Western Farmers Electric Cooperative

Hugo, Oklahoma

Combined Coal Combustion Residual Surface Impoundments and Landfill Annual Inspection Report Hugo Plant

October 2018

Prepared by:

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ENGINEERING CERTIFICATION

Pursuant to 40 CFR 257.83 and 40 CFR 257.84, and by means of this certification I attest that:

(i) I am familiar with the requirements of OAC 252:517 and 40 CFR Part 257 (CCR Rule);

(ii) I, or my agent, have visited and inspected the CCR units at the facility that are the subject of the Annual Inspection Report;

(iii) The aforementioned inspection(s) and this Annual Inspection Report have been conducted and prepared in accordance with good engineering practices, including consideration of applicable industry standards, and with the requirements of the CCR Rule; and

(iv) This Annual Inspection Report meets the requirements of OAC 252:517, 40 CFR 257.83 and 40 CFR 257.84

(v) I am a "Qualified Professional Engineer" as defined in 40 CFR 257.53 by the fact that I have the technical knowledge and experience to make specific technical certifications set forth herein.

CA NO. 7110
Expires 6-20-2020

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Combined Coal Combustion Residual
Surface Impoundments and Landfill
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Choctaw County, Oklahoma

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Background

Facility Description

Western Farmers Electric Cooperative (WFEC) engaged Cardinal Engineering (Cardinal) to perform the Annual Inspection of the Coal Combustion Residual (CCR) impoundments and landfill at its Hugo Power Plant (Hugo Plant). The annual inspection is a requirement of the Environmental Protection Agency (EPA) final rule titled Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments in 40 CFR Part 257, Subpart D, published in the Federal Register on April 17, 2015 and Oklahoma Administrative Code titled Disposal of Coal Combustion Residuals from Electric Utilities, OAC 252:517, effective date September 15, 2017.

The Hugo Plant is located on Highway 70, west of Fort Towson, Oklahoma in Choctaw County. Operation of the plant began in April 1982. The Hugo plant has one unit that burns Wyoming coal with a net output of 450 net mega-watts (MW).

The three types of ash generated from burning the coal are classified as fly ash, economizer ash or bottom ash. At the Hugo Plant, the fly ash is stored in silos or in the CCR landfill (labeled CCR1), economizer ash is managed in CCR1 and as of November 2018 the bottom ash is also managed in CCR1.

Cardinal performed the inspection of the impoundments and landfill in accordance with the requirements outlined in 40 CFR 257.83(b) and 40 CFR 257.84(b). The inspection included two (2) site visits during which the Hugo Plant's Operating Records, and available data were collected and reviewed. During each site visit, Cardinal walked the perimeter of CCR1, CCR2 and CCR3 to inspect for signs of distress or malfunction of each unit and appurtenant structures, and to obtain field measurements required to determine the remaining capacity of the landfill and impoundments. The volumes are not based on topographic level accuracy, but were calculated based on field measurements and original drawings of the landfill and impoundments.

Fly Ash

The fly ash landfill is a two-cell unit, labeled CCR1 that has a storage capacity of 1,044,000 cubic yards (cyds). The fly ash is pneumatically conveyed to the fly ash silo then loaded onto a truck and stored in the CCR landfill. Most of the fly ash is removed from the landfill and sold for beneficial use. There is an estimated 548,000 cyds of fly ash in the landfill and a remaining capacity of 496,000 cyds.

Bottom Ash

There is a single bottom ash impoundment consisting of two (2) cells. The north cell of the impoundment is labeled CCR2 and the south cell of the impoundment is labeled CCR3. The combined storage capacity of CCR2 and CCR3 is 1,064,000 cyds. Bottom ash from the boiler was sluiced to either CCR2 or CCR3 prior to fall 2018 outage. There is an estimated 231,000 cyds of bottom ash in the impoundments and a remaining capacity of 833,000 cyds.

WFEC inspects both cells each day. The cells are designed with a three-foot normal pool level freeboard. This normal pool level freeboard is currently maintained by a 24" diameter constant elevation vertical pipe spillway that discharges into the Process Waste Pond located on the east side of the cells. Water level below the three-foot normal pool level freeboard is lowered by operating a set of manual valves.

