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March 23, 2011

**Via E-mail to: hoffman.stephen@epa.gov**

Mr. Stephen Hoffman
U.S. Environmental Protection Agency (5304P)
1200 Pennsylvania Avenue, NW
Washington, DC 20460

**Re: Response to EPA Concerns**
**Burlington Generating Station**
**Confidential Business Information**

Dear Mr. Hoffman:

This letter is sent on behalf of Interstate Power and Light Company's ("IPL") Burlington Generating Station in response to your letter dated March 18, 2011, expressing significant structural stability concerns and requesting a response from IPL by close of business on March 23, 2011. Consistent with our prior submittals, and at least until we reach a mutually satisfactory resolution of these concerns, IPL requests and claims "Confidential Business Information" treatment and protection of this letter and its attachments.

IPL appreciates the United States Environmental Protection Agency's ("EPA") acceptance of its analysis of structural stability for the ash ponds at the Burlington Generating Station. IPL retained Aether DBS in late 2010 to assess the structural condition of the ponds using available subsurface information and new information collected on the soil used to construct the pond embankments. In the assessment, certain issues were identified which indicate that a release of pond contents within the Generating Station property could occur due to either static or earthquake induced liquefaction of the pond embankments or the underlying soil.

The potential for a ***static*** liquefaction failure is limited to the east end of the north slope of the Economizer Ash Pond where the embankment containing the pond appears to be constructed of ash. Because Aether did not find a clay embankment at this section of the Economizer Ash Pond, the analysis for structural stability assumed the embankment is only ash (no clay behind the ash) resulting in a factor of safety lower than accepted standards. Based on engineering judgment, Aether believes that a slope failure of the Economizer Ash embankment in question would result in a release that remains on the Burlington Generating Station Property. The only release to the Mississippi River would consist of water expelled from the Upper Ash Pond during the flow of the economizer ash. Attachment A presents a simplified dam break analysis for a static liquefaction release of economizer ash to support Aether's judgment. IPL hopes that this analysis helps to alleviate some of EPA's concerns.

IPL also believes it helpful to note that it owns the parcel of property immediately to the south of the BGS facility and the main ash pond as shown on the previously submitted site diagram. Attached to this letter is a site drawing showing that IPL (formerly IES Utilities, Inc.) owns the land one mile to the south of the plant along the Mississippi River. Thus, any potential release of ash or water/ash mixture from the Main Ash Pond south of the plant will continue to be on IPL property.

The potential for ***earthquake*** induced liquefaction of the foundation soils under the clay pond embankments on the former Ash Seal Water Pond and Main Ash Pond is dependent on the characteristics of the natural river deposited soil underlying the embankments. A detailed assessment of these soils will be undertaken by Aether to determine the probability of liquefaction. A basic plan for the use of in-situ cone penetrometer methods to determine the cyclic resistance capacity of the natural soils is enclosed in Attachment B. IPL commits to initiating this assessment as soon EPA concurs that the basic plan is reasonable. As with any project of this nature, the scheduling of contractors, analysis of soil results, and drafting of reports will take some time. IPL commits to completing this work as soon as reasonably possible.

Additionally, IPL will take the following actions based on the results of the simplified dam break analysis and present understanding of the structural stability of the Ash Pond systems.

1. In the interim, IPL will retrench the existing flow patterns of the Economizer Ash Pond away from the western embankment, per Recommendation 2 in the Aether Ash Pond Slope Stability and Hydraulic Analysis report. IPL is currently unable to retrench the Main Ash Pond because conditions are too wet to allow for the use of a track hoe. When conditions support use of a track hoe, IPL will similarly retrench.

2. IPL is planning upgrades to increase capacity of the outfall for the Upper Ash Pond to improve freeboard during storm events. IPL expects to have the improvements installed by late 2011 at the latest. While IPL would like to accomplish this work sooner, IPL believes it not practically able to commit to doing so sooner due to necessary construction permitting requirements and the potential for high flooding predicted for this area which would delay on-site work of this nature.

