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Coal Combustion Residuals Impoundment Liner Design Certification and Retrofit Plan

GenOn Northeast Management Company
Keystone Generating Station
Ash Filter Ponds A, B, and C (No. 0386201)
Shelocta, Pennsylvania

GAI Project Number: C141273.07, Task 002
March 2017

Prepared by: GAI Consultants, Inc.
Murrysville Office
4200 Triangle Lane
Export, Pennsylvania 15632-1358

Prepared for: GenOn Northeast Management Company
121 Champion Way, Suite 300
Canonsburg, Pennsylvania 15317

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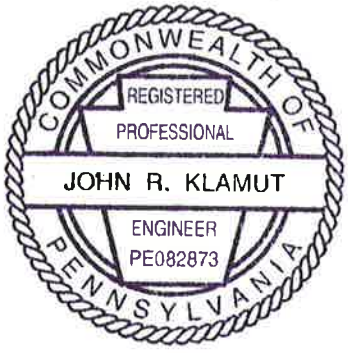
Table of Contents

Professional Engineer's Certification

The Retrofit Plan, including liner design, for the Keystone Generating Station Ash Filter Ponds A, B, and C was prepared by GAI Consultants, Inc. (GAI). This Professional Engineer's Certification is limited to the information available to GAI at the time the Plan was written. On the basis of and subject to the foregoing, it is my professional opinion as a Professional Engineer licensed in the Commonwealth of Pennsylvania that the Plan has been prepared in accordance with good and accepted engineering practices as exercised by other engineers practicing in the same discipline(s), under similar circumstances, at the same time, and in the same locale. It is my professional opinion that the liner design is consistent with the requirements of Title 40 of the Code of Federal Regulations (CFR) Section 257.72, as required by Section 257.72(c); that the liquid flow rate through the lower component of the alternative composite liner is no greater than the liquid flow rate through 2 feet of compacted soil with a hydraulic conductivity of 1 x 10-7 centimeters per second, as required by Section 257.70(c)(2); and that the Plan is consistent with the requirements of Section 257.102(k)(2), as required by Section 257.102(k)(2)(iv). These regulatory sections are portions of the United States Environmental Protection Agency's "Disposal of Coal Combustion Residuals from Electric Utilities," published in the Federal Register on April 17, 2015 with an effective date of October 19, 2015.

The use of the words "certification" and/or "certify" in this document shall be interpreted and construed as a Statement of Professional Opinion and is not and shall not be interpreted or construed as a guarantee, warranty or legal opinion.

John R. Klamut, PE	PE082873
Printed Name of Professional Engineer	Commonwealth of Pennsylvania License Number
Signature of Professional Engineer	3/9/2017
	Date



1.0 Introduction

The Keystone Generating Station is a steam electric generating station located along Crooked Creek in Plumcreek Township, Shelocta, Pennsylvania (PA). The station is jointly owned by the utilities in the Keystone Owners Group, and operated by GenOn Northeast Management Company, a subsidiary of NRG Energy, Inc. The station consists of two 900-megawatt coal-fired units.

Three ash filter ponds are located at the Keystone Generating Station and are operated and maintained under the PA Department of Environmental Protection (PADEP) Water Quality Management Permit No. 0386201. The ash filter ponds consist of Ash Filter Ponds A, B, and C. During station operations, bottom ash is sluiced from the ash hoppers to the hydrobins where the ash particles are allowed to settle. The hydrobin overflow water gravity-flows to a distribution box, which controls the water's routing to the individual ash filter ponds. The hydrobin underflow also gravity-flows to the ash filter ponds when it is periodically drained. The dewatered Coal Combustion Residuals (CCR) are loaded onto trucks for disposal at the Keystone Station Disposal Site. During normal operations, two ponds are in service to handle the hydrobin overflow, and the remaining pond is drained, cleaned, and prepared for service.

