

December 31, 2015

(via email)

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Subject: **First Annual (2015) CCR Impoundment Inspection Report**
Economizer Ash Pond System – FDEP#20
Tampa Electric Company
Big Bend Power Station
Apollo Beach, FL
AREHNA Project No. B-15-073

As authorized by Tampa Electric Company (TECO) Work Order Number 50204 dated November 19, 2015, AREHNA Engineering, Inc. (AREHNA) is presenting this first Annual CCR Impoundment Inspection Report for the Economizer Ash Pond System at TECO's Big Bend Plant. This report summarizes the findings of the inspections performed by a qualified Professional Engineer at the referenced site in December, 2015.

Project Scope

On April 17, 2015 the Environmental Protection Agency (EPA) published a final rule to regulate the disposal of coal combustion residuals (CCR) as solid waste under Subtitle D of the Resource Conservation and Recovery Act (RCRA). The rule includes requirements for annual inspections (starting within 9 months of rule publication): conducted and certified by a qualified professional engineer, focused primarily on the structural stability of the CCR surface impoundment to ensure that the operation and maintenance of the CCR surface impoundment is in accordance with recognized and generally accepted good engineering standards.

This report documents the inspections of the earthen berms surrounding the three ponds related to the economizer ash system, located at Tampa Electric's Big Bend Power Station. These ponds are filled with water and CCR (economizer ash and pyrites). This inspection was performed by a Professional Engineer in December 2015. Attached to this Annual Inspection Report is an aerial photo outlining the ponds and perimeter earthen berms related to the economizer ash pond system.

The perimeter berms were observed, either while on foot or operating a slow moving motorized vehicle to identify indications of distress, unusual or adverse behavior, or malfunction of each CCR unit. The Professional Engineer used a checklist for the following conditions:

- | | | |
|-----------------------------------|-----------|-------------------|
| ▪ Embankment / Liner Penetrations | ▪ Seepage | ▪ Soil Deltas |
| ▪ Settlement / Subsidence | ▪ Scarps | ▪ Animal Burrows |
| ▪ Vegetation Overgrowth | ▪ Cracks | ▪ Surface Erosion |
| ▪ Liner Deficiencies | ▪ Bulges | ▪ Vandalism |

The visual inspection and evaluation outlined in this inspection report were performed in accordance with generally accepted engineering practice ordinarily used by geotechnical engineers practicing in this area at the time the inspections were made. No other warranty, expressed or implied, is made.

These ponds are also being inspected weekly by TECO personnel. We were provided the opportunity to review weekly inspection reports for the period October 20, 2015 through November 24, 2015. Monthly instrumentation inspections are also being performed by TECO personnel. We reviewed the monthly inspection report dated November 6, 2015; the December monthly instrumentation report had not been submitted for review at the time of our inspection.

Economizer Ash Pond System

As indicated on the attached aerial photo, the economizer ash pond system is located south of Big Bend Road. The economizer ash pond system includes three ponds / storage areas:

North Economizer Ash Pond – This is an active CCR storage area approximately 330 x 710 feet in plan. Approximately the eastern half of the pond currently has exposed CCR materials / vegetation that extend above the water level in the pond.

Economizer Ash Suction Pond – This pond is located west of the north economizer ash pond and is approximately 230 x 340 feet in plan. The plant instrumentation for the water level in the economizer ash pond system is located in this pond. Since the weekly inspections required by the new rule began, the water surface elevation ranged from +26.51 to +27.59 feet (plant datum). We understand this corresponds to +24.51 to +25.59 NAVD88 datum.

South Economizer Ash Pond – This CCR facility no longer actively receives CCR materials; it is approximately 330 x 960 feet in plan. The 2012 survey shows the top of the impounded materials range from elevation +35 feet NAVD88 (west side) to +45 feet (east side) NAVD88. This pond has a perimeter ditch that conveys stormwater runoff to the Long Term Fly Ash pond, by routing along the north, west, and south sides of the impoundment to three drain pipes.

The above information is based on the documents provided to us, including:

- *Bid Specification for Earthwork in Byproducts Storage / Disposal Area*, prepared by Stone and Webster Engineering Corporation, dated 1982. This specification also indicates at least 95 percent of ASTM D-1557 compaction was specified for the structural fill used to construct the berms.
- A 2010 plan for the South Economizer Pond prepared by George F. Young, Inc. showing:



- Inside slopes of 2.6:1 (H:V)
 - Bottom liner at elevation +5 feet (plant datum, + 3 feet NAVD88)
 - Average top of berm top elevation +31.4 feet (plant datum, +29.4 feet NAVD88)
 - Design impounded fill height of +51 feet (plant datum, +49 feet NAVD88)
- A 2012 survey of the area, performed by George F. Young, Inc. The survey shows the top of the economizer ash berms to be slightly above elevation +29 feet NAVD88, which corresponds to slightly above elevation +31 feet in the plant datum system.