3. IPL will authorize Aether to investigate the cyclic resistance capacity of the soils under the clay embankments on the former Ash Seal Pond, Main Ash Pond, and Upper Ash Pond. Because of high flooding potential, and the need to get equipment on the embankments, the results of this assessment will likely be complete during the Summer of 2011.

4. IPL will authorize Aether to investigate the north bank of the Economizer Ash Pond to identify whether a clay embankment is located in the cross-section of the present slope. Because of high flooding potential, and the need to get equipment on the embankments, the results of this assessment will likely be complete during the Summer of 2011.

5. Upon receipt of Aether's reports, IPL will provide EPA with the results of items 3 and 4 and will conduct a meeting with the EPA to determine if any supplementary actions are necessary and determine the associated implementation schedule.

IPL hopes that this letter responds satisfactorily to the EPA's significant structural stability concerns at the Burlington Generating Station. If you have any questions, please call me at (319) 786-4686. Thank you.

Very truly yours,

Daniel L. Siegfried
Managing Attorney
Alliant Energy Corporate Services, Inc., for
Interstate Power and Light Company

DLS/bap
Attachments

cc: Terry Kouba - AECS
Vernon Hasten – IPL
William Skalitzky – AECS
Timothy Harrington – AETHER DBS

Attachment A

## Simplified Dam Break Analysis

A slope failure in the face of the ash embankment containing the Economizer Ash Pond would shear the ash behind the slope which could liquefy approximately 5,000,000 cubic feet of ash. The liquefied ash would flow into the Upper Ash Pond. The flow would be similar to the flow of water from a sudden dam break. The United States Army Corps of Engineers (USACE) published a simple analytical procedure for determine the initial wave height and velocity in Chapter 16 of EM 1110-2-1420[1]. The dynamic motion of the fluidized ash will be similar to water with the higher viscosity of the fluidized ash slowing the wave motion. Assuming that the wave is water leads to a conservative assessment of the wave height and velocity.

The USACE indicates an initial wave height 4/9 of the depth of water behind the dam (open channel flow energy conservation). The Economizer Ash Pond is 18 feet high from the toe of slope at the intersection with the Upper Ash Pond delta. If the full slope is mobilized, the height of the wave front will be 8-feet. As the wave advances the roughness of the bottom may further reduce wave height. It is approximately 400-feet to the Upper Ash Pond Clay embankment. It is conservative to assume that the wave front will remain 8-feet high as it moves towards the Upper Ash Pond Embankment. A scale cross-section of the Main Ash, Economizer Ash, Upper Ash, and Lower Ash ponds is shown on Figures 2 and 3. The location of the cross-section is shown on Figure 1.

When the 8-foot high wave impacts the clay embankment, it will have a force that is equal to ½ of the mass times the velocity squared. Wiegel[2] presents a simplified method for analysis of the force from a Tsunamis wave. The maximum velocity is 16 ft/sec (2/3 of the square root of 32.2 $ft/sec^2$ times initial height of 18-feet). At the embankment, the pond is 6-feet deep as measured in 2009 and the crest of the embankment is 2-feet above normal pond water elevation. The 8-foot advancing wave is approximately the same height as the Upper Ash Pond embankment.

To determine the impact force the weight of the fluid is assumed as 95 pounds per cubic foot which produces a force of 380 $lb/ft^2$. For an eight foot high embankment and a one foot thick slice the force is 3000 pounds per foot. To resist this force the embankment must slide over a length of approximately 60-foot (3:1 side slopes and 12-foot wide crest). The cohesion of the clay in the embankment is 1000 pounds per square foot (Attachment B-3 to February 3, 2011

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[1] USACE, Engineering and Design – Hydrologic Engineering Requirements for Reservoirs, EM 1110-2-1420, October 1997

[2] Wiegel Robert L., Earthquake Engineering, Prentice Hall, Inc., 1970

report). The resisting capacity is 60,000 pounds per foot which is much greater than the dynamic force from the flowing ash.

