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CCR Rule Report: Initial Structural Stability Assessment

For

Ash Pond

At Edwards Power Station

1 Introduction

This Coal Combustion Residual (CCR) Rule Report documents that the Ash Pond at the Illinois Power Resources Generating, LLC Edwards Power Station meets the structural stability assessment requirements specified in 40 Code of Federal Regulations (CFR) §257.73(d), except as noted herein. The Ash Pond is located near Bartonville, Illinois in Peoria County, approximately 0.1 miles west of the Edwards Power Station. The Ash Pond serves as the wet impoundment basin for CCR materials produced by the Edwards Power Station.

The Ash Pond is an existing CCR surface impoundment as defined by 40 CFR §257.53. The CCR Rule requires that an initial structural stability assessment for an existing CCR surface impoundment be completed by October 17, 2016. In general, the initial structural stability assessment must document that the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices.

The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer stating that the initial structural stability assessment was conducted in accordance with the requirements of 40 CFR § 257.73(d). The owner or operator must prepare a periodic structural stability assessment every five years.

2 Initial Structural Stability Assessment

40 CFR §257.73(d)(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 [the standards in (d)(1)(i)-(vii)].

An initial structural stability assessment has been performed to document that the design, construction, operation and maintenance of the Ash Pond is consistent with recognized and generally accepted good engineering practices. The results of the structural stability assessment are discussed in the following sections. Based on the assessment and its results, the design, construction, operation, and maintenance of the Ash Pond were found to be consistent with recognized and generally accepted good engineering practices, and meets the standards in 257.73(d)(1)(i)-(vii), except as noted herein.

2.1 Foundations and Abutments (§257.73(d)(1)(i))

CCR unit designed, constructed, operated, and maintained with stable foundations and abutments.

The stability of the foundations was evaluated using soil data from field investigations and reviewing design drawings, operational and maintenance procedures, and conditions observed in the field by AECOM. Additionally, slope stability analyses were performed to evaluate slip surfaces passing through the foundations and the abutments.

The foundation consists of soft to stiff soil. Slope stability analyses exceed the criteria listed in §257.73(e)(1) for slip surfaces passing through the foundation and abutments. The slope stability analyses are discussed in the *CCR Rule Report: Initial Safety Factor Assessment for Ash Pond at Edwards Power Station (October 2016)*. A review of operational and maintenance procedures as well as current and past performance of the dikes has determined appropriate processes are in place for continued operational performance.

Based on the conditions observed by AECOM, the Ash Pond was designed and constructed with stable foundations. Operational and maintenance procedures are in place to address any issues related to the stability of foundations. Therefore, the Ash Pond meets the requirements in §257.73(d)(1)(i).

2.2 Slope Protection (§257.73(d)(1)(ii))

CCR unit designed, constructed, operated, and maintained with adequate slope protection to protect against surface erosion, wave action and adverse effects of sudden drawdown.

The adequacy of slope protection was evaluated by reviewing design drawings, operational and maintenance procedures, and conditions observed in the field by AECOM.

Based on this evaluation, adequate slope protection was designed and constructed at the Ash Pond. No evidence of significant areas of erosion or wave action were observed. The interior slopes are covered with vegetation in some areas and crushed stone in other areas. The exterior slopes are covered in vegetation with some limited areas of crushed stone. Operational and maintenance procedures to repair the vegetation and crushed stone as needed are appropriate to protect against surface erosion and wave action. Intentional or unintentional sudden drawdown of the pool in the Ash Pond is not expected to occur due to the characteristics of the spillway structure.

Because sudden drawdown conditions are not expected to occur, slope protection to protect against the adverse effects of sudden drawdown is not required. Therefore, the Ash Pond meets the requirements in §257.73(d)(1)(ii).

2.3 Dike Compaction (§257.73(d)(1)(iii))

CCR unit designed, constructed, operated, and maintained with dikes mechanically compacted to a density sufficient to withstand the range of loading conditions in the CCR unit.

The density of the dike materials was evaluated using soil data from field investigations and reviewing design drawings, operational and maintenance procedures, and conditions observed in the field by AECOM. Additionally, slope stability analyses were performed to evaluate slip surfaces passing through the dike over the range of expected loading conditions as defined within §257.73(e)(1).

Based on this evaluation, the dike consists of soft to very stiff material that is stiff on average, which is indicative of mechanically compacted dikes. Slope stability analyses factors of safety exceed the criteria listed in §257.73(e)(1) for slip surfaces passing through the dike. The slope stability analyses are discussed in the *CCR Rule Report: Initial Safety Factor Assessment for the Ash Pond at Edwards Power Station* (October 2016); therefore, the original design and construction of the Ash Pond included sufficient dike compaction and density. Operational and maintenance procedures are in place to identify and mitigate deficiencies in order to maintain sufficient compaction of the dikes to withstand the range of loading conditions. Therefore, the Ash Pond meets the requirements in §257.73(d)(1)(iii).

2.4 Vegetated Slopes (§257.73(d)(1)(iv))¹

CCR unit designed, constructed, operated, and maintained with vegetated slopes of dikes and surrounding areas, except for slopes which have an alternate form or forms of slope protection.

The adequacy of slope vegetation was evaluated by reviewing design drawings, operational and maintenance procedures, and conditions observed in the field by AECOM.

