VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

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

January 14, 2016

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

Serial No. 15-369H
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

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 Dry Storage Cask Research and Development Project sponsored by the Department of Energy (DOE) and the Electric Power Research Institute (EPRI).

On December 11, 2015, NRC Senior Project Manager John Nguyen requested several calculations, design input memorandums, and drawings referenced in the above submittal. The requested material was subsequently supplied to Dominion by AREVA/TN. The calculations and drawings in Attachment 1 were determined by AREVA/TN to be proprietary as attested to in the affidavit provided in Attachment 2. The design input memorandums in Attachment 3 are non-proprietary.

NMSS24
NMSS26

~~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~~

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)

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 14th day of January, 2016.

My Commission Expires: August 31, 2019.

GARY DON MILLER
Notary Public
Commonwealth of Virginia
Reg. # 7629412
My Commission Expires August 31, 2019

Notary Public

Commitments made in this letter: None

Attachment 1: Requested AREVA/TN Calculations / Drawings Related to HBU Cask

Attachment 2: AREVA/TN Affidavit for Information Contained in Attachment 1

Attachment 3: Requested Design Input Memorandums

~~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~~

cc: U.S. Nuclear Regulatory Commission (w/o Attachment 1)
Region II
Marquis One Tower
245 Peachtree Center Avenue, NE Suite 1200
Atlanta, Georgia 30303-1257

NRC Senior Resident Inspector (w/o Attachment 1)
North Anna Power Station

Mr. John N. Nguyen (w/ attachments)
Senior Project Manager
U. S. Nuclear Regulatory Commission
Two White Flint North
Mail Stop T4B34
11545 Rockville Pike
Rockville, Maryland 20852-2738

Mr. J. E. Reasor, Jr. (w/o Attachment 1)
Old Dominion Electric Cooperative
Innsbrook Corporate Center, Suite 300
4201 Dominion Blvd.
Glen Allen, Virginia 23060

State Health Commissioner (w/o Attachment 1)
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. 15-369H
Docket No. 72-16

ATTACHMENT 1

Requested AREVA/TN Calculations / Drawings Related to HBU Cask

- **Calculation 19885-0211, Rev. 0,**
- **Calculation 19885-0212, Rev. 1,**
- **Calculation 19885-0218, Rev. 0,**
- **Drawing 02-8076669D-001**
- **Drawing 02-8076670D-000**

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. 15-369H
Docket No. 72-16

ATTACHMENT 2

AREVA/TN Affidavit for Information Contained in Attachment 1

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.**

AREVA

December 14, 2015
E-44058 Rev. 0

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

Subject: NRC Request #6 for Design Basis 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 AREVA TN 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 burn up (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, forwarded on to the NRC via an affidavit pursuant to 10 CFR 2.390.

The specific proprietary calculations to be transmitted electronically have previously been identified with proprietary markings and sent to Dominion Power are identified as follows:

19885-0211 Rev. 0
19885-0212 Rev. 1
19885-0218 Rev. 0

The following proprietary drawings provide details for the thermocouple lance assembly and seal connection into the modified cask lid:

02-8076669D-001
02-8076670D-000

Finally, the following non-proprietary design input memos for the HBU cask are also being forwarded to Dominion for transmittal to the NRC:

E-39552 Rev. 0 E-39973 Rev. 0 E-40199 Rev. 0

Sincerely,

T. M. Edwards

Tom Edwards
Design Project Engineer

AREVA TN

AREVA Inc.
7135 Minstrel Way - Suite 300 - Columbia, MD 21045 USA
Tel.: (410) 910-6900 - Fax: (410) 910-6902
us.areva.com/AREVATN

cc: Phil Lozmack (PM)
Todd Young (QAS)
Dennis Williford (Licensing)
Adam Jones
Rod Gooch (PM)
Lauren Naggs (DCA)
Project File 19885 – Outgoing Correspondence

AREVA TN

AREVA Inc.
7135 Minstrel Way - Suite 300 - Columbia, MD 21045 USA
Tel.. (410) 910-6900 - Fax: (410) 910-6902
us.areva.com/AREVATN

AFFIDAVIT PURSUANT
TO 10 CFR 2.390

AREVA Inc.)
State of Maryland) SS.
County of Howard)

I, Paul Triska, depose and say that I am a Vice President of AREVA Inc., 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 19885-0211, Revision 0
- Calculation 19885-0212, Revision 1
- Calculation 19885-0218, Revision 0
- Drawing 02-8076669D, Revision 1
- Drawing 02-8076670D, Revision 0

These documents have been appropriately designated as proprietary.

