minnesota power
AN ALLETE COMPANY

Allan S. Rudeck, Jr., Vice President – Generation

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Mr. Stephen Hoffman
US Environmental Protection Agency
Two Potomac Yard
2733 S. Crystal Drive
5th Floor, N-237
Arlington, VA 22202-2733

Dear Mr. Hoffman,

Minnesota Power (MP) has reviewed your letter of January 7, 2011 regarding findings of the May 17, 2010 United Stated Environmental Protection Agency (EPA) inspection of our Boswell Energy Center (BEC) coal combustion residual (CCR) management facilities in Cohasset, Minnesota. In the following paragraphs EPA's (and AMEC) recommendations are restated in their entirety (in italics), followed by Minnesota Power's plan and schedule for follow-up on the EPA the recommendations.

4.2 Hydrologic and Hydraulic Recommendations
Review of Minnesota Administrative Rules for Dam Safety does not indicate storage is required within the pond for any specific rainfall event. Minnesota Power provided a hydrologic calculation summary showing that the 12-inch 48-hour rainfall event can be successfully contained using the wet storage capacity of the Active Ash Pond Complex.

AMEC recommends Minnesota Power determine what rainfall event the Active Ash Pond Complex, Waste Water Treatment Plant Basins and Inactive Bottom Ash Pond are capable of containing. A more complete evaluation would determine the effect of the Probable Maximum Flood (PMF) event on the ash ponds and the Boswell Energy Center site.

MP's understanding of AMEC's recommendations and MP's proposed follow-up actions under Item 4.2 consists of two parts:

1) Determine what rainfall event the Active Ash Pond Complex, Waste Water Treatment Plant Basins and Inactive Bottom Ash Pond are capable of containing.

   Answering this question requires an iterative approach whereby the capacity of the facilities referenced above is compared to inflows from successively larger rainfall events to determine the largest event that these facilities can safely manage. Examples of progressively larger

rain events include events such as: 10-year 24-hour; 25-year 24-hour; 100-year 24-hour, 6-hour Probable Maximum Precipitation (PMP), 24-hour PMP and so on. Minnesota Power will perform this analysis and then present the results as part of a technical memorandum presenting results of all analysis completed in response to the AMEC recommendations and EPA request referenced herein.

2) Determine the effect of the Probable Maximum Flood (PMF) event on the ash ponds and the Boswell Energy Center site.

   Whereas Item 1 relates to water holding capacity of the CCR management facilities, Item 2 entails a broader question of what impacts to CCR management facilities and the BEC site would potentially result from the occurrence of a Probable Maximum Flood (PMF) event at the BEC. This will entail review of PMF event elevations relative to ash pond embankment elevations to evaluate the potential for CCR management facility inundation during a PMF, and will include review of PMF flow velocity relative to the erosion resistance of the CCR management facility embankment slopes. This will also include comparison of the PMF event elevations to the elevations of infrastructure at the BEC. These analyses will be based on readily available PMF elevation, flow velocity and duration data (such as that associated with the Pokegama Dam located just downstream of the plant site) to quantitatively and qualitatively evaluate potential impacts of a PMF event on the CCR management facilities and BEC.

4.3 Geotechnical and Stability Recommendations

AMEC recommends a stability analysis be completed for the Inactive Bottom Ash Pond that includes the maximum design water levels and appropriate steady-state phreatic surfaces. Likewise, the stability analyses should consider all critical stages during the life of the facility, such as maximum pool area and any potential surcharges, as well as likely loading combinations. AMEC recommends that the slope stability analyses include slip surfaces optimization to allow for noncircular failure surfaces. Additionally, for the Wastewater Treatment Plant Basins, Minnesota Power should verify this, including a stability analysis, if appropriate.

MP's understanding of AMEC's recommendations and MP's proposed follow-up actions under Item 4.3 consists of two parts:

1) Perform a slope stability analysis of the Inactive Bottom Ash Pond under conditions of maximum design water levels (which will be coincident with maximum pool area), any potential surcharges, and other likely loading conditions. Analyze for noncircular failure surfaces.

   Since the Inactive Bottom Ash Pond is hydraulically isolated (the tributary area is coincident with the area contained within the perimeter embankments of the pond), it is Minnesota

Power's opinion that the maximum design water levels that applied when the pond was in service are no longer applicable. Rather, Minnesota Power proposes to determine the elevation associated with the maximum water level rise (a.k.a. bounce) predicted to occur within the Inactive Bottom Ash Pond as a result of the 72-hour PMP event. For the resulting pond elevation, embankment stability will be analyzed using soil strength and hydraulic conductivity parameters obtained from material testing performed in conjunction with piezometer and inclinometer installation (ref. Item 4.4 below). We anticipate that seepage and slope stability analysis will be based on a drained shear strength analysis, and that a slope stability safety factor of approximately 1.5 will be acceptable. The selection of the drained shear strength analysis is on the basis of the long period of inactivity for the Inactive Bottom Ash Pond (no embankment loading or unloading, no significant water level increases or decreases within the pond), the likelihood that waters from a 72-hour PMP would drain from the facility slowly, and the resulting opinion that drained sear strengths would predominate.