Based on this evaluation, the vegetation on the exterior and interior slopes is adequate as no substantial bare or overgrown areas were observed. Crushed stone is present in some locations on the interior and exterior slopes, which is an alternate form of slope protection. Therefore, the original design and construction of the Ash Pond included adequate vegetation of the dikes and surrounding areas. Adequate operational and maintenance procedures are in place to regularly manage vegetation growth, including mowing and seeding any bare areas, as evidenced by the conditions observed by AECOM. Therefore, the Ash Pond meets the requirements in §257.73(d)(1)(iv).

¹ As modified by court order issued June 14, 2016, *Utility Solid Waste Activities Group v. EPA*, D.C. Cir. No. 15-1219 (order granting remand and vacatur of specific regulatory provisions).

2.5 Spillways (§257.73(d)(1)(v))

CCR unit designed, constructed, operated, and maintained with a single spillway or a combination of spillways configured as specified in [paragraph (A) and (B)]:

(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.*

The spillway was evaluated using design drawings, operational and maintenance procedures, and conditions observed in the field by AECOM. Additionally, hydrologic and hydraulic analyses were completed to evaluate the capacity of the spillway relative to inflow estimated for the probable maximum flood event for the high hazard potential Ash Pond. The hazard potential classification assessment was performed by Stantec in 2016 in accordance with §257.73(a)(2).

The primary spillway is comprised of a drop inlet riser structure that is constructed of either a corrugated metal pipe (CMP) or reinforced concrete pipe (RCP), and a CMP outlet pipe. The CMP and concrete (if present) are non-erodible materials designed to carry sustained flows. The capacity of the spillway was evaluated using hydrologic and hydraulic analysis performed per §257.82(a). The analysis found that the spillway can adequately manage flow during peak discharge resulting from the Probable Maximum Flood storm event without overtopping of the embankments. The hydrologic and hydraulic analyses are discussed in the *CCR Rule Report: Initial Inflow Design Flood Control System Plan for Ash Pond at Edwards Power Station* (October 2016). Operational and maintenance procedures are in place to repair any issues with the spillway and remove debris or other obstructions from the spillway, as evidenced by the conditions observed by AECOM. As a result, these procedures are appropriate for maintaining the spillway. Therefore, the Ash Pond meets the requirements in §257.73(d)(1)(v).

2.6 Stability and Structural Integrity of Hydraulic Structures (§257.73(d)(1)(vi))

CCR unit designed, constructed, operated, and maintained with 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.

Two hydraulic structures are present which pass through the dike of the Ash Pond: the CMP primary spillway outlet pipe and a high-density polyethylene (HDPE) sewer force main. The stability and structural integrity of the pipes were evaluated using design drawings, operational and maintenance procedures, inspections, and conditions observed in the field by AECOM. No other hydraulic structures are known to pass through the dike of or underlie the base of the Edwards Ash Pond.

The evaluation of design drawings and operational and maintenance procedures and conditions observed in the field did not identify any issues with either hydraulic structure. However, the evaluation of the stability and structural integrity of both hydraulic structures has not been fully completed, as high pipe flows in the primary spillway, required for operation of the Edwards Power Station, preclude closed circuit television (CCTV) inspection. Additionally, access issues preclude complete inspection of the sewer force main pipe, although a partial inspection was performed which found the inspected portions of the hydraulic structure to be free of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris that may negatively affect the operation of the hydraulic structure.

Based on this evaluation, the hydraulic structures at the Edwards Power Station cannot be certified to meet the requirements of §257.73(d)(1)(vi) because a complete CCTV inspection of both hydraulic structures has not yet been performed, thus, precluding completion of the evaluation of the stability and structural integrity of the pipes. In accordance with §257.73(d)(2), AECOM recommends that a CCTV pipe inspection of both hydraulic structures be completed as soon as feasible and that this assessment be updated once the inspection is completed.

2.7 Downstream Slope Inundation/Stability (§257.73(d)(1)(vii))

CCR unit designed, constructed, operated, and maintained with, 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.

The structural stability of the downstream slopes of the Ash Pond was evaluated by comparing the location of the Ash Pond relative to adjacent water bodies using published Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs), aerial imagery, and conditions observed in the field by AECOM.

Based on this evaluation, water bodies are not expected to inundate the downstream slopes of the Ash Pond. Although the Ash Pond is shown within the 100-year flood zone for the Illinois River on the FEMA FIRM map for the area, the Ash Pond is located behind a United States Army Corps of Engineers (USACE) levee. The levee was constructed to an elevation of 462 feet, which is 3 feet higher than the 100-year elevation of the Illinois River listed on the FIRM map (459 feet). Therefore, inundation of the downstream slopes is not expected to occur.

Based on this evaluation, the requirements in §257.73(d)(1)(vii) are not applicable to the Ash Pond, as inundation of the downstream slopes is not expected to occur.

3 Certification Statement

CCR Unit: Illinois Power Resources Generating, LLC; Edwards Power Station; Ash Pond

I, Victor A. Modeer, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief that the information contained in this CCR Rule Report, and the underlying data in the operating record, has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the initial structural stability assessment dated October 13, 2016 was conducted in accordance with the requirements of 40 CFR § 257.73(d).

VICTOR A. MODEER JR.
Printed Name

10/13/16
Date



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