

November 23, 2011

Mr. Wayne B. King, P.E. – D2SI Atlanta Regional Engineer
Federal Energy Regulatory Commission
Atlanta Regional Office
3700 Crestwood Parkway, Suite 950
Duluth, Georgia 30096

Serial No. F11-010

Dear Mr. King:

PROJECT NO. P-6335-VA / NATDAM NO. VA83005
NORTH ANNA HYDROELECTRIC PROJECT
PROJECT STATUS FOLLOWING SEISMIC EVENT

On August 23, 2011, at 1351 hours EDT, a 5.8 magnitude earthquake occurred approximately 11 miles WSW of the North Anna Power Station. Immediately following the earthquake and on subsequent days Station Civil Engineers performed visual inspections and tests at the main dam. No adverse conditions were identified. On August 26, 2011, each radial gate was opened one foot and closed to provide assurance the gates would operate in preparations for the arrival of Hurricane Irene. Rainfall from the hurricane did not raise lake level high enough to require radial gate operations. Subsequently, a radial gate was operated on October 14, 2011 and again on October 20, 2011 to discharge water to maintain lake level. No adverse conditions were identified following the gate operations. Project surveys were also performed in October 2011. The results compared satisfactorily to previous survey results. Attachment 1 provides the activities performed to date at the main dam. The Main Dam continues to function as designed protecting the health and safety of the public.

Please contact Michael P. Whalen at (540) 894-2572, should you have any questions concerning this submittal.

Sincerely,



N. Larry Lane
Site Vice President

Commitments: Radial Gate full height opening during 2012 Maintenance Outage
Attachment

U.S. Nuclear Regulatory Commission
Region II
Marquis One Tower
245 Peachtree Center Ave., NE Suite 1200
Atlanta, Georgia 30303-1257

NRC Senior Resident Inspector
North Anna Power Station

Attachment 1
Project No. P-6335-VA
Status Report Following Seismic Event of August 23, 2011

1. Project Inspections

- a) Inspections by Station Civil Engineers were performed on August 23, 24, 25, 26, 2011 and September 1 & 2, 2011.

As part of the post-seismic event response, measurements have been taken from the respective instrumentation systems and plotted to compare with recent and historical measurements.

In general, the piezometer and drainage weir measurements indicate post-seismic levels were within the historical water level fluctuation the specific instrument has measured.

Visual inspections conducted along the embankment did not reveal signs of distress such as sloughing, scarping, slumping, bulging, or abrupt translation on the upstream and downstream slopes. These observations reflecting no readily discernable embankment distress corroborated well with the instrumentation data noted in this document. The concrete spillway along with the radial and skimmer gates were also inspected and deemed to be in satisfactory condition. An additional inspection on the crest area with particular attention to items that are not typically anchored, such as a block supported maintenance trailer, indicated that they remained stable with no readily observable evidence of shifting, sliding, or toppling.

Visual inspections were also performed at Dike VI adjacent to the circulating water intake structure. No damage was identified resulting from the recent seismic events.

- b) On September 2, 2011, Station Civil Engineers were accompanied by several nuclear industry seismic experts for an inspection of North Anna Power Station and Main Dam looking for significant physical or functional earthquake-induced damage. The experts included:

- James R. Martin, Ph.D., Department of Civil Engineering and Environmental Engineering, Virginia Polytechnic Institute (VPI)
- Russell A. Green, Ph.D., Department of Civil Engineering and Environmental Engineering, VPI
- Matthew R. Eatherton, Ph.D., Department of Civil Engineering and Environmental Engineering, VPI
- Martin C. Chapman, Ph.D., Department of Geosciences, VPI

No physical or functional earthquake-induced damage was identified during the Main Dam inspections conducted by the seismic expert review team.

2. Project Tests

- a) Periodic Test Procedure 0-PT-1, Spillway Emergency Diesel Generator (SEDG) was completed satisfactorily on September 2, 2011. The test ensures SEDG start readiness and ability to supply emergency power to the motor control center at the spillway.
- b) Periodic Test Procedure 0-PT-2, Pore Water Pressure Measurement, was completed satisfactorily on August 25, 2011. The test measures pore water pressure within the Lake Anna Main Dam. Pressures from installed piezometer transducers and open-tube piezometers are monitored and used to construct gradients to evaluate seepage through the embankment. Lake level and tail water elevations at the time of post-seismic readings were 249.6' msl and approximately 173' msl, respectively.

