VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

~~PROPRIETARY INFORMATION – WITHHOLD UNDER 10 CFR 2.390~~

November 22, 2016

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Director, Division of Spent Fuel Management
Office of Nuclear Material Safety and Safeguards
Washington, DC 20555-0001

Serial No. 16-055E
NLOS/TJS R0
Docket No. 72-16
License No. SNM-2507

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION INDEPENDENT SPENT FUEL STORAGE INSTALLATION
PROPOSED TECHNICAL SPECIFICATION CHANGE REQUEST REGARDING STORAGE OF INCREASED MAXIMUM ENRICHMENT AND BURN-UP FUEL IN A MODIFIED TN-32B STORAGE CASK
SUPPLEMENTAL INFORMATION REGARDING SECOND REQUEST FOR ADDITIONAL INFORMATION

On August 24, 2015, Virginia Electric and Power Company (Dominion) requested an amendment (ADAMS Accession No. ML15239B251) in the form of revisions to the Technical Specifications to License Number SNM-2507 for the North Anna Power Station (NAPS) Independent Spent Fuel Storage Installation (ISFSI). The proposed amendment would allow storage of spent fuel in a modified TN-32B bolted lid cask as part of the High Burn-up (HBU) Dry Storage Cask Research and Development Project sponsored by the Department of Energy (DOE) and the Electric Power Research Institute (EPRI). This initial submittal was subsequently supplemented several times (see References) in response to NRC requests for supporting information.

On August 16, 2016, Dominion received a second Request for Additional Information (RAI) (ADAMS Accession No. ML16231A397) pertaining to the HBU Dry Storage Cask neutron shield material. Dominion submitted a response to the second RAI on September 23, 2016 (ADAMS Accession No. ML16272A378). Following the submittal of this response, a phone call was held between the NRC, Dominion, and AREVA/TN to discuss the response to the second RAI on October 12, 2016. During the phone call, it was agreed that Dominion would submit an updated normal and off-normal thermal calculation and design and licensing basis document (DLBD) using the more realistic design inputs provided in the second RAI response.

Except for the normal and off-normal thermal calculation, the calculations supporting the TN-32B HBU Cask utilized a conservative total decay heat load of 36.96 kW and an average daily ambient temperature of 100 °F. These higher decay heat load and ambient temperature assumptions, which predict higher component temperatures, bound the revised maximum decay heat load of 32.934 kW for the thirty-two HBU

NM5520
NM5526

fuel assemblies that will be loaded into the HBU Cask, and the more realistic and still conservative average daily ambient temperature of 93.5 °F. The calculations using the 36.96 kW decay heat and 100 °F average daily ambient temperature continue to demonstrate that the acceptance criteria are satisfied for the TN-32B HBU Cask. Thus, only the normal and off-normal thermal calculations have been updated. In order to ensure that the licensing basis is consistent with the revised DLBD, the Technical Specifications (TS) are also being modified to reflect the lower decay heats used in the thermal analysis. The marked-up TS pages supporting the TN-32B HBU Cask were provided to the NRC on December 1, 2015 (Adams Accession No. ML15342A065). Only the modified pages of these marked-up TS pages are being provided herein.

Attachment 1 contains information that has been determined by AREVA/TN to be proprietary in its entirety, therefore a non-proprietary version of this document has not been provided. Attachment 2 contains the TN-32B HBU DLBD that was prepared by AREVA/TN. AREVA/TN is requesting that Attachments 1 and 2 be withheld from public disclosure in accordance with 10 CFR 2.390, as they are proprietary. In support of the request to withhold Attachments 1 and 2, an affidavit has been prepared by AREVA TN and is provided as Attachment 6.

Additionally, the second RAI question (ADAMS Accession No. ML16231A397) focused on the potential of the neutron shield temperature to exceed 300°F, which could potentially result in accelerated degradation of the neutron shield and impair its ability to perform its intended safety function. Testing has demonstrated that at temperatures of 311°F there is a 1.5 - 2% material loss after 100 days, as shown in TN-32 FSAR, Rev. 9, Appendix 9A. This testing demonstrates that any loss of the neutron shield material is a relatively slow process. At NAPS, thermoluminescent dosimeters (TLDs) are used to record radiation doses at appropriate intervals along the ISFSI perimeter fence. If these TLDs detect increased onsite doses above expected doses, a condition report will be issued, and the deviating condition will be resolved as part of NAPS's corrective action program.

