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October 2016

CCR Rule Report: Initial Structural Stability Assessment

For

Bottom Ash Pond

At Baldwin Energy Complex

1 Introduction

This Coal Combustion Residual (CCR) Rule Report documents that the Bottom Ash Pond at the Dynegy Midwest Generation, LLC Baldwin Energy Complex meets the structural stability assessment requirements specified in 40 Code of Federal Regulations (CFR) §257.73(d). The Bottom Ash Pond is located near Baldwin, Illinois in Randolph County, approximately 0.9 miles southwest of the Baldwin Energy Complex. The Bottom Ash Pond serves as the primary wet impoundment for sluiced bottom ash and other non-CCR wastewaters produced at the Baldwin Energy Complex.

The Bottom 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 Bottom Ash Pond is consistent with recognized and generally accepted good engineering practices and meets the standards in 257.73(d)(1)(i)-(vii). 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 Bottom Ash Pond were found to be consistent with recognized and generally accepted good engineering practices.

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.

The foundation consists of soft to stiff clay, which indicates stable foundations. Soil conditions at the abutments were found to be similar to the foundation for the remainder of the Bottom Ash Pond. 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 Bottom Ash Pond at Baldwin Energy Complex* (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 Bottom Ash Pond was designed and constructed with stable foundations and abutments. Operational and maintenance procedures are in place to address any issues related to the stability of the foundations and abutments. Therefore, the Bottom 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 Bottom Ash Pond. No evidence of significant areas of erosion or wave action were observed. The interior slopes are covered with riprap erosion protection in some areas and vegetation in other areas. The exterior slopes are covered in vegetation. Operational and maintenance procedures to repair the vegetation and riprap as needed are appropriate to protect against surface erosion and wave action. Intentional or unintentional sudden drawdown of the pool in the Bottom Ash Pond is not expected to occur due to the characteristics of the spillway structures. 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 Bottom 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, which are discussed in the *CCR Rule Report: Initial Safety Factor Assessment for Bottom Ash Pond at Baldwin Energy Complex* (October 2016), exceed the criteria listed in §257.73(e)(1) for slip surfaces passing through the dike. Thus, the original design and construction of the Bottom Ash Pond included sufficient 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 Bottom 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. Riprap slope protection is present in some areas on the interior slopes and is used as an alternate form of slope protection, which is adequate as significant areas of erosion or bare soil within or around the riprap were not observed. Therefore, the original design and construction of the Bottom 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 Bottom 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 Bottom Ash Pond. The hazard potential classification assessment was performed by Stantec in 2016 in accordance with §257.73(a)(2).

Three separate spillways are present: a high-density polyethylene (HDPE) pipe conduit and riser, a riprap-lined emergency spillway, and a pumping station with HDPE discharge pipes. All of the spillways are constructed with non-erodible materials that are 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 uncontrolled overtopping of the embankments. The hydrologic and hydraulic analyses are discussed in the *CCR Rule Report: Initial Inflow Design Flood Control System Plan for Bottom Ash Pond at Baldwin Energy Complex* (October 2016). Operational and maintenance procedures are in place to repair any issues with the spillways and remove debris or other obstructions from the spillways, as evidenced by the conditions observed by AECOM. As a result, these procedures are appropriate for maintaining the spillway. Therefore, the Bottom 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.

The stability and structural integrity of the hydraulic structure penetrating the dike of the Bottom Ash Pond, the 30-inch HDPE pipe conduit spillway, was evaluated using design drawings, operational and maintenance procedures, closed-circuit televisions (CCTV) pipe 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 Bottom Ash Pond.

The CCTV inspection of the HDPE outflow pipe 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. Operational and maintenance procedures are in place to remove debris or other obstructions from the hydraulic structure, and address any deficiencies, as evidenced by conditions observed by AECOM. As a result, these procedures are appropriate for maintaining the spillway. Therefore, the Bottom Ash Pond meets the requirements in §257.73(d)(1)(vi).

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 Bottom Ash Pond was evaluated using hydraulic and hydrologic analyses, as discussed in the *CCR Rule Report: Initial Inflow Design Flood Control System Plan for Bottom Ash Pond at Baldwin Energy Complex* (October, 2016). This analysis, which considered a 100-year flood condition in the downstream Kaskaskia River, found that the peak water surface elevation of the downstream non-CCR Secondary Pond is 0.6 feet below the elevation of the Bottom Ash Pond embankment toe during 1,000-year Inflow Design Flood conditions. During normal conditions, the pool in the Secondary Pond is approximately 1,000 lateral feet beyond the toe of the Bottom Ash Pond embankment.

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

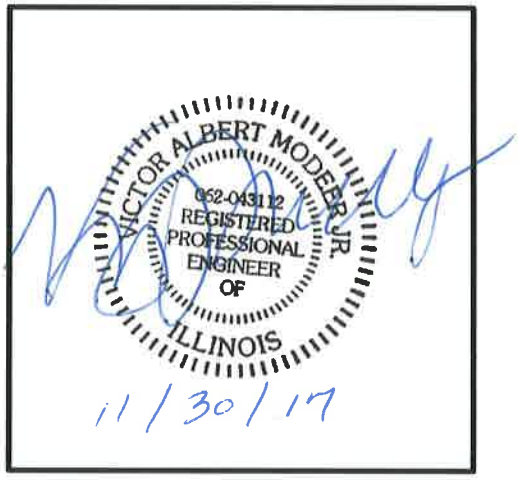
3 Certification Statement

CCR Unit: Dynegy Midwest Generation, LLC; Baldwin Energy Complex; Bottom 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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