2.0 Retrofit Plan

2.1 Retrofit Description

Ash Filter Ponds A, B, and C (ponds) will be retrofitted in accordance with Title 40 of the Code of Federal Regulations Section 257.102 (k)(1). The retrofit activities will include removal of the CCR and sediment in each pond and removal of underlying clay soils that visually appear to have been in contact with CCR. The retrofit will include the placement and compaction of earthen fill to raise the base and crest of each pond, installation of new inlet and outlet structures, and the installation of a PADEP Class I liner system in each pond.

The proposed Class I liner system will be constructed in accordance with Title 25 of the PA Code for Residual Waste Impoundments as follows, from bottom to top:

- Subbase [contaminant resistant (enhanced) geocomposite clay liner (EGCL)].
- Secondary liner [60-mil textured high-density polyethylene (HDPE) geomembrane].
- Geocomposite drainage net and perforated pipe collection system.
- Composite primary liner (EGCL and 60-mil textured HDPE geomembrane).
- 16 ounce per square yard non-woven cushion geotextile.
- Protective cover consisting of a reinforced concrete slab on the pond bottom and a concrete uniform section mat on the pond side slopes.

2.2 Schedule of Retrofit Activities

One pond per year will be taken out of service during replacement, and the pond will be placed back into service immediately following construction. The two ponds that are not being replaced at the time will remain in service to maintain normal operations at the Station. Construction of the retrofit activities for Ash Filter Pond C are scheduled to begin on May 15, 2017 pending receipt of the Water Quality Management Part II Permit amendment from the PADEP for Permit No. 0386201. Pond C retrofit activities are expected to be completed during the 2017 construction season. The Ash Filter Pond B retrofit will be started and completed in 2018, and the Ash Filter Pond A retrofit may be started as early as 2018 and completed by 2019.

2.3 CCR Removal Volume and Area Estimate

Sections 257.102(k)(2)(C) and (D) require that the maximum amount of CCR that will be removed and the maximum area affected as part of the retrofit operation be estimated. Soil, aggregate, and sediment are included in the Ash Filter Ponds A, B, and C volume estimates, as they may be intermingled with CCR. The volumes to be removed were calculated based on the Figure 1 areas of the inner dikes and pond bottoms. The thicknesses of materials to be removed from the pond bottoms include 2.5 feet of bottom ash, 1.5 feet of No. 8 aggregate, and an estimated 6 inches of the clay bottom. The estimated thicknesses of materials to be removed from pond side slopes are 1.5 feet of rock and 6 inches of clay.

The area of each pond affected by the retrofit operation is shown on Figure 2. The bottom, inner dike, crest, and outer dike of each pond will be raised; thus the total area of each pond will be affected. The estimated volumes and areas are summarized on Table 1.

Table 1

Estimate of Volumes to be Removed and Pond Areas to be affected by Retrofit Operations

Ash Filter Pond	CCR and Soils to be Removed (cubic yards)	Pond Areas to be Affected (square feet)
A	4,500	74,500
B	4,500	57,900
C	4,500	64,700
Total	**13,500**	**197,100**

2.4 Retrofit Notifications

In accordance with §257.102(k)(5), GenOn will post a notification of intent to initiate retrofit to the operating record prior to the initiation of retrofit activities. This plan will become part of the Station's operating record. Within 30 days of completion of retrofit activities, a notification of completion of retrofit activities, including certification by a qualified professional engineer, will be posted to the operating record, in accordance with §257.102(k)(6). The retrofit plan and applicable notifications will be posted to GenOn's publicly accessible internet site.

2.5 Liner Design

Section 257.102 (k)(1) requires retrofits to meet liner design criteria of §257.72, which refers to §257.70(c). Under §257.70(c), CCR surface impoundments may be lined with an alternative composite liner which must consist of a geomembrane upper component, and a lower component that is not a geomembrane with a liquid flow rate no greater than the liquid flow rate of 2 feet of compacted soil with a hydraulic conductivity of no more than 1 x 10-7 centimeters per second. Under the Environmental Protection Agency's (EPA) Rule, the liquid flow rate comparison of an alternative composite component, such as a GCL, to that of compacted soil must be determined based on the EPA's equation that includes the hydraulic conductivity of the liner, hydraulic head above the liner, and the thickness of the liner. Based on our calculations, the primary (upper) composite liners of Ash Filter Ponds A, B, and C meet this liquid flow rate comparison. The constructed materials meet the requirements for chemical properties, strength, and side slope shear resistance.

