

August 24, 2015

MEMORANDUM TO: Robert J. Pascarelli, Chief
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

FROM: John J. McHale, Chief */RA/*
Vessels and Internals Integrity Branch
Division of Engineering
Office of Nuclear Reactor Regulation

SUBJECT: NORTH ANNA POWER STATION, UNIT NOS. 1 AND 2,
EVALUATION OF INFORMATION RELATED TO
COMMITMENTS 6 AND 8 FROM CONFIRMATORY ACTION
LETTER NO. NRR-2011-002 (TAC NOS. MF1807 AND MF1808)

By letter dated May 13, 2013, the Virginia Electric and Power Company (doing business as Dominion), the licensee for North Anna Power Station (NAPS), Unit 1 and Unit 2, submitted information to address long term actions identified in its letter dated November 7, 2011 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML11314A069), and confirmed by the U.S. Nuclear Regulatory Commission (NRC) in Confirmatory Action Letter (CAL) No. NRR-2011-002 (ADAMS Accession No. ML11311A201) issued by the NRC on November 11, 2011. The Vessel & Internals Integrity Branch (EVIB) evaluated information intended to address Commitment 6 and Commitment 8 from the CAL, provided in the licensee's May 13, 2013 letter (ADAMS Accession No. ML13135A637). Commitment 6 states [t]he licensee will develop a plan with the NSSS [Nuclear Steam Supply System] vendor consisting of additional evaluations or inspections, as warranted, to assure long term reliability of the reactor internals. Commitment 8 states [t]he licensee will perform inspections at North Anna Power Station in accordance with the latest [Materials Reliability Program] MRP-227 revision approved by the NRC.

EVIB has completed its evaluation of the information provided by the licensee related to Commitment 6 and Commitment 8. EVIB's evaluation of information related to Commitment 6 only included the inspection aspects, not the structural or seismic evaluations. EVIB found that the additional inspections for seismically-induced damage related to Commitment 6 provide

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reasonable assurance that there has been no damage due to the 2011 earthquake that would impact the function of the RVI, and no additional inspections beyond those required by existing programs are warranted. EVIB found that the licensee has provided sufficient information to close Commitment 8, as detailed in the enclosure.

Docket Nos.: 50-338 and 50-339

Enclosure:
Evaluation of Information

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ADAMS Accession Number: ML15232A811

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EVALUATION OF INFORMATION RELATED TO
COMMITMENT 6 AND COMMITMENT 8 FROM
CONFIRMATORY ACTION LETTER NO. NRR-2011-002
NORTH ANNA POWER STATION, UNITS 1 AND 2
VIRGINIA ELECTRIC & POWER COMPANY

Commitment 6

Commitment 6, as captured in Confirmatory Action Letter No. NRR-2011-002 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML11311A201), stated [t]he licensee will develop a plan with the NSSS [Nuclear Steam Supply System] vendor consisting of additional evaluations or inspections, as warranted, to assure long term reliability of the reactor internals.

Licensee Evaluation

In Attachment 1 to its May 13, 2013 letter, (ADAMS Accession No. ML13135A637), the licensee stated that it performed a systematic review of the previous evaluations, U.S. Nuclear Regulatory Commission (NRC) correspondence, and inspections of the reactor vessel internals (RVI) that were performed following the August 23, 2011 earthquake. The licensee further stated that data and rationale for future planned programmatic inspections were considered and included input from Westinghouse, the NSSS vendor, and that results of the prior activities were summarized and evaluated regarding their demonstration of RVI integrity. As a result of the evaluation, the licensee concluded the RVI remain capable of reliably performing their function in the future. The licensee stated that [f]urthermore, RVI inspections performed during the spring 2012 Unit 1 refueling outage did not identify any seismically induced issues. The licensee finally stated that [t]herefore, it was concluded that developing a plan consisting of additional inspections and evaluations of the RVI beyond those already required by existing programs is not warranted for assuring the long term reliability of the RVI.

Staff Evaluation

The licensee stated that it performed inspections of the RVI during the 2012 Unit 1 refueling outage and did not identify any seismically induced issues. The staff considers seismically induced issues to include such conditions as visible distortion, missing or loose parts, or cracked or fractured components.