I have personal knowledge of the criteria and procedures utilized by AREVA Inc. 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 document, should be withheld.

1) The information sought to be withheld from public disclosure involves documents (structural analyses, cask stability evaluation, lid lifting evaluation, and drawings) 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 AREVA Inc.

2) The information is of a type customarily held in confidence by AREVA Inc. and not customarily disclosed to the public. AREVA Inc. 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 AREVA Inc. 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 AREVA Inc., take marketing or other actions to improve their product's position or impair the position of AREVA Inc.'s product, and avoid developing similar data and analyses in support of their processes, methods or apparatus.

Further the deponent sayeth not.

Paul Triska
Vice President, AREVA Inc.

Subscribed and sworn before me this 16th day of December, 2015.

Notary Public
My Commission Expires 10/16/19

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

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

Serial No. 15-369H
Docket No. 72-16

ATTACHMENT 3

Requested Design Input Memorandums

- **E-39552, Documentation of Previously Analyzed Bounding Missiles for TN-32B HBU Demonstration Cask**
- **E-39973, Documentation of previously analyzed bounding Cask Outer Shell Analyses for TN-32 in support of the TN-32B HBU project**
- **E-40199, Reconciliation of TN-32B HBU Demonstration Cask Trunnions and the Gamma Shield Shell Evaluation**

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.**

AREVA

6/11/2015

E-39552

Memorandum

To: AREVA TN, Americas

From: A. Ross

Subject: Documentation of Previously Analyzed Bounding Missiles for TN-32B HBU Demonstration Cask

The TN-32B HBU Demonstration cask (HBU cask) is a modification of the TN-32B cask. The modification largely entails the addition of seven (7) Ø 8 inch through lid penetrations allowing the addition of instrumentation for the monitoring of the fuel assembly temperatures over a period of time. The TN-32B cask is a modification of the TN-32 cask where the upper trunnions are single failure proof.

The TN-32 cask has been licensed for use at the North Anna Power Station and the evaluations performed in support of these licensing activities are referenced in this memorandum. A discussion of the applicability of these evaluations is included in order to demonstrate how the HBU cask design is bounded by these previous evaluations and that no further evaluations are necessary at this time.

Tornado and wind is defined in § 4.2.1.3 of the DCD [1] with a maximum wind velocity of 360 mph with the missiles defined as follows:

1. A wooden utility pole 40 feet long, 12 inches in diameter, with a density of 50 lb/ft^3, and traveling in a vertical or horizontal direction at 150 mph, [1,571 lb].
2. A 1-ton automobile traveling at 150 mph not more than 25 feet above ground and with a contact area of 30 ft^2.
3. A 1-inch solid steel rod, three feet long, with a density of 490 lb/ft^3, and traveling in a vertical or horizontal direction at 200 mph, [8 lb].
4. A 6-inch Schedule 40 pipe, 15 feet long, with a density of 490 lb/ft^3, and traveling in a horizontal direction at 200 mph, [285 lb].
5. A 12-inch Schedule 40 pipe, 15 feet long, with a density of 490 lb/ft^3, and traveling in a horizontal direction at 200 mph, [473 lb].

The tornado wind and missiles defined in [1] are also defined in both § 3.2.1 of DI-19885-01 [2], the North Anna ISFSI SAR [2] and § IV of 1066-28 [3] TN-32 Tornado Missile Damage Analysis for North Anna Power Station Site. The missile velocities for missiles 3 – 5 are not defined in [2], however the bounding damage evaluated for missile 4 in [3] is documented in [2] and it is reasonable to assume that the 200 mph missile velocity defined in [1] and [3] was used in the ISFSI SAR [2].

The difference between the TN-32B HBU cask and the TN-32 cask evaluated in calculation 1066-28 [3] and documented in the ISFSI SAR [2] is the inclusion of the 8-inch diameter holes in the lid to accommodate the instrumentation (thermocouples).

The bounding missile for the TN-32 cask is the 6-inch diameter, Schedule 40 pipe. This missile is sized to challenge the penetrations in the lid of the TN-32 HBU cask, however, since this missile travel is horizontal, it is not a penetration hazard to the TN-32 HBU cask.

