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CCR Rule Report: Initial Structural Stability Assessment

For

East Ash Pond

At Hennepin Power Station

1 Introduction

This Coal Combustion Residual (CCR) Rule Report documents that the East Ash Pond at the Dynegy Midwest Generation, LLC Hennepin Power Station meets the structural stability assessment requirements specified in 40 Code of Federal Regulations (CFR) §257.73(d), except as noted herein. The East Ash Pond is located near Hennepin, Illinois in Putnam County, approximately 0.4 miles east of the Hennepin Power Station. The East Ash Pond serves as the wet impoundment basin for CCR material produced by the Hennepin Power Station.

The East 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 East 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 East 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 and abutments 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.

The foundation consists of medium dense to very dense soil, which indicates stable foundations. Slope stability analyses exceed the criteria listed in §257.73(e)(1) for slip surfaces passing through the foundation. The slope stability analyses are discussed in the *CCR Rule Report: Initial Safety Factor Assessment for East Ash Pond at Hennepin 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 East 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 East 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 East Ash Pond. No evidence of significant areas of erosion or wave action was observed. The interior slopes are protected with a geomembrane liner. The exterior slopes are adjacent to the pool level of the downstream East Leachate Pond and East Polishing Pond non-CCR units and either a geomembrane liner (East Leachate Pond) or riprap (East Polishing Pond) is present as slope protection. Vegetation is present on the exterior slopes above the liner and

riprap. The geomembrane liner on the interior and exterior slopes isolates the embankment soils from surface erosion or wave action. Operational and maintenance procedures to repair the vegetation, liner, and riprap as needed are appropriate to protect against surface erosion or wave action. Given the presence of a liner that serves to prevent saturation of the dike's soils below the normal pool, sudden drawdown, as well as the corresponding adverse effects, is not applicable to the interior slopes East Ash Pond and the exterior slopes adjacent to the East Leachate Pond. Sudden drawdown of the exterior slopes adjacent to the East Polishing Pond is not expected to occur due to operational controls associated with the East Polishing Pond, and therefore slope protection to protect against sudden drawdown is not required for the slopes adjacent to the East Polishing Pond. Therefore, the East 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 stiff to hard material, which is indicative of mechanically compacted dikes. Slope stability analyses 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 East Ash Pond at Hennepin Power Station* (October 2016); therefore, the original design and construction of the East Ash Pond included sufficient density and dike compaction. 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 East 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 slopes is adequate as no substantial bare or overgrown areas were observed. Exposed geomembrane liners on the interior and exterior slopes, and riprap on the exterior slopes are used as an alternate form of slope protection, which is adequate as significant tears, defects, or areas of erosion were not observed. Therefore, the original design and construction of the East 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 East 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 spillways were 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 spillways relative to inflow estimated for the 1,000-year flood event for the significant hazard potential East Ash Pond. The hazard potential classification assessment was performed by Stantec in 2016 in accordance with §257.73(a)(2).

The spillways are comprised of a reinforced concrete pipe primary spillway and a secondary spillway consisting of a concrete riser and reinforced concrete outlet pipe, which are non-erodible materials designed to carry sustained flows. The capacity of the spillways was evaluated using hydrologic and hydraulic analysis performed per §257.82(a). The analysis found that the spillways can adequately manage flow during peak discharge resulting from the 1,000-year 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 East Ash Pond at Hennepin Power Station* (October 2016). Operational and maintenance procedures are in place to repair any issues with the spillways 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 spillways. Therefore, the East 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 pass through the dike at the East Ash Pond: the reinforced concrete pipe primary spillway and reinforced concrete pipe secondary spillway. The stability and structural integrity of the pipes was 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 East Ash Pond.

A closed-circuit television (CCTV) pipe inspection of the primary spillway was performed and covered the complete length of the pipe and found the pipe to be free of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris that may negatively affect the operation of the hydraulic structure. Evaluation of design drawings and operational and maintenance procedures for this pipe also did not identify any issues.

The evaluation of design drawings and operational and maintenance procedures and conditions observed in the field did not identify any issues with the secondary spillway pipe. However, the evaluation of the stability and structural integrity of the secondary spillway has not been fully completed because the pipe is full of water, which is required for operation of the Hennepin Power Station and precluded CCTV inspection.

Based on this evaluation, all East Ash Pond hydraulic structures cannot be certified to meet the requirements of §257.73(d)(1)(vi) because a CCTV inspection of the secondary spillway pipe has not yet been performed, thus, precluding completion of the evaluation of the stability and structural integrity of that pipe. In accordance with §257.73(d)(2), AECOM recommends that a CCTV pipe inspection of the secondary spillway 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 East Ash Pond was evaluated by comparing the location of the East 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, the nearest downstream water body is the Illinois River. However, the East Ash Pond is outside of the 100-year flood boundary for the Illinois River, as shown on the FEMA FIRM for the area. The East Ash Pond is adjacent to the downstream East Polishing Pond and East Leachate Pond non-CCR units, however these are not rivers, streams, or lakes, and drawdown of these non-CCR units is discussed in **Section 2.2** of this report, pursuant to §257.73(d)(1)(ii).

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

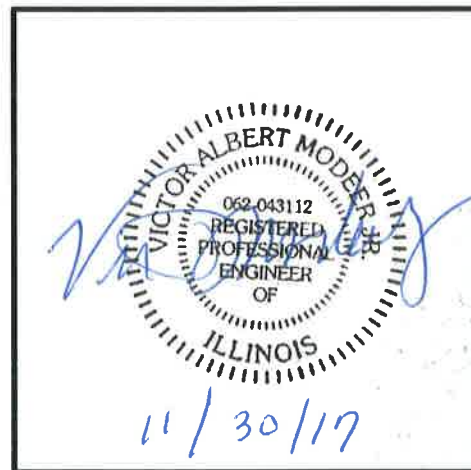
3 Certification Statement

CCR Unit: Dynegy Midwest Generation, LLC; Hennepin Power Station; East 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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