If you have any questions or require additional information, please contact Mr. Thomas Szymanski at (804) 273-3065.

Sincerely,

Mark D. Sartain
Vice President – Nuclear Engineering

COMMONWEALTH OF VIRGINIA)
)
COUNTY OF HENRICO)

CRAIG D SLY
Notary Public
Commonwealth of Virginia
Reg. # 7518653
My Commission Expires December 31, 2020

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by Mark D. Sartain, who is Vice President – Nuclear Engineering, of Virginia Electric and Power Company. He has affirmed before me that he is duly authorized to execute and file the foregoing document in behalf of that Company, and that the statements in the document are true to the best of his knowledge and belief.

Acknowledged before me this 22nd day of November, 2016.

My Commission Expires: December 31, 2020

Notary Public

References:

1. Dominion Letter No. 15-369A, dated 10/08/15 (ADAMS Accession No. ML15289A189)
2. Dominion Letter No. 15-369C, dated 11/18/15 (ADAMS Accession No. ML15328A483)
3. Dominion Letter No. 15-369D, dated 11/19/15 (ADAMS Accession No. ML15331A132)
4. Dominion Letter No. 15-369E, dated 12/01/15 (ADAMS Accession No. ML15342A065)
5. Dominion Letter No. 15-369F, dated 11/19/15 (ADAMS Accession No. ML16022A073)
6. Dominion Letter No. 15-369G, dated 12/28/15 (ADAMS Accession No. ML16004A108)
7. Dominion Letter No. 15-369H, dated 01/14/16 (ADAMS Accession No. ML16019A335)
8. Dominion Letter No. 15-369I, dated 02/04/16 (ADAMS Accession No. ML16043A371)

9. Dominion Letter No. 16-055, dated 03/22/16 (ADAMS Accession No. ML16089A092)
10. Dominion Letter No. 16-055A, dated 04/21/16 (ADAMS Accession No. ML16118A206)
11. Dominion Letter No. 16-055B, dated 06/21/16 (ADAMS Accession No. ML16176A239)
12. Dominion Letter No. 16-055C, dated 07/26/16 (ADAMS Accession No. ML16211A077)
13. Dominion Letter No. 16-055D, dated 09/23/16 (ADAMS Accession No. ML16272A378)

Attachments:

1. AREVA/TN Calculation, 19885-0403, Revision 3, "Thermal Evaluation of TN-32B HBU Cask for Normal and Accident Conditions." (Proprietary)
2. TN-32 DLBD (Proprietary)
3. TN-32 DLBD (Non-proprietary)
4. Modified Marked-Up SNM-2507 TS Pages
5. Modified Clean SNM-2507 TS Pages
6. AREVA/TN Affidavit

Commitments made in this letter: None

cc: U.S. Nuclear Regulatory Commission (w/o Attachments)
Region II
Marquis One Tower
245 Peachtree Center Avenue, NE, Suite 1200
Atlanta, Georgia 30303-1257

NRC Senior Resident Inspector (w/o Attachments)
North Anna Power Station

Mr. William Allen
Senior Project Manager
U. S. Nuclear Regulatory Commission
Two White Flint North, Mail Stop 4 B34
11545 Rockville Pike
Rockville, Maryland 20852-2738

Mr. J. E. Reasor, Jr. (w/o Attachments)
Old Dominion Electric Cooperative
Innsbrook Corporate Center, Suite 300
4201 Dominion Blvd.
Glen Allen, Virginia 23060

State Health Commissioner (w/o Attachments)
Virginia Department of Health
James Madison Building – 7th Floor
109 Governor Street, Room 730
Richmond, Virginia 23219

~~PROPRIETARY INFORMATION – WITHHOLD UNDER 10 CFR 2.390~~

Serial No. 16-055E
Docket No. 72-16

ATTACHMENT 1

AREVA/TN Calculation, 19885-0403, Revision 3, "Thermal Evaluation of TN-32B HBU Cask for Normal and Accident Conditions."

(Proprietary)

North Anna Power Station ISFSI

Virginia Electric and Power Company

~~ATTACHMENT 1 CONTAINS INFORMATION THAT IS BEING WITHHELD FROM PUBLIC DISCLOSURE UNDER 10 CFR 2.390~~. UPON SEPARATION THIS PAGE IS DECONTROLLED.