PNEUMATIC

<u>Piezometer</u>	<u>Water Level</u>	<u>Previous Water level (6/6/11)</u>
1A	234.2'	232.91'
2A	225.4'	226.24'
3A	221.1'	222.36'
4A	220.3'	220.77'
5A	201.0'	199.72'
8A	203.3'	201.78'
16A	200.7	201.4'
20A	216.6'	218.1'
25A	235.2'	234.64'

OPEN STANDPIPE

<u>Piezometer</u>	<u>Water Level</u>	<u>Previous Water level (6/6/11)</u>
6B	177.7'	176.93'
7B	173.4'	173.18'
9B	199.7'	198.6'
10B	183.2'	183.15'
17B	189.3'	189.46'
21B	219.7'	220.16'
23B	237.6'	237.59'
24B	233.8'	233.78'
26B	232.9'	233.64'
27B	235.1'	235.0'
28B	233.8'	233.9'
29B	235.6'	237.6'
30B	230.9'	232.9'

- c) Periodic Test Procedure 0-PT-3, Drainage Weirs Flow Measurement, was completed satisfactorily on September 1, 2011. The test measures the flow rates through four main drainage weirs to evaluate seepage through the embankment and foundation of the main dam.

<u>Weir</u>	<u>Flow (gpm)</u>	<u>Previous Flow (8/18/11)</u>
1	6.8	6.1
2	1.6	1.3
3	dry	dry
4	6.1	5.5

Lake level elevation at the time of post-seismic readings was 249.8' msl. Calculated water head for Weirs 1, 2, and 4 were 2.3", 1.2", and 2.2" respectively. There were no flow increases > 50 % and no flow variations out of the ordinary.

The manhole openings themselves were in good condition, with no noticeable post-seismic structural effects. No concerns were noted with the drainage weir flow measurements.

Rainfall recorded at the Main Dam from August 23, 2011 through September 1, 2011 was 3.86 inches.

3. Gate Operations Since Seismic Event

a) Tainter (Radial) Gates (1-SP-RG-1A / 1-SP-RG-1B / 1-SP-RG-1C)

August 26, 2011 All three radial gates were opened one foot and closed to ensure operability prior to the arrival of Hurricane Irene.

October 14, 2011 Center radial gate, RG-1B, opened one foot to maintain lake level. (Closed on October 15, 2011)

October 20, 2011 Center radial gate, RG-1B, opened one foot to maintain lake level. (Closed on October 22, 2011)

b) Skimmer Gates (1-SP-SG-1A / 1-SP-SG-1B) Full Height Opening = 7'

August 28, 2011 Skimmer Gate 1A opened seven feet for hydro unit operation. Open through October 11, 2011.

October 13, 2011 Skimmer Gate 1A opened seven feet for hydro unit operation. Open through October 24, 2011.

October 13, 2011 Skimmer Gate 1B opened three feet to maintain lake level.

October 14, 2011 Skimmer Gate 1B opened seven feet to maintain lake level.

Skimmer Gates (continued)

- October 15, 2011 Skimmer Gate 1B closed to three feet to maintain lake level.
Closed on October 17, 2011
- October 29, 2011 Skimmer Gate 1A opened seven feet for hydro unit
operation. Open through November 24, 2011.
- October 31, 2011 Skimmer Gate 1B opened seven feet to maintain lake level.

There were no issues or concerns regarding radial or skimmer gate operations during the above noted manipulations. Full height opening of all three radial gates will be performed during the 2012 Project Maintenance Outage.

4. Project Survey

Periodic Test Procedure 1-PT-8, Main Reservoir - Alignment - Settlement Markers, was completed satisfactorily October 20, 2011. Field survey work was performed October 5 – 8, 2011. The test monitors the vertical and horizontal deformation of the Main Dam. The presence, absence, and/or magnitude of vertical or horizontal movement of the embankment provides an indication of embankment performance and stability.

An elevation and alignment survey is conducted on an annual basis on monuments M-1 through M-17 and reference monuments C and D. Total vertical deformation from 1972 through May 2011 measured at these monuments varied from 0.000 feet to 0.182 feet. A post-seismic survey indicated that total deformations had increased, ranging from 0.001 feet to 0.188 feet. This reflects an elevation change ranging from 0.001 feet to 0.008 feet, or an average change of 0.003 feet. The 0.003 feet compares favorably to the recent historical trend during which year to year average deformations varied from 0.001 feet to 0.0047 feet over the last five years.

During the elevation survey at the main dam monuments, an alignment survey is also conducted so that translations from their original locations perpendicular and parallel to the dam axis can be tracked. Since 1972 through May 2011, total perpendicular translations ranged from 0.021 feet to 0.116 feet and total parallel translations ranged from 0.002 feet to 0.105 feet. Post-seismic survey indicated total perpendicular translations ranging from 0.023 feet to 0.123 feet and total parallel translations ranging from 0.002 feet to 0.117 feet. This represents a perpendicular change ranging from 0.002 feet to 0.007 feet, and a parallel change ranging from 0.000 feet to 0.012 feet between May 2011 and the most recent survey.

The vertical and horizontal deformation survey data corroborates well with inspection observations that did not detect damage. Measured translations are below the

established threshold levels (0.042 feet vertical change and 0.05 feet horizontal change between surveys) for the structures, below what would be readily apparent to visual inspection, and well below what would indicate structural instability.