



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION II  
245 PEACHTREE CENTER AVENUE NE, SUITE 1200  
ATLANTA, GEORGIA 30303-1257

RTI

August 30, 2011

MEMORANDUM TO: Mark Franke, Team Leader  
North Anna Augmented Inspection Team

FROM: Victor M. McCree /RA/  
Regional Administrator

SUBJECT: AUGMENTED INSPECTION CHARTER TO EVALUATE TOTAL  
LOSS OF OFFSITE POWER, DUAL UNIT REACTOR TRIPS  
AND PLANT EQUIPMENT ISSUES FOLLOWING A SEISMIC  
EVENT AT NORTH ANNA

You have been selected to lead an Augmented Inspection Team (AIT) to assess the circumstances surrounding the total loss of offsite power and dual unit reactor trip, 2H emergency diesel generator coolant leak and other plant equipment issues following a seismic event on August 23, 2011, at the North Anna Power Station. Greg Kolcum will be your assistant team leader. The on-site portion of the inspection should begin on August 30, 2011, with the following other team members. Team members may be added as required by the results of the inspection.

- Shakur Walker (RII)
- Ladonna Suggs (RII)
- Rahsean Jackson (RII)
- Yong Li (Sr. Seismologist, NRR)
- Manas Chakravorty (Structural Engineer, NRO)

A. Basis

On August 23, 2011, at 2:03 p.m. EDT, North Anna Power Station declared an Alert due to significant seismic activity onsite from an earthquake which had a measured magnitude of 5.8. The Alert was declared under Emergency Action Level HA6.1 (Other conditions existing which in the judgment of the site emergency manager warrant declaration of an Alert). Both units experienced automatic reactor trips from 100% power and were stabilized in Mode 3. All offsite electrical power to the site was lost. All four emergency diesel generators automatically started, loaded and provided power to the emergency buses. All control rods inserted into the core. Decay heat was removed via the steam dumps to atmosphere.

CONTACT: Gerry McCoy, RII/DRP  
(404) 997-4551

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After the 2H emergency diesel generator (EDG) was started and loaded, a coolant leak developed which required the diesel to be shutdown. The station's blackout (SBO) diesel generator (DG) was subsequently started to power the 2H vital bus. Offsite power sources were subsequently restored. Both units were brought to cold shutdown for further inspection and repairs. Damage to several onsite non-vital transformers was noted by the licensee.

The current best estimate of the Peak Ground Acceleration (PGA) for the North Anna Power Station based on US Geological Survey data and data from the licensee indicated the safe shutdown earthquake ground motion designed limits may have been exceeded for some frequencies. The North Anna Power Station has two Safe Shutdown Earthquake (SSE) ground motion design limits, one for structures, systems, and components (SSCs) located on top of rock of 0.12 g, and the other is for SSCs located on top of soil, of 0.18 g. The site also has two corresponding Operating Basis Earthquake (OBE) ground motion spectra, of 0.06 g for rock and 0.09 g for soil.

In accordance with MD 8.3, "NRC Incident Investigation Program," deterministic and conditional risk criteria were used to evaluate the level of NRC response for this operational event. This issue meets the deterministic criteria of Management Directive (MD) 8.3 in that the ground movement of the earthquake could have exceeded the design bases of the facility. The Conditional Core Damage Probability (CCDP) for the event was estimated to be  $1.1E-4$ , which is in the region of an Augmented Inspection Team (AIT). Because a deterministic criteria was met and the level of risk involved, an AIT was deemed appropriate in this case.

The objectives of this inspection are to: (1) collect, analyze and document factual information and evidence to determine the probable cause(s) as well as the conditions and circumstances relevant to plant equipment issues directly related to the earthquake on August 23, 2011; (2) assess the licensee's actions and plant equipment response during the earthquake and aftershocks; (3) identify any generic issues associated with the event; (4) conduct an independent extent of condition review; and (5) collect information to support the final determination of the risk of significance of the event.

## B. Scope

To accomplish these objectives, the following will be performed:

1. Develop a sequence of events from the time of the earthquake until offsite power was restored to the plant.
2. Collect data to support a determination of the strength of the seismic activity at the plant. This includes information about the maintenance and calibration of the seismic monitoring equipment installed at the plant.
3. Ascertain the actual parameter/trip signal that caused the reactors to trip.
4. Evaluate the performance of the EDGs in response to the earthquake induced loss of offsite power, including the cause of the 2H EDG coolant leak. Identify any anomalies or failures which occurred, including their potential causes.