The licensee's May 13, 2013 letter provided little detail on the RVI inspections. However, previous correspondence related to post-earthquake inspections provided additional information on RVI inspections. The staff reviewed information in the licensee's October 3, 2011 letter (ADAMS Accession No. ML11277A270) which reported the results of inspections of certain RVI components in North Anna Power Station (NAPS), Unit 2, performed after the earthquake. These inspections included recording the height of the upper internals and comparing to the same measurement taken in 2010, which confirmed the fuel assembly nozzle springs lift the upper internals to the nominal position (i.e., there is no significant binding of components). The licensee also reported there was no difficulty engaging the upper internals lift rig, no rod cluster control assembly anomalies, and no anomalies related to insertion or retraction of flux thimbles. Video inspections were also performed that showed no fuel assembly

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interferences and no damage to peripheral fuel assemblies, which would be most sensitive to seismically-induced damage. The licensee's October 10, 2011 letter (ADAMS Accession No. ML11286A018) summarized additional inspections performed on the NAPS, Unit 2 RVI in 2011, following the earthquake. The licensee provided a table with its selection criteria for the inspections and the potential adverse conditions on which the inspections would focus. The components selected were generally those judged to be most sensitive to seismic damage, and did not include items that required the removal of the lower internals. These inspections were supplementary to the those recommended by "Materials Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guidelines (MRP-227-A)," and did not include all the inspections specified by MRP-227-A. However, the MRP-227-A inspections are intended to look for effects caused by long term aging mechanisms such as stress corrosion cracking , irradiation-assisted stress corrosion cracking (IASCC), void swelling and irradiation-assisted stress relaxation, rather than damage caused by short-term loading events such as earthquakes. Earthquake loading would tend to affect different components than those most likely to be affected by age-related mechanisms. Therefore, the staff finds the components inspected were selected appropriately.

The NAPS, Unit 2 inspections were performed on a best-effort basis using remote video equipment and reviewed by Level 3 nondestructive examiners. No adverse conditions were noted by the licensee in these inspections.

The licensee's October 10, 2011 letter also discussed the possibility that RVI components are likely to be less ductile due to long term neutron irradiation, and could also have preexisting cracks due to IASCC, particularly in baffle-former bolts for which operating experience has shown this can occur. However, the licensee compared the susceptibility of NAPS baffle-former bolts to those at Surry, in which inspections found a very low incidence of cracking even though the bolt material (Type 347 stainless steel) is known to be more susceptible than the NAPS, Unit 1 and 2 bolt material (Type 316 stainless steel). Therefore, the licensee concluded that it was unlikely widespread bolt cracking was present prior to the earthquake. The licensee also pointed out that the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI Category B-N-3 inspection was most recently performed in 2010 on the NAPS, Unit 2 RVI, finding no relevant conditions. The licensee also stated that [c]omparison with the 2010 10-year ISI inspections showed no observable changes to the condition of the internals, post-seismic event, compared to the condition in 2010. The licensee therefore stated [i]t is therefore concluded that no seismic-related damage occurred to NAPS, Unit 2 as a result of the seismic event. The licensee also indicated that NAPS, Unit 2 was more susceptible to baffle-former bolt failure and baffle jetting than NAPS, Unit 1, because Unit 1 was converted to upflow in the baffle region in 1996. Therefore, NAPS, Unit 2 was expected to bound NAPS, Unit 1 with respect to the potential for seismic damage.

Although the licensee stated in its May 13, 2013 letter that RVI inspections in NAPS, Unit 1 in 2012 did not identify any seismically-induced issues, the licensee did not state that it inspected the same set of seismically sensitive RVI components that were inspected at NAPS, Unit 2 prior to restart in 2011. However, NAPS, Unit 1 conducted refueling outages in spring 2012 and fall 2013, which necessitated removing the upper internals. Any significant damage to the upper internals or the inner surfaces of the lower internals, such as the baffle-former assembly and lower core plate, would probably have been noted.

