Cardinal Power Plant

Structural Stability Assessment for

Existing Bottom Ash Pond Complex

Issue Purpose: For Use, Rev. 1

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PREPARED BY:

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1 PURPOSE

Pursuant to 40 CFR 257.73(d), this report provides the 2021 periodic structural stability assessment for the coal combustion residual (CCR) unit of the existing Bottom Ash Pond Complex (BAPC) at the Cardinal Power Plant. The BAPC consists of two existing coal combustion residual (CCR) surface impoundments, the Bottom Ash Pond and Recirculation Pond, which are interconnected and are managed as a single CCR unit. The previous structural stability assessment for the BAPC was completed and uploaded to the Plant Operating Record on October 9, 2016. Pursuant to 40 CFR 257.73(f), this periodic structural stability assessment was conducted and completed within five years of the previous assessment.

2 APPLICABLE CCR REGULATION

To develop the structural stability assessment for the BAPC, the following excerpts from 40 CFR Part 257 Subpart D (Federal CCR Rule) are applicable:

- **§257.73(d):**
  "Periodic structural stability assessments.
  (1) The owner or operator of the CCR unit must conduct initial and periodic structural stability assessments and document whether the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices for the maximum volume of CCR and CCR wastewater which can be impounded therein. The assessment must, at a minimum, document whether the CCR unit has been designed, constructed, operated, and maintained with:
  (i) Stable foundations and abutments;
  (ii) Adequate slope protection to protect against surface erosion, wave action, and adverse effects of sudden drawdown;
  (iii) Dikes mechanically compacted to a density sufficient to withstand the range of loading conditions in the CCR unit;
  (iv) Vegetated slopes of dikes and surrounding areas not to exceed a height of six inches above the slope of the dike, except for slopes which have an alternate form or forms of slope protection;
  (v) A single spillway or a combination of spillways configured as specified in paragraph (d)(1)(v)(A) of this section. The combined capacity of all spillways must be designed, constructed, operated, and maintained to adequately manage flow during and following the peak discharge from the event specified in paragraph (d)(1)(v)(B) of this section.
  (A) All spillways must be either:
  (1) Of non-erodible construction and designed to carry sustained flows; or
  (2) Earth- or grass-lined and designed to carry short-term, infrequent flows at non-erosive velocities where sustained flows are not expected.
  (B) The combined capacity of all spillways must adequately manage flow during and following the peak discharge from a:
  (1) Probable maximum flood (PMF) for a high hazard potential CCR surface impoundment; or
  (2) 1000-year flood for a significant hazard potential CCR surface impoundment; or
  (3) 100-year flood for a low hazard potential CCR surface impoundment.
  (vi) Hydraulic structures underlying the base of the CCR unit or passing through the dike of the CCR unit that maintain structural integrity and are free of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris which may negatively affect the operation of the hydraulic structure; and

(vii) For CCR units with downstream slopes which can be inundated by the pool of an adjacent water body, such as a river, stream or lake, downstream slopes that maintain structural stability during low pool of the adjacent water body or sudden drawdown of the adjacent water body.

(2) The periodic assessment described in paragraph (d)(1) of this section must identify any structural stability deficiencies associated with the CCR unit in addition to recommending corrective measures. If a deficiency or a release is identified during the periodic assessment, the owner or operator unit must remedy the deficiency or release as soon as feasible and prepare documentation detailing the corrective measures taken.

(3) The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer stating that the initial assessment and each subsequent periodic assessment was conducted in accordance with the requirements of this section."

3 STRUCTURAL STABILITY ASSESSMENT RESULTS

To develop the assessment presented herein, a review of the available construction documents, soil borings through the dikes, the annual inspections conducted to date by a third-party, qualified professional engineer in accordance with 40 CFR 257.83(b)(1), Cardinal's observations of the dikes, and visual observations from a September 2021 walkdown done by a qualified professional engineer from Sargent & Lundy has been completed. Pursuant to 40 CFR 257.73(d)(1), the standard for this evaluation is consistent with recognized and generally accepted good engineering practices.

3.1 Stable Foundations and Abutments - 40 CFR 257.73(d)(1)(i)

Calculations supporting the Station's Safety Factor Assessment (completed in accordance with 40 CFR 257.73(e)) indicate the soils supporting the exterior dikes of the BAPC meet or exceed the minimum required safety factors to be considered in stable condition for the maximum volume of CCR and CCR wastewater which can be impounded therein. The soils were screened for liquefaction potential and the soils were found to be non-liquefiable.

3.2 Adequate Slope Protection - 40 CFR 257.73(d)(1)(ii)

The slopes of the dikes are adequately protected against surface erosion, wave action, and adverse effects of sudden drawdown.

3.3 Compacted Dikes - 40 CFR 257.73(d)(1)(iii)

As documented by the Station's Safety Factor Assessment (completed in accordance with 40 CFR 257.73(e)), the dikes are adequately compacted to provide the required engineering properties to meet or exceed the minimum required stability safety factors for the required loading conditions.

3.4 Vegetated Slopes - 40 CFR 257.73(d)(1)(iv)

The slopes of the BAPC are regularly maintained and no woody vegetation was observed. They are in compliance with 40 CFR 257.73(d)(1)(iv).

3.5 Spillway - 40 CFR 257.73(d)(1)(v)

Discharge to the Ohio River is through a principal spillway located at the south end of the recirculation pond (a drop outlet and a 36-inch pipe). During normal operation, there is no discharge to the river. All flows are recirculated into the plant via the pump station located on the west side of the recirculation pond.

The combined capacity of the spillway can adequately manage flow during and following the peak discharge from a 1000-year flood for a signification hazard potential CCR surface impoundment.

3.6 Hydraulic Structures - 40 CFR 257.73(d)(1)(vi)

Based on the information reviewed, the discharge pipe does not show any sign of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, or debris which would negatively affect the operation of the hydraulic structure.

3.7 Adjacent Water Bodies - 40 CFR 257.73(d)(1)(vii)

As documented by the Station's Safety Factor Assessment (completed in accordance with 40 CFR 257.73(e)), the downstream slopes of the exterior dikes are appropriate for the flooding risks of the adjacent Ohio River.

4 RESULTS & CONCLUSIONS

This structural stability assessment confirms that the existing CCR surface impoundments, the Bottom Ash Pond and Recirculation Pond, at Cardinal Power Plant – Bottom Ash Pond Complex – have been designed, constructed, operated, and maintained consistent with recognized and generally accepted good engineering practices to provide structural stability for the maximum volume of CCR and CCR wastewater which can be impounded therein.

5 CERTIFICATION

I certify that

- This periodic structural stability assessment was prepared by me or under my supervision,
- This periodic structural stability assessment meets the requirements of 40 CFR 257.73(d) and 40 CFR 257.73(f), and
- I am a registered professional engineer under the laws of the State of Ohio.

Certified By: Syed Ahmed _____ Date: 10/06/2021

Digitally signed by Syed Ahmed
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