The analyses referenced do not credit the neutron shield in the evaluations and only partially credit the protective cover. The protective cover and neutron shield are only important in the vertical direction missile for the modified lid. The protective cover was evaluated in [4] where it was shown to absorb 94% of the energy of missile B (Ø 8, 276 lb artillery shell at 88.2 mph) through deflection only. The protective cover will be more than sufficient to absorb all of the impact energy of the Ø 1 inch rod (8 lb at 200 mph). Additionally, the neutron shield is two (2) thicknesses of 1/4 inch steel in addition to the resin. The wooden utility pole crushes on impact and would not shear through the combined thickness of the protective cover and neutron shield.

It is noted the facility is located in region 2 as identified in [5] and the specified maximum wind velocity is 200 mph with a horizontal missile velocity (Ø 6 inch pipe) of 76 mph and a vertical missile velocity of 51 mph in lieu of the 300 mph / 150 mph velocities specified for the wind and utility pole respectively in [2].

The DI-19885-01, ISFSI SAR [2] in § 3.2.1 allows Tornado and Wind Loadings to be evaluated for the 300 mph/150 mph specified or to be evaluated per Reg Guide 1.76 [5] which specifies the values of 200 mph / 76 mph / 51 mph.

While the protective cover and neutron shield are sufficient to withstand the vertical missile at the velocities specified in [1 & 2], additional margin is available when the values specified in Reg Guide 1.76 [5] are used

Conclusion

The tornado wind and missiles defined for evaluation in the Design Criteria Document [1] were evaluated in the referenced calculation [3] and documented in the ISFSI SAR [2]. The bounding missile (Ø 6 inch pipe) will not challenge the lid penetrations for the TN-32B HBU cask. The vertically oriented missiles (Ø 12 inch utility pole and Ø 1 inch steel rod) will not penetrate the combined thicknesses of the protective cover and neutron shield plates.

References:

1. TN Document "Design Criteria Document (DCD) - TN-32B High Burnup Demonstration Cask", 19885-0101, Rev. 2.
2. TN Document "North Anna Power Station Units 1 & 2 Independent Spent Fuel Storage Installation (ISFSI) Safety Analysis Report, TN-32B HBU Demonstration Cask Project", DI-19885-01, Rev 1.
3. TN Calculation, "TN-32 Tornado Missile Damage Analysis for North Anna Power Station Site", 1066-28, Rev. 0.
4. TN Calculation, "Deformation of TN-32 Protective Cover Hit in the Center of the Head", 1049-33, Rev. 0.
5. U.S. Nuclear Regulatory Commission, "Design-Basis Tornado and Tornado Missiles for Nuclear Power Plants", Regulatory Guide 1.76 (Reg Guide 1.76), Rev. 1.

Author: A. Ross Date: 11 June 15

Reviewed: S. Klein Date: 6/11/2015

AREVA

6/9/2015

E-39973

Memorandum

To: AREVA TN, Americas

From: A. Ross

Subject: Documentation of previously analyzed bounding Cask Outer Shell Analyses for TN-32 in support of the TN-32B HBU project

The TN-32B HBU cask is a modification of the TN-32B and TN-32 casks (the TN-32B cask includes single failure proof trunnions not included in the original TN-32 cask design). The HBU project utilizes a previously constructed TN-32B cask as the base hardware for the project. The HBU modification to the TN-32B cask largely entails the addition of seven (7) 8" diameter through lid penetrations allowing the addition of instrumentation for the monitoring of the fuel assembly temperatures over a period of time.

The TN-32 and TN-32B casks are licensed and the evaluations performed in support of these licensing activities will be referenced in this memorandum. A discussion of the applicability of these evaluations will be included in order to demonstrate that the TN-32B HBU design is bounded by these previous evaluations and no further evaluations are necessary to accommodate these modifications.

The load conditions listed in Table 4-6 of [1] for the TN-32B HBU cask do not exceed the loads evaluated in calculations performed for the original TN-32 Cask [4] & [5]. The results of the calculations are also documented in the TSAR [2].

