	☒	☐	☐	Minimal surficial cracking from dry conditions
	Adequate vegetative cover	☒	☐	☐	Isolated bare areas
	Are trees growing on the slope	☐	☒	☐	
	Visual depressions or bulges	☒	☐	☐	Some equipment tracking & depression near top of slope
	Visual settlement	☐	☒	☐	
	Animal Burrows	☐	☒	☐	
	Are boils present at the toe or slopes	☐	☒	☐	
	Are drainage features obstructed or damaged	☐	☒	☐	
	Are drainage features flowing	☐	☒	☐	
	Is seepage present	☒	☐	☐	Seepage believed to be from the designed blanket toe drain

	ITEM	STATUS			OBSERVATIONS
		YES	NO	N/A	
	Is seepage or discharge carrying sediment	☐	☒	☐	
	Soft or spongy zones present	☒	☐	☐	
4	**ABUTMENTS**				
	Any erosion	☐	☒	☐	
	Visual differential movement	☐	☒	☐	
	Any cracks	☐	☒	☐	
	Are drainage features flowing	☐	☒	☐	
	Is seepage present	☐	☒	☐	
	Is seepage or discharge carrying sediment	☐	☐	☒	
5	**PRINCIPAL SPILLWAY**				
	Any deterioration of the spillway structure	☐	☒	☐	
	Any deterioration of the spillway conduit	☐	☒	☐	
	Spillway clear from obstructions	☒	☐	☐	
	Is the spillway functioning and discharging correctly	☒	☐	☐	
	Trash racks or skimmer operational	☒	☐	☐	
	Any signs of leakage with the structure or conduit	☐	☒	☐	
	Abnormally high or low pool elevation	☐	☒	☐	
6	**EMERGENCY SPILLWAY**				
	Any deterioration of the spillway structure	☐	☐	☒	
	Spillway clear from obstructions	☐	☐	☒	
	Signs or erosion or slope sloughing	☐	☐	☒	
	Adequate vegetative cover	☐	☐	☒	
	Signs of or currently discharging water	☐	☐	☒	
7	**VALVES/GATES**				
	Are the valves/gates operational	☐	☐	☒	
	Are the valves/gates broken or bent	☐	☐	☒	
	Are the valves/gates corroded or rusted	☐	☐	☒	
	Have the valves/gates been maintained	☐	☐	☒	
8	**HYDRAULIC STRUCTURES UNDER/THROUGH DAM**				
	Hydraulic structures under/through embankment are in safe and reliable operating condition	☒	☐	☐	
	Abnormal flow	☐	☒	☐	
	Abnormally colored discharge	☐	☒	☐	
	Debris or sediment in discharge	☐	☒	☐	
9	**SEEPAGE**				
	Seepage from toe drain	☒	☐	☐	

ITEM		STATUS			OBSERVATIONS
		YES	NO	N/A	
	Seepage from abutment drain	☐	☐	☒	
	Seepage from blanket drain	☒	☐	☐	
	Seepage from slope areas	☐	☒	☐	

DEFICIENCIES AND MAINTENANCE ITEMS

No deficiencies were observed during the annual inspection.

Professional Engineer Certification [Per 40 CFR §257.83(b)]
Reid/HMP&L CCR Surface Impoundment
Annual Inspections by a Qualified Professional Engineer

I hereby certify that myself or an agent under my review has prepared this Annual Inspection Report (Report), and being familiar with the provisions of the final rule to regulate the disposal of coal combustion residuals (CCR) as solid waste under subtitle D of the Resource Conservation and Recovery Act (RCRA), attest that this Report has been prepared in accordance with good engineering practices and meets the intent of 40 CFR Part 257.83(b). To the best of my knowledge and belief, the information contained in this Report is true, complete, and accurate.

David A. Lamb

David A. Lamb P.E.

State of Kentucky License No. 17822

Date: 1-11-2017