2) The basis for the requested actions under the second part of Item 4.3 are unclear (*Additionally, for the Wastewater Treatment Plant Basins, Minnesota Power should verify this, including a stability analysis, if appropriate.*).

Minnesota Power and its geotechnical consultant, Barr Engineering, have conferred on this item and the need for and value of slope stability analysis of the Wastewater Treatment Plant Basins (Basins) remains unclear. The Basins are primarily incised in the surrounding landscape as shown on Figure No. 9 of the AMEC Inspection Report to the EPA, with a relatively shallow depth of 14 feet, a maximum differential between the Basin crest embankment elevation and the exterior toe of slope of approximately 4 feet, and a normal freeboard of 2 feet. As such the primary failure modes for the basins consist of an interior slope failure and/or embankment overtopping. Since the plant site infrastructure is inspected on a daily basis (24/7), the probability of overtopping before response actions can be implemented is low. The probability of any type of containment failure is low as evidenced by the Basins having been in service since 1979 with no external dike breach or failure during this time. With these considerations in mind, to efficiently address this portion of the EPA request Minnesota Power will perform a slope stability analysis of the perimeter embankment for the Wastewater Treatment Plant Basins using assumed soil strength parameters derived from soil borings performed at the nearby cooling towers. We will perform the analysis for both full and empty Basin conditions. For this facility both drained and undrained soil shear strength analysis will be performed under the assumption that drained soil shear strength conditions currently exist, and under the assumption that undrained soil shear strength conditions would predominate in the event of rapid drainage of the Basins. A slope stability safety factor of approximately 1.5 will be deemed acceptable for drained soil shear strength

conditions, whereas a slope stability safety factor of approximately 1.3 will be deemed acceptable for undrained soil shear strength conditions.

4.4 Instrumentation Monitoring Recommendations

AMEC recommends additional instrumentation to monitor slope stability and landslide conditions. In order to monitor these parameters, Minnesota Power should install combination slope inclinometers and additional piezometers in the river side dike of each ash pond. These instruments may be installed within the same borehole. Routine monitoring should be established with corresponding elevations within the ash ponds at the time of the measurement in order to establish an understanding of the embankment behavior.

Due to the limited outflow capacities of the ponds, AMEC recommends Minnesota Power create an Emergency Action Plan in the event of the PMF or other significant event. The emergency action plan should relate pool elevation to specific response actions, identify potential emergency conditions and prescribe procedures to be followed to minimize damage.

AMEC's recommendations and MP's proposed follow-up actions under Item 4.4 consist of two parts:

1) Install and monitor slope inclinometers and piezometers in the river side dike of each ash pond.

   Minnesota Power proposes to install piezometers and inclinometers in the river side dike of each ash pond – the Active Ash Pond Complex and the Inactive Bottom Ash Pond.

   Active Ash Pond Complex – inclinometer and piezometer sets will be installed at one riverside embankment cross-section near the southeast corner of Pond 3, near the northwest corner of Pond 4, along the north side of Pond 4, and on the east side of the Bottom Ash Pond. The Pond 3 location is a riverside location; the only Active Ash Pond Complex riverside location where the slope is of a configuration and height that warrants monitoring. The additional locations selected for monitoring include embankment sections with the greatest differential elevation between embankment crest and exterior toe of slope.

   Inactive Ash Pond Complex – inclinometer and piezometer sets will be installed at one riverside embankment cross-section near the eastern end of the pond where the load from ash filling adjacent the embankment is the greatest.

   Piezometer and inclinometer locations will be reported after installation is completed, location is documented via survey, and in conjunction with the submittal of the other information described herein.

Item No.	Activity	Date of Report Submittal to EPA
4.2 Subpart 1	Hydraulic Capacity of Active Ash Pond Complex, Waste Water Treatment Plant Basins and Inactive Bottom Ash Pond.	By September 30, 2011
4.2 Subpart 2	Effect of the Probable Maximum Flood (PMF) event on the ash ponds and the Boswell Energy Center site.	By September 30, 2011
4.3 Subpart 1	Slope stability analysis of the Inactive Bottom Ash Pond.	By September 30, 2011
4.3 Subpart 2	Slope stability analysis of the Wastewater Treatment Plant Basins.	By September 30, 2011
4.4 Subpart 1	Slope inclinometer and piezometer installation and monitoring.	By September 30, 2011
4.4 Subpart 2	Emergency Action Plan (EAP) update.	By September 30, 2011
4.5	Continued annual dam safety inspections.	Not Applicable

Please contact me in the event that you have any questions or suggested revisions to Minnesota Power's planned follow-up activities described herein.

Best regards,

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Vice President – MP Generation

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