A. SCOPE OF INSPECTION

The purpose of the annual inspection is to meet the requirements outlined in 40 CFR 257.83(b) and 40 CFR 257.84(b) and OAC 525:517-13-4. The regulations require an annual inspection performed by a "Qualified Professional Engineer" as defined in 40 CFR 257.53. The CCR Rule specifies the Annual Inspection Report must address the following items for a CCR impoundment:

- Changes in geometry since the previous annual inspection
- Location and type of existing instrumentation and maximum recorded readings of each instrument since the previous annual inspection
- Approximate minimum, maximum, present depth, and elevation of the impounded water and CCR since the previous annual inspection
- Storage capacity of the surface impoundment at time of inspection
- Approximate volume of the impounded water and CCR at the time of inspection
- Appearance of an actual or potential structural weakness
- Existing conditions that are disrupting or have the potential to disrupt the operation and safety of the impoundment
- Any other changes which may have affected the stability or operation of the impounding structure since the previous annual inspection
- Deficiencies or releases

The CCR Rule specifies the Annual Inspection Report must address the following items for a CCR landfill:

- Changes in geometry since the previous annual inspection
- Approximate volume of CCR at the time of inspection
- Appearance of an actual or potential structural weakness
- Existing conditions that are disrupting or have the potential to disrupt the operation and safety of the impoundment
- Any other changes which may have affected the stability or operation of the landfill since the previous annual inspection

- Deficiencies or releases

B. Site Inspection

An agent for Cardinal's Qualified Professional Engineer made two (2) trips to the Hugo Plant to review documentation and gather all the necessary field data and measurements for completion of the requirements of this Annual Inspection Report. The first trip on October 10, 2018 consisted of data gathering and initial site reconnaissance, including inspection of the integrity of the hydraulic structures that passed through the cells of the impoundment and landfill to the extent possible. The second trip on October 11, 2018 was for obtaining field measurements and an additional site reconnaissance of both the impoundments and landfill.

Site visits included visual inspections of CCR1, CCR2, and CCR3. Any dike integrity issues, vegetation growth, or other potential detrimental activity was noted during the visual inspections.

The field measurements for the impoundment cells (CCR2 and CCR3) included the following:

• Verify the elevation of the vertical pipe spillway

• Verify the relation between the level gauges, 3 foot freeboard, and the overflow (vertical pipe spillway)

• Verify the dimensions the impoundment and slopes of the dikes

• Determine the bottom topography of the cells using design and as built drawings

The field measurements for the landfill (CCR1) included the following:

• Verify the dimensions of the impoundment and slope of the dikes.

• Verify the amount of ash in the landfill

During the first site visit on October 10, 2018, Cardinal collected records of operation, operation manuals, and construction drawings, as well as made a cursory inspection of CCR1, CCR2, and CCR3.

All three units, CCR1, CCR2, and CCR3, were visually inspected on October 10 and 11, 2018 by Cardinal staff members. The inspection included walking around all three structures, taking photographs, taking notes and taking level measurements to determine water surface elevation of CCR2. CCR2 and CCR3 had slope slough repairs on the outside slope of the east portion of the embankment between the CCR units and the Process Waste Pond. The slough area repaired was estimated to be 50 feet long by 10 feet wide by 3 feet deep at CCR2 and 60 feet long by 10 feet wide by 3 feet deep at CCR3. No slope sloughing issues were observed. The design interior slopes of the dikes are 2H:1V. The steep slopes hinder the maintenance of the CCR's by limiting access to equipment for mowing and repairs.

The depth of water contained in CCR2 was measured by using a water level depth gauge board located near the spillway pipe. CCR3 unit water depth was below the water level gauge and was being lowered of impounded water at the time of the inspection.

C. Findings

The following inspection findings are reported according to 40 CFR 257.83 and 40 CFR 257.84 based on field observations, measurements and data provided by WFEC.

1.0 Bottom Ash Impoundment CCR2 (north cell) and CCR3 (south cell)

1.1 Regulation Citation §257.83 (b)(i) and OAC 252:517-13-5(b)(A)

Review of available information regarding the status and condition of the CCR unit, including, but not limited to, files available in the operating record (e.g. CCR unit design and construction information required by §§257.73(c)(1) and 257.74(c)(1), previous periodic structural stability assessments required under §§257.73(d) and 257.74(d), the results of inspection by a qualified person and results of previous annual inspections).

Findings: Reviewed available information including previous annual inspection report, structural stability assessment, and 2018 weekly inspection reports. Based on the observed site condition, slopes appear stable. However, construction of two (2) horizontal to one (1) vertical interior slopes may present maintenance difficulties.