The two calculations listed above as well as the TSAR all use a bounding shell temperature of 300°F for the normal condition. The thermal analysis performed for the TN-32B HBU project [3] reports results for a normal / off-normal evaluation. The result of the TN-32B HBU off-normal thermal evaluation bounds the normal temperatures. The thermal result, listed in Table 7-1 of [3], show a maximum shell temperature of 293°F. This is bounded by the 300°F used in the original TN-32 calculations referenced in this memorandum [4] & [5]. Additionally, the TN-32 calculations [4] & [5] as well as the TSAR [2] use material properties for SA-516, Grade 55. The outer shell of both the TN-32 and TN-32B casks are constructed from SA-516, Grade 70 that has a higher yield strength at 300°F than does the Grade 55.

In conclusion, the loads on the TN-32B HBU cask are less than or equal to the loads used in the referenced calculations and the predicted material temperatures for the TN-32B HBU cask from [3] are bounded by the bounding temperature used in the

calculations performed for the TN-32 cask. Additionally, the allowable stress for the material used in the cask construction is higher than the value used in the calculations.

Therefore, the current design is bounded by the previously completed calculations and no further analysis is required.

References:

1. TN Document, "Design Criteria Document (DCD) –High Burn-up Demonstration, TN-32B Cask", 19885-0101, Rev. 2.
2. TN Document, "TN-32 Dry Storage Cask Topical Safety Analysis Report (TSAR), Rev. 9A".
3. TN Calculation, "Thermal Evaluation of TN-32 Cask for Normal, Off-Normal and Accident Conditions", 19885-0403, Rev. 0.
4. TN Calculation, "Structural Analysis of Outer Shell and Closure Plate", 1049-19, Rev. 1.
5. TN Calculation, "TN-32 Outer Shell Stress Calculations", 1049-106, Rev. 0.

Author: A. Ross Date: 9 June 15

Reviewed: M. Kamalian Date: 6/9/15

AREVA

06/09/2015

E-40199

Memorandum

To: AREVA TN Americas

From: Mehdi Kamalian

Subject: Reconciliation of TN-32B HBU Demonstration Cask Trunnions and the Gamma Shield Shell Evaluation.

The TN-32B HBU gamma shield shell and trunnions use the same design as in the existing TN-32B cask currently in use. The lifting and maneuvering of the cask are performed through a set of upper and lower trunnions [5] and [6].

The original analysis of the upper trunnions [2] utilized a design load of 267.3 kips (including a 1.1 dynamic load factor) at a temperature of 300 °F. In Section 4.2.2.1, the current DCD [1] for the TN-32B HBU Demonstration Cask (HBU cask), specifies a design load of 242 kips times a dynamic load factor of 1.1, which is 266.2. This is less than the design load previously used in [2]. The current thermal analysis of the HBU cask [Table 7-1 of 3] identifies a maximum temperature of 280 °F for the upper trunnions, which is also less than the temperature used in [2].

Therefore, because all of the design aspect of the upper trunnions are the same and the design load is less than that used in calculation 1086-02 [2], the evaluations in the original calculation [2] is bounding for the HBU cask upper trunnions.

As for the lower trunnions, because this evaluation is for the cask storage conditions only and the lower trunnions are used to rotate the cask during set up on site, the acceptability of the lower trunnions to support handling of the empty cask is documented in [4]. The lower trunnions, evaluated in the transportation phase of the project, are beyond the scope of this document.

References

1. TN Document: "Design Criteria Document (DCD) – TN-32B High Burnup Demonstration Cask", 19885-101, Rev. 2.
2. TN Calculation: "TN-32 Upper Trunnions and Bijlaard Analysis For WEPCO", 1086-02, Rev. 0.
3. TN Calculation: "Thermal Evaluation of TN-32B HBU Cask for Normal and Accident Conditions", 19885-403, Rev. 0.
4. TN Document: "TN-32 Updated Final Safety Analysis Report", Rev. 6.
5. TN Drawing:"TN-32B HBU Demonstration Cask Shell Assembly",19885-30-2, Rev.0.

6. TN Drawing: "TN-32B HBU Demonstration Cask Shell Details and Parts List", 19885-30-3, Rev. 0.

Conclusion

Due to having a higher design load, higher temperature effect for the same material and the same geometry, the evaluation in calculation 1086-02 [2] is found to be bounding for the upper trunnion and gamma shield shell reconciliation of HBU cask. The lower trunnions are not evaluated as part of the cask storage system.

Author: M. Kamalian Date: 6,9,15

Reviewer: A. Ross Date: 9 June 15