Based on the materials provided and discussions with TECO personnel, no hydraulic structures are known to underlay the base of these CCR units, passing through the berms. As indicated above, visible portions of the influent and effluent penetrations were observed / inspected by our engineer.

Findings and Recommendations

This is the first inspection performed under the EPA's CCR rules published April 17, 2015. The slopes of the perimeter berms were generally well maintained with the vegetative overgrowth adequately mowed to permit observation of the slopes and for detection of structural and other concerns, as outlined previously. Representative photos of our operations are attached. No exterior seepage or other critical conditions that would require an immediate response were noted.

In summary, based on the information provided to us and our observations, we certify:

1. A review of aerial photographs dated January 17, 2014 and February 19, 2015, revealed no changes in the geometry of the impounding structures.
2. The plant instrumentation for this system of ponds is located in the economizer ash suction pond. This instrumentation records the water level relative to the plant datum elevation system.
3. The data provided shows that during the period October 20, 2015 through November 24, 2015:
 - a. minimum water elevation: +26.51 feet (plant datum), i.e. +24.51 NAVD88 datum
 - b. maximum water elevation: +27.59 feet (plant datum), i.e. +25.59 NAVD88 datum
 - c. latest water elevation (11/24/15): +27.13 feet (plant datum), i.e. +25.13 NAVD88 datum
4. As indicated in the attached calculations, the calculated storage capacity of the north economizer ash pond is based on:
 - a. a bottom liner elevation of +5 feet (plant datum)
 - b. a water / CCR elevation of +27.5 feet (plant datum)

The resulting storage capacity of the north economizer ash pond is approximately 83 acre feet, and the storage capacity of the economizer ash suction pond is approximately 21 acre feet.

5. The volume of the impounded water and CCR at the time of inspection was calculated as outlined above, resulting in approximately 83 and 21 acre feet in the north economizer ash pond and the



economizer ash suction pond, respectively. Based on the 2012 survey information provided, the south economizer pond has been filled to within 4 to 14 feet of the design top elevation.

6. In our inspection we did not observe any appearances of an actual or potential structural weakness of the economizer ash pond system, or any existing conditions that are disrupting or have the potential to disrupt the operation and safety of the economizer ash pond system and appurtenant structures.
7. This is the first inspection under the referenced rules. As indicated previously, our review of aerial photographs, as well as our site observations, did not reveal recent changes to the economizer ash pond system that may have affected the stability or operation of the impounding structures.

Two areas were noted in the TECO weekly inspections, as well as this inspection, that should be further investigated:

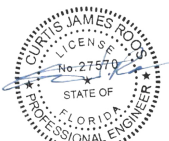
- There is a small bulge in the liner beneath the central pipe that drains stormwater from the previously capped and inactive South Economizer Ash Pond to the Long Term Fly Ash Pond. The reason for the bulge is not readily apparent. Since the bulge is directly below a drainage pipe, we recommend that this area be further inspected.
- The lined inside north-slope of the economizer ash suction pond has an inconsistent slope surface that also resembles a bulge. The water level in the suction pond should be lowered and this area further inspected.

We appreciate the opportunity to support you on this project. If you have any questions with regard to this report, please do not hesitate to contact us at 813.944.3464.

Sincerely,

AREHNA Engineering, Inc.

FLORIDA BOARD OF PROFESSIONAL ENGINEERS CERTIFICATE OF AUTHORIZATION NO. 28410



Digitally signed
by Curtis J Roos
Date: 2016.01.18
15:40:00 -05'00'

Curtis J. Roos, P.E.
Senior Geotechnical Engineer
Florida Registration 27570

A handwritten signature in blue ink that reads "Jessica A. McRory".

Jessica A. McRory, P.E.
Geotechnical Engineer
Florida Registration 68440

Copy to: Zel Jones: ZDJones@tecoenergy.com
Randy Melton: RMelton@tecoenergy.com

Attachments: Earthen Berm Inspection Plan
Photographs
Storage Volume Calculations



ATTACHMENTS

Earthen Berm Inspection Plan
Photographs
Storage Volume Calculations





North Economizer Ash Pond
(north side, looking west)



North Economizer Ash Pond
(east side, looking south)

Photographs

Economizer System Earthen Berm Inspection
TECO Big Bend, FL
AREHNA Project No. B-15-073



AREHNA | Engineering, Inc.