1.2 Regulation Citation §257.83(b)(ii) and OAC 252:517-13-5-(b)(B)

A visual inspection of the CCR unit to identify signs of distress or malfunction of the CCR unit

Findings: CCR2 and CCR3, were visually inspected on October 10 and 11, 2018. The inspection included: walking around both cells, taking photographs and taking notes. CCR2 water depth measurement was collected from the water level gauge located at the spillway pipe. CCR3 appeared to be lowered at the time of inspection. Although several areas of erosion rills were noted during the inspection, there was no indication that these areas would cause a malfunction in the safe operation of the impoundments.

1.3 Regulation Citation §257.83(b)(iii) and OAC 252-517-13-5(b)(2)

A visual inspection of any hydraulic structures underlying the base of the CCR unit or passing through the dike of the CCR unit for structural integrity and continued safe and reliable operations

Findings: Concrete structures at each end of the pipe passing under the CCR dike are in good condition. The pipe itself was not visible in CCR2 due to complete submergence. However, this pipe is a recent HDPE replacement of the original corrugated metal pipe.

1.4 Regulation Citation §257.83(b)(2)(i) and OAC 252-517-13-5(b)(2)

Any changes in geometry of the structure since the previous annual inspection

Findings: No noticeable changes appear to have occurred to CCR2 and CCR3 since construction. Two areas of slough repair have been completed at the east exterior berm between CCR2, CCR3 and Process Waste Pond.

1.5 Regulation Citation §257.83(b)(2)(ii) and OAC 252:517-13-5(b)(2)

The location and type of existing instrumentation and the maximum recorded readings of each instrument since the previous annual inspection.

Findings: The water level of CCR2 and CCR3 are both measured toward the east end of the cells using a vertical staff marked with 0.1 foot increments. At the time of the inspection, CCR3 water level was 3 inches below the water depth gauge and 13.70 feet below the top of the dike. CCR2 level was 5.30 feet below the top of the dike. A review of weekly inspection reports provided the maximum recorded reading for CCR2 and CCR3. Since the previous annual inspection, the maximum recorded readings are 3.50 feet below the top of the dike for CCR2 and 3.8 feet below the top of the dike for CCR3.

1.6 Regulation Citation §257.83(b)(2)(iii) and OAC 252:517-13-5(b)(2)

The approximate minimum, maximum, and present depth and elevation of the impounded water and CCR since the previous annual inspection

Findings: Observed water elevation is measured at the outlet structure. The water elevation at the time of the inspection for CCR2 level was 5.80 feet below the top of the dike. CCR3 impoundment water level was 8.30 feet below the top of the dike and being lowered at the time of inspection. According to the weekly inspection reports, the maximum water elevation was reported at 3.50 feet below the top of the dike for CCR2 and 4.20 feet below the top of the dike for CCR3. Minimum water elevation reported from the weekly inspection reports for both CCR units was 18.0 feet below the top of the dike.

1.7 Regulation Citation §257.83(b)(2)(iv) and OAC 252:517-13-5(b)(2)

The storage capacity of the impounding structure at the time of the inspection

Findings: At the time of the inspection (on October 11, 2018), the remaining storage capacity at normal pool level, three feet below the top of dike, for CCR2 was 402,000 cyds and 431,000 cyds for CCR3.

1.8 Regulation Citation §257.83(b)(2)(v) and OAC 252:517-13-5(b)(2)

The approximate volume of the impounded water and CCR at the time of inspection

Findings: At the time of the inspection (on October 11, 2018), the volume of impounded water in CCR2 was estimated at 418,000 cyds (at an elevation of 443.37 ft) and the volume of impounded water in CCR3 was 375,000 cyds (at an elevation of 441.7 ft). Elevation readings are based on the elevation of 446 feet assigned to the top of the discharge structure in construction drawings.

1.9 Regulation Citation §257.83(b)(2)(vi) (part 1) and OAC 252:517-13-5(b)(2)

Any appearances of an actual structural weakness of the CCR unit

Findings: The visual inspection revealed there are no slope sloughing on the interior berms of CCR2 or CCR3. As identified previously, CCR2 and CCR3 had slope slough repairs on the outside slope of the east portion of the embankment between CCR2, CCR3 and the Process Waste Pond. No structural weaknesses were identified.

