

126

**Kulesa, Gloria**

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**From:** Martin, Robert  
**Sent:** Tuesday, September 13, 2011 8:30 AM  
**To:** Boyle, Patrick  
**Cc:** Kulesa, Gloria  
**Subject:** FW: RAI questions  
**Attachments:** North\_Anna\_RAIs.docx

I am working on the letter to send these to Dominion.

**From:** Mendiola, Anthony  
**Sent:** Monday, September 12, 2011 3:49 PM  
**To:** Martin, Robert  
**Subject:** RAI questions

Here you go.

Anthony Mendiola  
Chief, Nuclear Performance and Code Review Branch  
SNPB/DSS/NRR/NRC  
(301) 415-1054

~~D/126~~

North Anna RAI Questions:

1. 1. FANP Topical Report, BAW-10239(P)(A) Revision 0 provides an evaluation of the Advanced Mark-BW fuel assembly in a sample reactor against the criteria defined in the Section 4.2 of the Standard Review Plan (SRP). Section 5.3.4 discusses fuel assembly structural damage from external forces, such as OBE, SSE, as well as SSE + LOCA. The faulted evaluation also addresses both horizontal (LOCA and Seismic) and vertical LOCA effects. Based on the Dominion presentation and the Advanced Mark-BW fuel mechanical design report, the NRC staff is unable to determine the operability of the core internals, specifically of the fuel assemblies (grids, fuel rods, guide tubes) and control rods.

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a) Please provide a comprehensive strategy and qualifying criteria for determining the operability of these components.

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a)b) Provide a comparison of the predicted design basis loads (e.g., local acceleration) on the core internals and fuel assemblies against the predicted loads derived from the measured ground motion data during the seismic event. In addition, compare these predicted loads against the measured yielding load and deflection from the fuel assembly grid crush testing.

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2. Please describe the extent of fuel assembly inspections which will be performed to confirm the structural integrity of the fuel. Please provide specific information on how the inspections will determine that there is no distortion of the fuel lattice array or Control Element Assembly guide tubes that occurred as a result of the seismic event.
3. Please describe the extent of fuel assembly inspections and supporting analysis which will be performed to confirm the thermal hydraulic performance of the fuel. Please provide specific information on how the inspections will determine that there is no deflection of any Fuel Grid Mixing Vanes or any other component that will alter the Thermal Hydraulic performance of the fuel bundle as a result of the seismic event. If any deficiencies are detected, please provide information on the impact on the fuel DNB and CHF calculations.
4. Describe the extent of inspections and testing which will be performed to demonstrate the operability of the control element drive mechanisms.
5. Describe all additional sources of technical information considered in determining the operability and integrity of the fuel.
6. Please provide any nuclear fuel related information that has been gathered considering the EPRI guidance and recommendations found in EPRI NP-6695. Specific information of interest is control rod drive mechanism operability; in-core instrumentation readouts for changes; primary coolant radiation monitor changes; primary coolant flow, temperature, and pressure for changes; loose parts monitoring equipment noise signatures; and primary coolant sample chemistry samples.
7. Please provide the fuel inspection plans and acceptance criteria for the fuel inspections planned for North Anna cores. Include a description of the extent of guide tube drag and CEA drop testing.

8. Please explain the rationale and extent of the operability determinations for the core components (fuel and control rods) and their support systems.

9. Please provide the final root cause analysis report on the cause of the reactor trips.

10. Please describe the extent of inspection on the core shroud to investigate possible changes in local flow conditions (e.g., baffle jetting, change in core bypass flow).

11. Third burned fuel assemblies are generally located along the core periphery in locations where seismic loading is limiting. These assemblies are at end-of-life and would be discharged to the SFP (no reinsertion). Are there any plans to do detailed investigations and measurements (including rod pulls, dismantling, hot cell examinations) on any of the third burned fuel assemblies located at the core periphery of Unit 2?

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## Kulesa, Gloria

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**From:** Martin, Robert  
**Sent:** Tuesday, September 13, 2011 11:06 AM  
**To:** McCoy, Gerald; Hiland, Patrick  
**Cc:** Giitter, Joseph; Kulesa, Gloria; Boyle, Patrick; Khanna, Meena  
**Subject:** NA draft RAIs - Fuel & Reactor Systems  
**Attachments:** RAI Fuel Reac Systems.docx



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION**  
WASHINGTON, D.C. 20555-0001

Mr. David A. Heacock  
President and Chief Nuclear Officer  
Virginia Electric and Power Company  
Innsbrook Technical Center  
5000 Dominion Boulevard  
Glen Allen, VA 23060-6711

**SUBJECT: NORTH ANNA POWER STATION, UNIT NOS. 1 AND 2, REQUEST FOR  
INFORMATION REGARDING THE EARTHQUAKE OF AUGUST 23, 2011 (TAC  
NOS. ME7050 AND ME7051)**

Dear Mr. Heacock:

On September 8, 2011, we met in a public meeting in Rockville, Maryland to discuss the earthquake of August 23, 2011, and its effect on the North Anna Power Station (NAPS). We have reviewed the information provided in the slides provided by the Virginia Electric and Power Company for the meeting and find that we need additional information as identified in the enclosure.