~~PROPRIETARY INFORMATION – WITHHOLD UNDER 10 CFR 2.390~~

Serial No. 16-055E
Docket No. 72-16

ATTACHMENT 2

TN-32 DLBD

(Proprietary)

North Anna Power Station ISFSI

Virginia Electric and Power Company

~~ATTACHMENT 2 CONTAINS INFORMATION THAT IS BEING WITHHELD FROM PUBLIC DISCLOSURE UNDER 10 CFR 2.390~~. **UPON SEPARATION THIS PAGE IS DECONTROLLED.**

ATTACHMENT 6

AREVA/TN Affidavit

North Anna Power Station ISFSI

Virginia Electric and Power Company

AREVA

Oct. 28, 2016
E-46778 Rev. 0

Don McGee, PM
Mail Code CLT-1D
7207 IBM Dr.
Charlotte, NC 28262

Subject: NRC Request for Additional Design Documents Supporting License Amendment Request Serial No. 15-369 to License SNM-2507 Docket No. 72-16

Dear Mr. McGee:

This correspondence is written to provide response to a request by the NRC to receive copies of select design documents that support the subject License Amendment Request (LAR). This LAR is for the storage of high burnup (HBU) nuclear fuel at the North Anna Power Station as part of a project to monitor the effects of long-term storage. The documents requested are being transmitted to Dominion Power under proprietary agreement and, subsequently, will be forwarded to the NRC via affidavit pursuant to 10 CFR 2.390.

The specific documents are as follows:

- E-42038 Rev. 5, Design Licensing Basis Document (DLBD)
- 19885-0403 Rev. 3, Thermal Evaluation of TN-32B HBU Cask for Normal and Accident Conditions

If you or anyone at Dominion Power has questions on information contained herein, please contact me and I will strive to resolve the issue as soon as possible.

Sincerely,

T. M. Edwards

Tom Edwards
Design Project Engineer

cc: Phil Lozmack (PM)
Todd Young (QAS)
Dennis Williford (Licensing)
Lauren Naggs (DCA)
Rod Gooch (PM)
John McEntire (PM)
Brian Vitiello (Dominion Power)
Project File 19885 – Outgoing Correspondence

TN AMERICAS LLC
7135 Minstrel Way, Suite 300, Columbia, Maryland 21045
Tel.: 410 910 6900 - www.us.areva.com/TNAmericas

AFFIDAVIT PURSUANT
TO 10 CFR 2.390

TN Americas LLC)
State of Maryland) SS.
County of Howard)

I, Greg Vesey, depose and say that I am President of TN Americas LLC, duly authorized to execute this affidavit, and have reviewed or caused to have reviewed the information which is identified as proprietary and referenced in the paragraph immediately below. I am submitting this affidavit in conformance with the provisions of 10 CFR 2.390 of the Commission's regulations for withholding this information.

The information for which proprietary treatment is sought is listed below:

- Calculation 19885-0403, Revision 3
- Document E-42038, Revision 5

These documents have been appropriately designated as proprietary.

I have personal knowledge of the criteria and procedures utilized by TN Americas LLC in designating information as a trade secret, privileged, or as confidential commercial or financial information.

Pursuant to the provisions of paragraph (b) (4) of Section 2.390 of the Commission's regulations, the following is furnished for consideration by the Commission in determining whether the information sought to be withheld from public disclosure, included in the above referenced documents, should be withheld.

1) The information sought to be withheld from public disclosure involves documents (design criteria document, thermal design analysis) related to the design of the modified TN-32B dry storage cask (High Burnup Fuel Cask Demonstration Project), which are owned and have been held in confidence by TN Americas LLC.
2) The information is of a type customarily held in confidence by TN Americas LLC and not customarily disclosed to the public. TN Americas LLC has a rational basis for determining the types of information customarily held in confidence by it.
3) Public disclosure of the information is likely to cause substantial harm to the competitive position of TN Americas LLC because the information consists of descriptions of the design and analysis of the modified TN-32B dry spent fuel storage cask, the application of which provide a competitive economic advantage. The availability of such information to competitors would enable them to modify their product to better compete with TN Americas LLC, take marketing or other actions to improve their product's position or impair the position of TN Americas LLC's product, and avoid developing similar data and analyses in support of their processes, methods or apparatus.

Further the deponent sayeth not.

Greg Vesey
President, TN Americas LLC

Subscribed and sworn before me this 2nd day of November, 2016.

