



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

July 24, 2019

Mr. Daniel G. Stoddard
Senior Vice President and Chief Nuclear Officer
Innsbrook Technical Center
5000 Dominion Boulevard
Glen Allen, VA 23060-6711

SUBJECT: U.S. NUCLEAR REGULATORY COMMISSION IN-OFFICE REVIEW AND
NOTICE OF VIOLATION – DOMINION ENERGY SERVICES, INC.

Dear Mr. Stoddard:

This letter refers to the U.S. Nuclear Regulatory Commission's (NRC's) in-office review and results of an inspection performed on August 23, 2018, concerning a change to the Virginia Electric and Power Company (VEPCO), North Anna Power Station (NAPS), Independent Spent Fuel Storage Installation (ISFSI), Safety Analysis Report (SAR), Revision 10 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18131A227), applicable to Materials License No. SNM-2507, Revision 5 and Docket No. 72-16. The office review focused on the high burn-up (HBU) TN-32B demonstration cask, specifically the cask lid bolt qualification under the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME NB-2300), and a Title 10 of the *Code of Federal Regulations* (10 CFR) 72.48 evaluation that was performed for the HBU cask lid bolt material.

Based on the results of the review of records, "10 CFR 72.48 Evaluation No. ETE-NAF-2017-0138, Revision 0," dated October 26, 2017, as well as, an NRC inspection performed at your corporate office, the NRC has determined that a violation of NRC requirements occurred. This violation involves a change Dominion Energy Services, Inc. (Dominion) made that resulted in 1) more than a minimal increase in the likelihood of occurrence of a malfunction, and 2) a change to a method of evaluation described to the NAPS ISFSI SAR in which Dominion should have sought NRC approval via an amendment to the licensing basis of the TN-32B HBU cask. The change involved the addition of an ASME Code Exception to the ISFSI SAR to remove the ASME Code requirement to meet minimum impact toughness criteria for the lid closure bolts of the TN-32 HBU Dry Storage Cask. The SAR revision was made after the procured lid bolts for the TN-32 HBU Dry Storage Cask failed to meet the ASME impact testing requirements, in part because the bolt supplier could not meet the required minimum 25 mil lateral expansion at the lowest service temperature of -29°C (-20°F).

The NRC has concluded that a change to the licensing basis would result in a license amendment because Dominion failed to demonstrate/acknowledge that the bolts 1) are not fracture critical, 2) be ductile via passing the ASME toughness tests, and 3) measured ductility was sufficient to meet the intent of the bolt stress calculation method.

The staff noted that Dominion's 72.48 Evaluation concluded that bolts do not need to meet impact toughness requirements because they are not fracture critical. In making this conclusion, Dominion cited the NRC endorsement of portions of NUREG/CR-1815, "Recommendations for Protecting Against Failure by Brittle Fracture in Ferritic Steel Shipping

Containers Up to Four Inches Thick." The NRC does not concur with your determination that NUREG/CR-1815 states that all bolts do not need to meet impact-testing requirements. Although NUREG/CR-1815 states that bolts are not considered fracture-critical components, the document acknowledges that this statement is not true for all cases. NUREG/CR-1815 states "...in cases where a particular bolt is determined to be a fracture-critical component, the toughness requirements for that bolt should be specified at the same category level as other components of the system." Dominion's 72.48 Evaluation did not include an analysis to determine if the lid bolts are fracture critical (e.g., evaluate the potential for bolt fracture in the absence of minimum toughness standards and evaluate if the fracture of one or more bolts would impact the closure lid's containment function). In addition, the staff noted that the NRC endorsement of portions of NUREG/CR-1815 is applicable only to material with a maximum yield strength of 100 ksi, when in fact; the subject lid bolts have a yield strength of approximately 160 ksi.

The stress analysis of bolts in the TN-32B High Burnup Cask amendment request uses a methodology described in NUREG/CR-6007, "Stress Analysis of Closure Bolts for Shipping Casks," that requires that bolts meet the ASME Subsection NB impact toughness testing criteria. The staff noted that NUREG/CR-6007 also states, "A ductile material behavior is also implicitly required by the bolt force/moment analysis methods presented in this report." and "...the present analysis methods are not adequate for the stress analysis for bolted closures made of brittle material." Dominion did not perform testing or analysis to demonstrate that the bolt material had sufficient toughness to meet the requirements of the methodology. In its 72.48 Evaluation, Dominion concluded that the -29°C (-20°F) lowest service temperature in the SAR design basis was an impractical assumption because the decay heat of the cask would preclude the bolts from ever reaching that low temperature. The staff noted that Dominion did not provide any quantitative analysis of the temperature of the bolts with the addition of decay heat. Without such analysis of the bolt temperatures, it is not clear to the staff how Dominion reached a conclusion that the lowest service temperature stated in the SAR was an unreasonable assumption.

In addition, the staff noted that the bolt supplier performed impact testing at a temperature higher than the lowest service temperature (-12°C, +10°F), and the measured toughness at the higher temperature met the ASME threshold in testing of one bar, but failed to meet the threshold for the second bar tested. As stated above, the 72.48 Evaluation did not include a quantitative analysis that would support the validity of using impact test properties at the higher temperature, including the consideration that one bar tested at -12°C (+10°F) still fell short of the ASME requirements.