Sincerely,

Robert E. Martin, Senior Project Manager  
Plant Licensing Branch II-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket Nos. 50-338 and 50-339

Enclosure  
cc w/encls: Distribution via Listserv

Mr. David A. Heacock  
 President and Chief Nuclear Officer  
 Virginia Electric and Power Company  
 Innsbrook Technical Center  
 5000 Dominion Boulevard  
 Glen Allen, VA 23060-6711

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Enclosure

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DATE	09/ /11	09/ /11	09/ /11	09/ /11	09/ /11

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VIRGINIA ELECTRIC AND POWER COMPANY (VEPCO)

NORTH ANNA POWER STATION, UNIT NOS. 1 AND 2 (NAPS)

DOCKET NOS. 50-338 AND 50-339

The following requests for information are related to the earthquake of August 23, 2011, that occurred in the vicinity of the NAPS, as discussed in the public meeting held on September 8, 2011. The licensee's presentation materials from that meeting are available in Reference 1. They are grouped according to the format of the Standard Review Plan.

4.0 Fuel :

1. FANP Topical Report, BAW-10239(P)(A), Revision 0, provides an evaluation of the Advanced Mark-BW fuel assembly in a sample reactor against the criteria defined in the Section 4.2 of the Standard Review Plan (SRP). Section 5.3.4 of the topical report discusses fuel assembly structural damage from external forces, such as the operating basis earthquake (OBE), the safe shutdown earthquake (SSE), as well as SSE + loss-of-coolant-accident (LOCA) loads. The evaluation of faulted conditions also addresses both horizontal (LOCA and seismic) and vertical LOCA effects. Based on the availability of information to date from VEPCO's presentation and the Advanced Mark-BW fuel mechanical design report, the Nuclear Regulatory Commission (NRC) staff is unable to determine the operability condition for the core internals, specifically for the fuel assemblies (grids, fuel rods, guide tubes) and control rods.
  - a) Please provide a comprehensive strategy and qualifying criteria for determining the operability of these components.
  - b) Provide a comparison of the predicted design basis loads (e.g., local acceleration) on the core internals and fuel assemblies against the predicted loads derived from the measured ground motion data during the seismic event. In addition, compare these predicted loads against the measured yielding load and deflection from the fuel assembly grid crush testing.
2. Describe the extent of fuel assembly inspections which will be performed to confirm the structural integrity of the fuel. Provide specific information on how the inspections will determine that there is no distortion of the fuel lattice array or Control Element Assembly (CEA) (CE words?) guide tubes that occurred as a result of the seismic event.
3. Describe the extent of fuel assembly inspections and supporting analysis which will be performed to confirm the thermal-hydraulic performance of the fuel. Provide specific information on how the inspections will determine that there is no deflection of any fuel grid mixing vanes or any other component that will alter the thermal-hydraulic performance of the fuel bundle as a result of the seismic event. If any deficiencies are detected, provide

information on the impact on the fuel departure from nucleate boiling ration (DNB) and critical heat flux (CHF) calculations (**are these redundant terms for a W reactor?**).

4. Describe the extent of inspections and testing which will be performed to demonstrate the operability of the control element drive mechanisms.
5. Describe all additional sources of technical information considered in determining the operability and integrity of the fuel, including involvement of the fuel vendors.
6. Provide any nuclear fuel related information that has been gathered considering the Electric Power Research Institute (EPRI) guidance and recommendations found in EPRI report NP-6695 (reference 3). Specific information of interest is control rod drive mechanism operability as related to changes in-core instrumentation readouts; changes in primary coolant radiation monitor values; changes in other parameters such as primary coolant flow, temperature, and pressure; loose parts monitoring equipment noise signatures; and primary coolant chemistry sample results.
7. Provide the plans and acceptance criteria for fuel inspections planned for NAPS cores. Include a description of the extent of guide tube drag and CEA drop testing.
8. Explain the rationale and extent of the operability determinations for the core components (fuel and control rods) and their support systems.
9. Provide the final root cause analysis report on the cause of the reactor trips.
10. Describe the extent of inspections on the core shroud to investigate possible changes in local flow conditions (e.g., baffle jetting, change in core bypass flow).
11. Third burned fuel assemblies are generally located along the core periphery in locations where seismic loading may be limiting. These assemblies are at end-of-life and would be discharged to the spent fuel pool (SFP) (no reinsertion). Are there any plans to do detailed investigations and measurements (including rod pulls, dismantling, hot cell examinations) on any of the third burned fuel assemblies located at the core periphery of Unit 2?

#### 5.0 Reactor systems

1. Describe the evaluations, inspections and analyses of the steam generators (SG) to ensure SG tube integrity? What further work is planned in this area?
2. Discuss provisions to ensure that system pressure relief capabilities are maintained.
3. Discuss measures to verify overall reactor coolant system (RCS) pressure boundary integrity. What have the licensee's observations been so far?
4. Discuss inspections, examinations and evaluations of the emergency core cooling systems that have or will be performed. Discuss assurances that support a conclusion that the ECCS will continue to perform as designed, including ECCS performance under simultaneous design basis earthquake loading per the ECCS design basis seismic requirements? **This needs a bit of work. What are you trying to say?**



5. Were there any complications in residual heat removal (RHR) following the earthquake? Did all RHR equipment perform as intended?
6. Discuss assessments of the reactor trip system, including its actuation circuitry and its mechanical components. How will the licensee ensure the RCCAs (**or CEAs – do they have both?**) and the guide tubes retain their required functionality?

References:

1. VEPCO presentation materials for public meeting of September 8, 2011, ADAMS No.ML11252A006.
2. FANP Topical Report, BAW-10239(P)(A) Revision 0 **Need full title, date, adams number**
3. EPRI NP-6695, "Guidelines for Nuclear Plant Response to an Earthquake," December 1989.