Notary Public
My Commission Expires 10/16/19

RONDA JONES
NOTARY PUBLIC STATE OF MARYLAND
My Commission Expires October 16, 2019

Serial No. 16-055E
Docket No. 72-16

ATTACHMENT 4

Modified Marked-Up SNM-2507 TS Pages

North Anna Power Station ISFSI

Virginia Electric and Power Company

Table 2.1-1 (page 1 of 2)
Fuel Assembly Limits

SSSC MODEL	LIMIT
1. TN-32	
a. Initial Enrichment	≤ 4.30 wt. %
b. Average Burnup	≤ 45,000 MWD/MTU
c. Cooling Time After Discharge	See Figure 2.1-1
d. Decay Heat Including BPRA/TPD	≤ 1.02 kw/assembly
e. Fuel Assembly Design	Westinghouse 17 x 17 Standard Westinghouse 17 x 17 Vantage 5H
f. Fuel Assembly Inserts	Fuel assemblies may contain burnable poison rod assemblies (BPRAs) and/or thimble plugging devices (TPDs).
g. Fuel Assembly Weight Including BPRA/TPD	≤ 1,533 pounds
h. Cooling Time After Shutdown for BPRAs in TN-32 Dry Storage Casks	See Figure 2.1-2
i. Cooling Time After Shutdown for TPDs in TN-32 Dry Storage Casks	See Figure 2.1-3
j. Fuel Assembly Initial Uranium Content	≤ 467.1 KgU/assembly
2. TN-32B HBU	
a. Initial Enrichment	≤ 4.60 wt. % (Areva Advanced Mark BW) ≤ 3.64 wt. % (Westinghouse Standard) ≤ 4.50 wt. % (Westinghouse Vantage 5H)
b. Average Burnup	≤ 60 GWd/MTU
c. Cooling Time After Discharge	See Figure 2.1-4
d. Decay Heat	≤ ~~36.96~~ 32.934 kW
e. Fuel Assembly Design	Areva Advanced Mark BW (AMBW) Westinghouse Standard Westinghouse Vantage 5H

Table 2.1-1 (page 2 of 2)
Fuel Assembly Limits

SSSC MODEL	LIMIT
f. Fuel Assembly Inserts	Poison Rod Assemblies (unirradiated)
g. Fuel Assembly Weight Including PRA	≤ 1551 pounds
h. Fuel Assembly Initial Uranium Content	≤ 469.0 KgU/assembly

Table 2.2-1 (page 1 of 1)
Decay Heat Load Methodology for Fuel Stored in TN-32B HBU Cask

The following algorithm is to be used to determine the individual fuel assembly decay heat load for the zone loading represented in Figure 2.1-4.

The Decay Heat (DH) in watts is expressed as:

$F1 = A + B*X1 + C*X2 + D*X1^2 + E*X1*X2 + F*X2^2$

$DH = F1*Exp(\{[1-(5/X3)]*G\}*[(X3/X1)^H]*[(X2/X1)^I])$, where

F1 is the Intermediate Function, basically the thermal source at five year cooling,
X1 is the assembly average burnup in GWd/MTU,
X2 is the assembly average initial enrichment in wt. % U-235, minimum of 1.5 percent and maximum of 5 percent.
X3 is the cooling time of the assembly in years

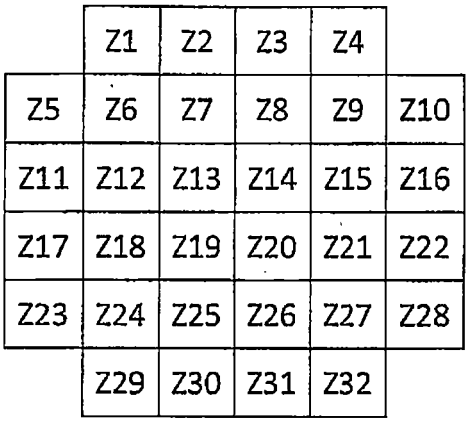
Constants:

A = 13.69479 B = 25.79539 C = -3.547739 D = 0.307917 E = -3.809025

F = 14.00256 G = -0.831522 H = 0.078607 I = -0.095900

The ORIGEN-ARP code is to be used to determine the individual fuel assembly decay heat load for the zone loading represented in Figure 2.1-4.