1.10 Regulation Citation §257.83(b)(2)(vi) (part 2) and OAC 252:517-13-5(b)(2)

Any existing conditions that are disrupting or have the potential to disrupt the operation and safety of the CCR unit

Findings: The dikes of both CCR2 and CCR3 were designed and constructed at two (2) horizontal to one (1) vertical slope. These slopes require monitoring and repair of sloughing as needed. No other conditions are disrupting or have the potential to disrupt the operation and safety of the CCR units.

1.11 Regulation Citation §257.83(b)(2)(vii) and OAC 252:517-13-5(b)(2)

Any other change(s) which may have affected the stability or operation of the impounding structure since the previous annual inspection.

Findings: There have been no improvements or repairs to the impoundment since the previous inspection.

2.0 Fly Ash Landfill CCR1

2.1 Regulation Citation §257.84(b)(i) and OAC 252:517-13-5(b)(A)

Review of available information regarding the status and condition of the CCR unit, including, but not limited to, files available in the operating record (e.g. results of inspections by a qualified person, and results of previous annual inspection)

Findings: Reviewed available information and 2018 weekly inspection reports. There were no indications of distress or malfunctions from the weekly inspection report review.

2.2 Regulation Citation §257.84(b)(ii) and OAC 252:517-13-5(b)(B)

A visual inspection of the CCR unit to identify signs of distress or malfunction of the CCR unit

Findings: CCR1 was visually inspected on October 10, 2018, with a follow-up inspection on October 11, 2018. The inspection included walking around the structure, taking photographs, taking notes, and measuring the approximate distance below the top of the dike of the landfilled fly ash. No signs of distress or malfunction were identified.

2.3 Regulation Citation §257.84(b)(2)(i) and OAC 252:517-13-5(b)(2)

Any changes in geometry of the structure since the previous annual inspection

Findings: No noticeable changes appear to have occurred to CCR1 since the previous annual inspection report**.**

2.4 Regulation Citation §257.84(b)(2)(ii) and OAC 252:517-13-5(b)(2)

The approximate volume of CCR contained in the unit at the time of inspection

Findings: The approximate volume of fly ash contained in CCR1 at the time of inspection on October 11, 2018 was 548,000 cyds.

2.5 Regulation Citation §257.84(b)(2)(iii) (part 1) and OAC 252:517-13-5(b)(2)

Any appearances of an actual structural weakness of the CCR unit

Findings: The visual inspection revealed water ponding within CCR1 from recent heavy rainfall. Rainwater was being pumped from the unit during the inspection. No actual structural weaknesses were identified.

2.6 Regulation Citation §257.84(b)(2)(iii)(part 2) and OAC 252:517-13-5(b)(2)

Any existing conditions that are disrupting or have the potential to disrupt the operation and safety of the CCR unit

Findings: The dikes of CCR1 were designed and constructed at two (2) horizontal to one (1) vertical slope. These slopes require monitoring and repair of sloughing. No conditions were identified that are disrupting or have the potential to disrupt the operation and safety of the CCR unit.

2.7 Regulation Citation §257.84(b)(2)(iv) and OAC 252:517-13-5(b)(2)

Any other change(s) which may have affected the stability or operation of the CCR unit since the previous annual inspection

Findings: There were no changes identified that would affect the stability or operation of CCR1 since the previous annual inspection report.

D. Conclusion

Overall, this annual inspection under the CCR Rule did not reveal any deficiencies or releases in either CCR1, CCR2, or CCR3. Under the Hugo Plant's standard practice, slope sloughs and other maintenance issues are noted on the weekly inspection reports and logged into the Hugo Plant's mechanical maintenance system. Specifically, slope sloughs are assigned maintenance work orders by priority based on location and severity of the slough. Severity of a slope slough is objective and based on the amount of displaced material.

Various operational changes have occurred since the commissioning of CCR1, CCR2, and CCR3 that differ from the original design of the systems. The original operation of the CCR2 and CCR3 specified the use of stop logs to manage the water level within the impoundments, which allowed the decanting of water. The current operational practice does not use the stop logs; instead, the non-emergency gates remain open. This practice does not allow for decanting, but it does provide a balance between personal safety and the original intent of the stop logs.

Cardinal finds that at the time of this annual inspection of the Hugo Plant, CCR1, CCR2, and CCR3 are designed, constructed, operated, and maintained consistent with recognized and generally accepted good engineering standards.