Further, Dominion determined that bolts were sufficiently ductile to meet the intent of NUREG/CR-6007 due to the "reduction of area" measurement in the tensile testing of the bolt material. However, the staff noted that reduction of area is not a measure of a material's ability to absorb energy in a high strain rate impact and thus the ASME Code does not allow such a tensile test measurement to be used as a substitute for impact testing.

The staff noted, upon immediate discovery, Dominion entered the lid bolt nonconformance condition into their corrective action program as a condition adverse to quality (Condition Report No. 1125821). Dominions corrective actions taken include planned actions to: (1) address process/program/procedure/concerns that allowed this to occur and to initiate improvements, (2) develop and implement a plan to redefine the lowest service temperature for the lid bolts based on actual temperature measurements from the cask loading campaign, and complete thermal analyses that include decay heat from the cask, (3) retest a sample of bolt material at a more

realistic and conservative service temperature to confirm that adequate ductility is present in the lid bolts, and (4) revise or write a new engineering technical evaluation and 72.48 and any other necessary documentation to restore full qualification on all lid bolts. The staff noted that until compliance is restored and to address compensatory measures, Dominion performed an operability determination the resultant of which concluded that the TN-32B HBU remains operable, in part, because: (1) the cask exhibits no indication of problems or confinement leaks since being transferred to the ISFSI in November 2017, (2) the cask lid seals are monitored continuously and connected to an alarm panel to assure compliance with ISFSI Technical Specification 3.1.4 requirements for confinement integrity, and (3) the lid bolts in question continue to perform all of their design functions, but are considered nonconforming until additional confirmatory testing and requisite revision of 10 CFR 72.48 Evaluation No. ETE-NAF-2017-0138 is completed.

Based on the results of this inspection, the NRC has determined that a Severity Level IV violation of NRC requirements occurred. The NRC has evaluated the violation under the risk significance determination process as having very low safety significance. Because Dominion initiated a condition report (CR1125821) to address this issue and because the violation is not repetitive nor willful, this violation is being treated as a Non-Cited Violations (NCV), consistent with Section 2.3.2 of the Enforcement Policy. The NCV is described in the subject inspection report. If you contest the violation or significance of the NCV, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington DC 20555-0001, with copies to: (1) the Regional Administrator, Region II; (2) the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and (3) Margaret Tobin, Senior Resident Inspector at the North Anna Power Station facility.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response, if you choose to provide one, will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's ADAMS, accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>. To the extent possible, your response should not include any personal privacy or proprietary information so that it can be made available to the Public without redaction.

D. Stoddard

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If you have any questions, please contact Earl Love at (301) 415-7011 or by e-mail at Earl.Love@nrc.gov.

Sincerely,

/RA/

Christian Araguas, Chief
Inspections and Operations Branch
Division of Spent Fuel Management
Office of Nuclear Material Safety
and Safeguards

Docket Nos.: 72-16, 50-338 and 50-339

Enclosure:
Notice of Violation

cc: MTobin, SRI NAPS
N. L. Lane, VEPCO
J. Jenkins, VEPCO
W. S. Blair, Dominion

D. Stoddard

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SUBJECT: U.S. NUCLEAR REGULATORY COMMISSION IN-OFFICE REVIEW AND
NOTICE OF VIOLATION, DOCUMENT DATE: July 24, 2019

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NOTICE OF VIOLATION

Dominion Energy
5000 Dominion Blvd
Glenn Allen VA

Docket No. 72-16
Materials License No. SNM-2507, Revision 5

Based on the results of a U.S. Nuclear Regulatory Commission (NRC) in-office review and results of an inspection performed on August 23, 2018, a violation of NRC requirements was identified. In accordance with the NRC Enforcement Policy, dated August 1, 2016, the violation is listed below:

Title 10 of the *Code of Federal Regulations* (10 CFR) 72.48 (c)(1)(i)(C), "Changes, tests, and experiments," requires, in part, that a licensee may make changes in the facility or spent fuel storage cask design as described in the FSAR (as updated), make changes in the procedures as described in the FSAR (as updated), and conduct tests or experiments not described in the FSAR (as updated), without obtaining a license amendment pursuant to § 72.56 if the change, test, or experiment does not meet any of the criteria in paragraph (c)(2)(i-viii).

Contrary to the above, as of October 26, 2017, Dominion implemented a change to the North Anna Power Station (NAPS) Independent Spent Fuel Storage Installation (ISFSI), Safety Analysis Report (SAR) that resulted in more than a minimal increase in the likelihood of occurrence of a malfunction and a change to a method of evaluation. Specifically, Dominion revised the NAPS ISFSI SAR to remove the American Society of Mechanical Engineers Boiler and Pressure Vessel Code requirement to meet minimum impact toughness criteria for the lid closure bolts of the TN-32 HBU Dry Storage Cask without seeking NRC approval via an amendment to the licensing basis of the TN-32B HBU cask.

This violation is being treated as a non-cited violation, consistent with Section 2.3.2 of the Enforcement Policy.

Because your response will be made available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's Agencywide Documents Access and Management System, accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>, to the extent possible, it should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the public without redaction. If personal privacy or proprietary information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies the information that should be protected and a redacted copy of your response that deletes such information. If you request withholding of such material, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim of withholding (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390(b) to support a request for withholding confidential commercial or financial information). If safeguards information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR 73.21. If Classified Information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR Part 95.

In accordance with 10 CFR 19.11, you may be required to post this Notice within two working days.

Dated this 24th day of July 2019.

Enclosure