Section 257.72 requires that surface impoundment (pond) alternative liners meet the requirements of 257.70(c). In accordance with §257.70(c)(3), the composite liner will be constructed of materials that meet the requirements for chemical properties, strength, and side slope shear resistance; placed upon a foundation providing adequate support; and installed to cover all surrounding earth likely to be in contact with CCR or leachate. In accordance with 257.72(b), dikes will not be constructed on top of

the composite liner. Certification from a qualified professional engineer that the alternative composite liner has been constructed in accordance with the EPA requirements will be provided upon completion of each pond retrofit, as required by §257.72(d).

3.0 References

Gilbert Associates, Inc. *Existing Ash Filter Pond Liner Installation Plan Drawings (D-781-071, D781-072, and D-781-075).* Prepared for Keystone Generating Station. January 1987.

United States Environmental Protection Agency*. 40 CFR Parts 257 and 60 Hazardous and Solid Waste Management Disposal System; Disposal of Coal Combustion Residual from Electric Utilities,* Final Rule, April 2015.

FIGURES

SIDE SLOPE
23,444 SQ. FT. (3D SURFACE AREA)

POND BOTTOM
15,915 SQ. FT. (2D SURFACE AREA)

ASH FILTER POND C

SIDE SLOPE
22,987 SQ. FT. (3D SURFACE AREA)

POND BOTTOM
15,681 SQ. FT. (2D SURFACE AREA)

ASH FILTER POND B

SIDE SLOPE
24,385 SQ. FT. (3D SURFACE AREA)

POND BOTTOM
15,372 SQ. FT. (2D SURFACE AREA)

ASH FILTER POND A

MAP REFERENCE:
BASE TOPOGRAPHIC MAPPING AND EXISTING SITE FEATURES PROVIDED TO GAI CONSULTANTS, INC. BY NRG AND IS BASED ON A FIELD SURVEY COMPLETED BY NRG IN AUG. 2016.

LEGEND:

1020 EXISTING MAJOR CONTOUR

1019 EXISTING MINOR CONTOUR

SCALE: 1" = 60'

60 0 60 120

REFERENCE ONLY

gai consultants

NO.	DATE	REVISIONS	BY	CHK	APP

DATE: 02/23/2017
BY: BRIARS
CHK: BALSANJ
APP: KLAMUJR
SIZE:
DISCIPLINE:
SCALE: AS SHOWN

nrg

KEYSTONE GENERATING STATION
SHELOCTA, PA

AREAS OF EXCAVATED MATERIAL

ASH FILTER POND RECONSTRUCTION

DRAWING NO.
FIGURE 1
SHEET: 1 OF 1
REV:
FILE: C141273-00-000-00-C-E2-RFIT

POND C
64,690 SQ. FT.

POND B
57,937 SQ. FT.

POND A
74,464 SQ. FT.

ASH FILTER POND C

ASH FILTER POND B

ASH FILTER POND A

MAP REFERENCE:
BASE TOPOGRAPHIC MAPPING AND EXISTING SITE FEATURES PROVIDED TO GAI CONSULTANTS, INC. BY NRG AND IS BASED ON A FIELD SURVEY COMPLETED BY NRG IN AUG. 2016.

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DATE: 02/23/2017
BY: BRIARS
CHK: BALSANJ
APP: KLAMUJR
SIZE:
DISCIPLINE:
SCALE: AS SHOWN

nrg

KEYSTONE GENERATING STATION
SHELOCTA, PA

POND DISTURBANCE AREAS

ASH FILTER POND RECONSTRUCTION

DRAWING NO.
FIGURE 2
SHEET: 1 OF 1
REV:
FILE: C141273-00-000-00-C-E2-RFIT