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North Economizer Ash Pond
(south side, looking east)



Economizer Ash Suction Pond
(east side, looking northeast)

Photographs

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Economizer Ash Suction Pond
(south side, looking east)



Economizer Ash Suction Pond
(north side, looking west
at irregular liner surface)

Photographs

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Economizer Ash Suction Pond
(west side, looking east
at embankment penetrations)



Economizer Ash Suction Pond
(west side, looking south
at instrumentation platform)

Photographs

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South Economizer Ash Pond
(east side, looking north)



South Economizer Ash Pond
(south side, looking west)

Photographs

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South Economizer Ash Pond
(south side, looking southwest
at bulge below central pipe discharging
into the Long Term Fly Ash Pond)



South Economizer Ash Pond
(south side, looking southeast
at bulge below central pipe discharging
into the Long Term Fly Ash Pond)

Photographs

Economizer System Earthen Berm Inspection
TECO Big Bend, FL
AREHNA Project No. B-15-073



AREHNA | Engineering, Inc.

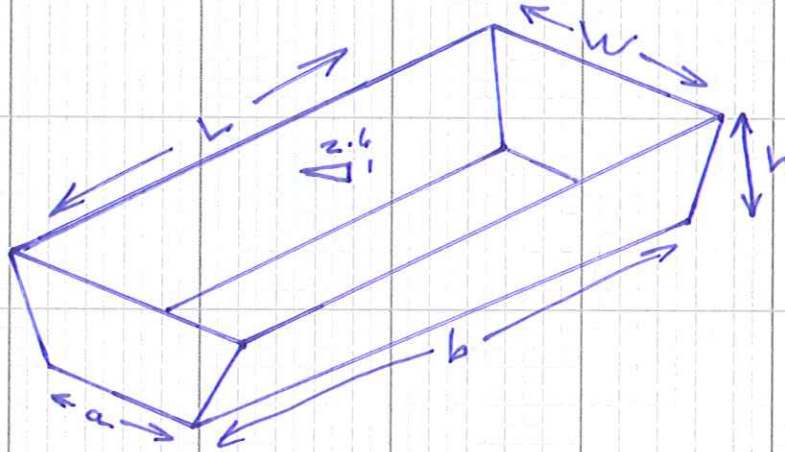
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NTS

NORTH ECONOMIZER ASH POND

USE PLANT DATUM



- TOP OF BANK/ELEV. = +31
- TOP OF WATER = +27.5'
- LINER ELEV. = +5'

$h = 27.5 - 5 = \underline{\underline{22.5}}$ ✓

- AT TOP OF BANK ELEVATION [+31']

LENGTH = 710'
WIDTH = 330'

- WITH 2.6:1 (H:V) INSIDE SLOPES, AT ELEV +27.5'

$L = 710 - 2 [2.6 (31 - 27.5)]$
 $= \underline{\underline{692}}$ ✓

$W = 330 - 2 [2.6 (31 - 27.5)]$
 $= \underline{\underline{312}}$ ✓

$a = 330 - 2 [2.6 (31 - 5)]$
 $= \underline{\underline{195}}$ ✓

$b = 710 - 2 [2.6 (31 - 5)]$
 $= \underline{\underline{575}}$ ✓

RECTANGULAR TRAPEZOIDAL PRISM:

• $V_{\text{Volume}} = h [ab + 0.5(W-a)b + 0.5(L-b)a + \frac{1}{3}(W-a)(L-b)]$
 $= 22.5 [195(575) + 0.5(312-195)575 + 0.5(692-575)195 + \frac{1}{3}(312-195)(692-575)]$
 $= \underline{\underline{3,638,992 \text{ ft}^3}}$ ✓ SAY: 83 ACRE FEET ✓

ECONOMIZER ASH SUCTION POND

- AT TOP OF BANK ELEVATION [+31] PLANT DAMM

$$\begin{aligned} \text{LENGTH} &= 340' \\ \text{WIDTH} &= 230' \end{aligned}$$

$$h = 275 - 5 = \underline{22.5}'$$

- WITH 2.6:1 (H:V) INSIDE SLOPES, AT ELEV +27.5

$$\begin{aligned} L &= 340 - 2 [2.6 (31 - 27.5)] \\ &= \underline{322}' \end{aligned}$$

$$\begin{aligned} W &= 230 - 2 [2.6 (31 - 27.5)] \\ &= \underline{212}' \end{aligned}$$

$$\begin{aligned} a &= 230 - 2 [2.6 (31 - 5)] \\ &= \underline{95}' \end{aligned}$$

$$\begin{aligned} b &= 340 - 2 [2.6 (31 - 5)] \\ &= \underline{205}' \end{aligned}$$

$$\begin{aligned} V &= h (ab + 0.5(W-a)b + 0.5(L-b)a + \frac{1}{3}(W-a)(L-b)) \\ &= 22.5' (95(205) + 0.5(212-95)205 + 0.5(322-205)95 + \frac{1}{3}(212-95)(322-205)) \\ &= 935,730 \text{ SM}^3 \quad \underline{21 \text{ ACRES FEET}} \end{aligned}$$