Figure 2.1-4
Zone Heat Load Limits for TN-32B HBU Cask



Zone No.	Heat Load Limit (W)(1)	Zone No.	Heat Load Limit (W)(1)
1	1013 960	17	1165 1045
2	1167 1047	18	1492 1276
3	1015 968	19	1037 968
4	909 853	20	735 604
5	914 858	21	1496 1280
6	1276 1111	22	1121 1010
7	1503 1287	23	1036 982
8	1477 1263	24	1031 963
9	1163 1043	25	1498 1278
10	903 853	26	1511 1277
11	882 834	27	1178 1061
12	1496 1279	28	1035 965
13	858 581	29	1073 970
14	1287 1115	30	1155 1035
15	1482 1267	31	1031 977
16	1120 1009	32	918 861
		Total Heat Load (kW)	36.96 32.934

(1) Refer to Table 2.2-1 for decay heat calculation method to be used when making comparisons to limits

ATTACHMENT 5

Modified Clean SNM-2507 TS Pages

North Anna Power Station ISFSI

Virginia Electric and Power Company

Table 2.1-1 (page 1 of 2)
Fuel Assembly Limits

SSSC Model	LIMIT
1. TN-32	
a. Initial Enrichment	≤ 4.30 wt. %
b. Average Burnup	≤ 45,000 MWD/MTU
c. Cooling Time After Discharge	See Figure 2.1-1
d. Decay Heat Including BPRA/TPD	≤ 1.02 kW/assembly
e. Fuel Assembly Design	Westinghouse 17 x 17 Standard Westinghouse 17 x 17 Vantage 5H
f. Fuel Assembly Inserts	Fuel assemblies may contain burnable poison rod assemblies (BPRAs) and/or thimble plugging devices (TPDs)
g. Fuel Assembly Weight, Including BPRA/TPD	≤ 1,533 pounds
h. Cooling Time After Shutdown for BPRAs in TN-32 Dry Storage Casks	See Figure 2.1-2
i. Cooling Time After Shutdown for TPDs in TN-32 Dry Storage Casks	See Figure 2.1-3
j. Fuel Assembly Initial Uranium Content	≤ 467.1 KgU/assembly
2. TN-32B HBU	
a. Initial Enrichment	4.60 wt. % (Areva Advanced Mark BW) 3.64 wt. % (Westinghouse Standard) 4.50 wt. % (Westinghouse Vantage 5H)
b. Average Burnup	≤ 60 GWD/MTU
c. Cooling Time After Discharge	See Figure 2.1-4
d. Decay Heat	≤ 32.934 kW
e. Fuel Assembly Design	Areva Advanced Mark BW (AMBW) Westinghouse Standard Westinghouse Vantage 5H

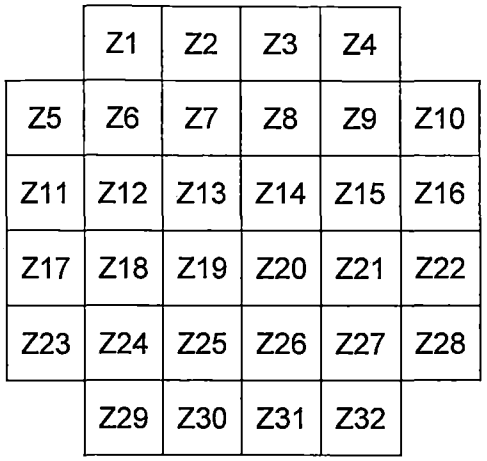
Table 2.1-1 (page 2 of 2)
Fuel Assembly Limits

SSSC Model	LIMIT
f. Fuel Assembly Inserts	Poison Rod Assemblies (unirradiated)
g. Fuel Assembly Weight Including PRA	≤ 1551 pounds
h. Fuel Assembly Initial Uranium Content	≤ 469.0 KgU/assembly

Table 2.2-1 (page 1 of 1)
Decay Heat Load Methodology for Fuel Stored in TN-32B HBU Cask

The ORIGEN-ARP code is to be used to determine the individual fuel assembly decay heat load for the zone loading represented in Figure 2.1-4.

Figure 2.1-4
Zone Heat Load Limits for TN-32B HBU Cask



Zone No.	Heat Load Limit (W)[1]	Zone No.	Heat Load Limit (W)[1]
1	960	17	1045
2	1047	18	1276
3	962	19	968
4	853	20	664
5	858	21	1280
6	1111	22	1010
7	1287	23	982
8	1263	24	963
9	1043	25	1278
10	853	26	1277
11	834	27	1061
12	1279	28	965
13	581	29	970
14	1115	30	1035
15	1267	31	977
16	1009	32	861
Total Heat Load (kW)			**32.934**

[1] Refer to Table 2.2-1 for decay heat calculation method to be used when making comparisons to limits