5. Review the performance of the electrical system of the station.
  - a. Evaluate the electrical perturbations at the site during and after the earthquake, and until offsite power was restored to all emergency buses.
  - b. Evaluate the performance of the supervisory and protection relaying and lockouts.
  - c. Review the performance of the reserve station service transformers in response to the earthquake and the probable cause(s) of the transformers' failure.
  - d. Review the performance of any other transformers which may have failed due to the earthquake.
  - e. Evaluate licensee implementation of vendor recommendations regarding the performance of transformers during earthquakes.
6. Evaluate the on-shift human performance in response to the earthquake.
  - a. Determine whether emergency operating procedures (EOPs) were performed consistent with training.
  - b. Verify that the SBO DG was placed into service consistent with procedures.
  - c. Verify proper and timely response to identifying and reacting to the 2H EDG failure.
  - d. Review the restoration of offsite power through the reserve station service transformers.
  - e. Review the timeliness and adequacy of Emergency Planning declarations during the event.
  - f. Evaluate immediate operator response with regard to the guidance in Regulatory Guide 1.166, Pre-Earthquake Planning and Immediate Nuclear Plant Operator Post Earthquake Actions.
7. Review all plant parameters and sequence of events recorders.
  - a. Identify any unexplained anomalies in plant response or equipment performance during or after the earthquake.
  - b. Assess the licensee's activities related to identification of additional failure mechanisms and damage to safety related equipment due to the event.
8. Review and assess the licensee's operability determinations for safety equipment required to be operable in the current plant condition.
9. Assess the licensee's plans and procedures for evaluating the conditions of the plant prior to restart.
10. Assess the extent of any impact or damage to the Independent Spent Fuel Storage Installation from the seismic event.
11. Collect data to support an independent assessment of the risk significance of the event.

12. Identify any potential generic safety issues and make recommendations for appropriate follow-up actions (e.g., Information Notices, Generic Letters, and Bulletins).

### C. Guidance

Inspection Procedure 93800, "Augmented Inspection," provides additional guidance to be used during the conduct of the inspection. Your duties will be as described in this procedure and should emphasize fact-finding in its review of the circumstances surrounding the event. Safety or security concerns identified that are not directly related to the event should be reported to the Region II office for appropriate action. You will report to the site, conduct an entrance, and begin inspection no later than August 30, 2011. It is anticipated that the on-site portion of the inspection will be completed during the next three weeks. An initial briefing of Region II management will be provided the second day on-site at approximately 3:00 p.m. In accordance with IP 93800, you should promptly recommend a change in inspection scope or escalation if information indicates that the assumptions utilized in the MD 8.3 risk analysis were not accurate. A report documenting the results of the inspection should be issued within 30 days of the completion of the inspection. The report should address all applicable areas specified in section 3.02 of Inspection Procedure 93800. At the completion of the inspection you should provide recommendations for improving the Reactor Oversight Process baseline inspection procedures and the Augmented Inspection process based on any lessons learned.

Inspection Report Number: 05000338, 339/20011011

### D. References

1. NRC Inspection Procedure 93800, Augmented Inspection Team
2. Region II Regional Office Instruction 2271, Augmented Inspection Team Reports
3. Management Directive 8.3, NRC Incident Investigation Program
4. Manual Chapter 0612, Power Reactor Inspection Reports
5. Manual Chapter 0609, Significance Determination Process
6. Regulatory Guide 1.166, Pre-Earthquake Planning and Immediate Nuclear Plant Operator Post-earthquake Actions
7. Regulatory Guide 1.167, Restart of A Nuclear Power Plant Shut Down By A Seismic Event
8. Regulatory Guide 1.12, Nuclear Power Plant Instrumentation for Earthquakes
9. EPRI NP-6695, Guidelines for Nuclear Plant Response to an Earthquake, December 1989
10. North Anna Updated Final Safety Analysis Report, Section 3.7, Seismic Design

M. Franke

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This charter may be modified should you develop significant new information that warrants review. Should you have any questions concerning this charter, contact Gerry McCoy at (404) 997-4551.

Docket Nos. 50-338, 50-339

License Nos. NPF-4, NPF-7

cc: R. W. Borchardt, EDO  
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ADAMS:  Yes      ACCESSION NUMBER: ML11243A021                       SUNSI REVIEW COMPLETE  FORM 665 ATTACHED

OFFICE	RII:DRP	RII:DRP	RII:ORA	RII:ORA			
SIGNATURE	/RA/	//RA/	/RA/	/RA/			
NAME	GMcCoy	RCroteau	LWert	VMcCree			
DATE	8/29/11	8/29/11	8/30/11	8/30/11			
E-MAIL COPY?	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO

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CHARTER.DOCX