The staff notes that those RVI classified as core support structures are required to be visually inspected every ten years under the ASME Code, Section XI, IWB-2500, Examination Category B-N-3. In addition, the licensee has committed to perform the augmented inspections of MRP-227-A as detailed in its resolution of CAL Commitment 8 discussed in the next section. Therefore, these existing programs manage long-term aging of the RVI and should detect any issues not detected by the post-earthquake inspections.

Conclusion

The staff reviewed the supplementary inspections that were performed by the licensee at NAPS, Unit 2 in 2011, and finds that these inspections provide reasonable assurance that there has been no damage due to the 2011 earthquake that would impact the function of the RVI. The staff's finding is based on the fact that the licensee selected the most seismically sensitive components in the reactor more likely to have pre-existing aging damage, the low likelihood of extensive aging damage before the earthquake, and the lack of change from pre-earthquake inspection results. For NAPS, Unit 1, the access to the RVI during the refueling outages would have allowed identification of any significant seismic damage. Therefore, the staff concludes that additional inspections of the RVI beyond those required by existing programs are not warranted.

Commitment 8:

Commitment 8, as captured in Confirmatory Action Letter No. NRR-2011-002 (ADAMS Accession No. ML11311A201), stated [t]he licensee will perform inspections at NAPS in accordance with the latest MRP-227 revision approved by the NRC.

Licensee Evaluation

In Attachment 1 to its May 13, 2013 letter (ADAMS Accession No. ML13135A637), the licensee stated that the status of this commitment is complete, and that the inspection plan has been finalized and is included in Attachment 2 to [the licensee's May 13, 2013 letter].

In Attachment 2 to its May 13, 2013 letter, the licensee stated in part that it is providing its inspection plan for RVI, which conforms to MRP-227-A. The licensee further stated that [b]ased on the results of the inspection of the NAPS Unit 2 reactor vessel internals performed post-earthquake (fall of 2011), no additional inspections or evaluations beyond the planned MRP-227 inspection are deemed necessary. The licensee also stated that [t]he plan identifies the scope and schedule of the NAPS examinations to meet the requirements of MRP-227-A. The licensee further stated that the Unit 1 and 2 reactor internal components are in line with the Westinghouse design requirements of the material reliability program. The licensee further stated that [s]pecific evaluations and any analyses required will be performed as needed to support the scheduled examinations and the applicable Licensee Action Items identified in the December 16, 2011 Safety Evaluation for MRP-227, and that [a]t this time, there are no expected deviations from the recommendations of MRP-227-A, as approved by the NRC. Finally, the licensee stated that [t]he inspection scope is preliminary and may vary within the limits of the approved version of MRP-227 applicable at the time the examinations are required. Attachment 2 to the May 2013 letter also contains tables listing the "Primary" and "Existing Programs" inspections to be performed on the NAPS Units 1 and 2 RVI in accordance with

MRP-227-A. These tables list the component, examination method, required examination coverage and acceptance criteria, expansion link, and schedule for initial examinations.

Staff Evaluation

The staff reviewed the licensee's inspection tables provided in Attachment 2 to its May 13, 2013 letter. The staff found the information for the "Primary" and "Existing Programs" category inspections, including the component, examination method, required examination coverage and acceptance criteria, expansion link, and schedule for initial examinations, is all consistent with the corresponding information in Table 4-3, "Westinghouse Plants Primary Component Inspections," and Table 4-9, "Westinghouse Plants Existing Programs Inspections," from MRP-227-A. The licensee did not provide a table providing the detailed information for the "Expansion" category components (component, examination method, required examination coverage, and acceptance criteria). However, based on its statement that at this time there are no expected deviations from MRP-227-A, the staff expects that the licensee will perform the "Expansion" category inspections in accordance with the scope, schedule, and inspection methods described in MRP-227-A, if the inspection results for any "Primary" category components indicate degradation triggering the expansion criteria.

Conclusion

Based on the fact that the licensee's planned RVI inspections are consistent with those specified in MRP-227-A, combined with the licensee's statement that it will implement its RVI Inspection Program consistent with MRP-227-A with no deviations, the staff finds that the licensee has adequately addressed Commitment 8.