The result indicates that the flow will be arrested by the Upper Ash Pond embankment. However, the motion of the wave will push the water in the Upper Ash pond and possibly some of the fluid mud in the Upper Ash Pond over the embankment and into the Lower Ash Pond.

The capacity of the Upper Ash pond is approximately 1,000,000 cubic feet using only the eastern half of the Upper Ash pond for storage. If some ash goes over the Upper Ash pond embankment, the Lower Ash Pond is contained on the north end by a three foot high embankment, see photo below, with a concrete overflow weir. This is the final pond containment prior to discharge to the Mississippi River. The volume of the Lower Ash Pond from the top of the Upper Ash Pond embankment at 531 to the top of the final Lower Ash Pond embankment at 524 is approximately 5,000,000 cubic feet.

The analysis indicates that it is a sound judgment to conclude that the contents of a release from the Economizer Ash Pond will remain primarily in the Upper Ash Pond and that any release over the top of the Upper Ash Pond Embankment will be contained in the Lower Ash Pond. The only unusual event will be a pulse of water flowing to the Mississippi river at the time of the contained ash flow.

Attachment B

Cone Penetrometer Testing to Determine Cyclic Resistance Capacity

Some of the results from the investigation performed in late 2010 and other information on the soils found below the ash ponds at the Burlington Generating Station indicate a potential for liquefaction of the soil during an earthquake with a 2% probability of occurring in 50-years (Landfill Subtitle D Guidance Document Standards). In-situ penetrometer testing using a dutch cone penetrometer (ASTM D5778) is a proven method for determining the cyclic resistance of soil to liquefaction under earthquake loadings. The National Center for Earthquake Engineering Research (NCEER) published a summary of the methods for assessing the liquefaction resistance of soil in the Geotechnical Journal, Youd[3]. The method for using a cone penetrometer was enhance by Moss et al[4] to include probabilistic enhancements based on the world wide database of actual liquefaction experience. The approach to using the tip resistance and sleeve friction for determining a probabilistic prediction of liquefaction resistance will be the method used in assessing the in-situ results at the Burlington Generating Station.

In addition to determining the tip resistance, sleeve resistance, and pore pressure response with depth at the 21 locations shown on Figure 1, discrete samples of soil will be recovered from locations below the clay embankments or in the Economizer embankment. The samples will be tested for Atterberg limits, water content, and grain size. The Atterberg limits test will be used to determine if the soil will liquefy. Soils with a plastic index greater than 12% will not be considered to be liquefiable in an earthquake. Soils with a plastic index less than 12% and with natural water content greater than 80% of the liquid limit will be considered a liquefiable soil.

Soils that are fine sand or silt (SP and SM) or silt (ML) along with the very low plasticity very soft clays will be assessed to determine their cyclic resistance ratio (dynamic shear stress to effective confining pressure ratio). The ratio will be compared to the corrected tip resistance values from the cone penetrometer normalized based on the procedure of Youd and Moss.

During the cone penetrometer testing, extra probes will be installed on the north slope of the Economizer ash pond to determine if a clay embankment is covered in the ash deposit on the face of the slope. If a clay embankment is found, the static structural stability of the embankment will be reassessed and reported with the cyclic resistance results.

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[3] Youd, T. Tl. And I. M. Idriss, Liquefaction Resistance of Soils, Journal of Geotechnical Engineering, April 2001.

[4] Moss R.E.S, R. B. Seed, R.E. Kayen, J.P. Stewart, T.L. Youd, and K. Tokimatsu, Geoengineering Research Report No.n UCB/GE-2003/04, 2003

A final report will be prepared indicating the results of the assessment and if liquefiable soils are confirmed, providing recommendations on in-situ improvements to mitigate the risk of earthquake induced liquefaction.