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Dominion®

July 25, 2011

PROPRIETARY – Withhold Under 10 CFR 2.390

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D. C. 20555

Serial No. NA3-11-035R
Docket No. 52-017
COL/DWL

DOMINION VIRGINIA POWER
NORTH ANNA UNIT 3 COMBINED LICENSE APPLICATION
SRP 10.02.03: RESPONSE TO RAI LETTER 73

On June 3, 2011, the NRC requested additional information to support the review of certain portions of the North Anna Unit 3 Combined License Application (COLA), which consisted of eight questions. The responses to these Request for Additional Information (RAI) questions are provided in Enclosures 2 through 13:

- RAI 5811, Question 10.02.03-1 — Turbine and Turbine Generator Models
- RAI 5811, Question 10.02.03-2 — Low Pressure (LP) Rotor Materials
- RAI 5811, Question 10.02.03-3 — LP Rotor Design Detail Differences
- RAI 5811, Question 10.02.03-4 — Turbine Design Detail Differences
- RAI 5811, Question 10.02.03-5 — LP Rotor Tangential Stress
- RAI 5811, Question 10.02.03-6 — LP Rotor High Cycle Fatigue Stress
- RAI 5811, Question 10.02.03-7 — LP Turbine Temperature Distributions
- RAI 5811, Question 10.02.03-8 — Turbine Maintenance and Inservice Inspection Procedure.

This information will be incorporated into a future submission of the North Anna Unit 3 COLA, as described in the enclosures.

The responses to RAI 5811 Questions 10.02.03-2, 10.02.03-3, 10.02.03-5, and 10.02.03-7 contains information designated as proprietary by Mitsubishi Heavy Industries (MHI). Immediately preceding each proprietary response, alternate responses with the proprietary information redacted are also provided. The basis for designating certain information as proprietary is provided in the MHI Proprietary Information Affidavit provided in Enclosure1, pursuant to 10 CFR 2.390(b)(1).

Enclosures 4, 6, 9, and 12 contain information that is being withheld from public disclosure under 10 CFR 2.390. Upon separation, this page is decontrolled.

D089
NRO

Please contact Regina Borsh at (804) 273-2247 (regina.borsh@dom.com) if you have questions.

Very truly yours,

Eugene S. Grecheck

Enclosures:

1. MHI Affidavit for Withholding of Information Pursuant to 10 CFR 2.390
2. Response to RAI Letter No. 73, RAI 5811 Question 10.02.03-1
3. Response to RAI Letter No. 73, RAI 5811 Question 10.02.03-2 (Non-Proprietary)
4. Response to RAI Letter No. 73, RAI 5811 Question 10.02.03-2 (Proprietary)
5. Response to RAI Letter No. 73, RAI 5811 Question 10.02.03-3 (Non-Proprietary)
6. Response to RAI Letter No. 73, RAI 5811 Question 10.02.03-3 (Proprietary)
7. Response to RAI Letter No. 73, RAI 5811 Question 10.02.03-4
8. Response to RAI Letter No. 73, RAI 5811 Question 10.02.03-5 (Non-Proprietary)
9. Response to RAI Letter No. 73, RAI 5811 Question 10.02.03-5 (Proprietary)
10. Response to RAI Letter No. 73, RAI 5811 Question 10.02.03-6
11. Response to RAI Letter No. 73, RAI 5811 Question 10.02.03-7 (Non-Proprietary)
12. Response to RAI Letter No. 73, RAI 5811 Question 10.02.03-7 (Proprietary)
13. Response to RAI Letter No. 73, RAI 5811 Question 10.02.03-8

Commitments made by this letter:

1. Incorporate proposed changes in a future COLA submission.

COMMONWEALTH OF VIRGINIA

COUNTY OF HENRICO

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by Eugene S. Grecheck, who is Vice President-Nuclear Development of Virginia Electric and Power Company (Dominion Virginia Power). He has affirmed before me that he is duly authorized to execute and file the foregoing document on behalf of the Company, and that the statements in the document are true to the best of his knowledge and belief.

Acknowledged before me this 25th day of July, 2011
My registration number is 7173057 and my
Commission expires: August 31, 2012

Wanda K. Marshall
Notary Public

WANDA K. MARSHALL
Notary Public
Commonwealth of Virginia
7173057
My Commission Expires Aug 31, 2012

cc: U. S. Nuclear Regulatory Commission, Region II
C. P. Patel, NRC
T. S. Dozier, NRC
J. T. Reece, NRC

ENCLOSURE 1

Affidavit for Withholding of Proprietary Information Pursuant to 10 CFR 2.390

MITSUBISHI HEAVY INDUSTRIES, LTD.

AFFIDAVIT

I, Kosuke Yasuda, state as follows:

1. I am Project Manager, APWR Promoting Department, of Mitsubishi Heavy Industries, LTD ("MHI"), and have been delegated the function of reviewing MHI's US-APWR documentation to determine whether it contains information that should be withheld from public disclosure pursuant to 10 C.F.R. § 2.390 (a)(4) as trade secrets and commercial or financial information which is privileged or confidential.

2. In accordance with my responsibilities, I have reviewed the enclosed document entitled "Response to NRC RAI Letter 73, RAI 5811 Question10.02.03", Serial No. NA3-11-035R, and have determined that portions of the document contain proprietary information that should be withheld from public disclosure. Those pages containing proprietary information are identified with the label "Proprietary" on the top of the page and the proprietary information has been bracketed with an open and closed bracket as shown here "[ ]". The first page of the document indicates that all information identified as "Proprietary" should be withheld from public disclosure pursuant to 10 C.F.R. § 2.390 (a)(4).

3. The information identified as proprietary in the enclosed document has in the past been, and will continue to be, held in confidence by MHI and its disclosure outside the company is limited to regulatory bodies, customers and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and is always subject to suitable measures to protect it from unauthorized use or disclosure.

4. The basis for holding the referenced information confidential is that it describes the unique methodology developed by MHI for assessing the integrity and safety US-APWR integrated turbine rotor. That methodology was developed at significant cost to MHI, since it required the performance of detailed design calculations, analyses, and testing extending over several years. The referenced information is not available in public sources and could not be gathered readily from other publicly available information. MHI knows of no way the information could be lawfully acquired by organizations or individuals outside of MHI.

5. The referenced information is being furnished to the Nuclear Regulatory Commission ("NRC") in confidence and solely for the purpose of supporting the NRC staff's review of Dominion's Application for a Combined License for the North Anna Power Station (Unit3).

6. Public disclosure of the referenced information would assist competitors of MHI in their design of new nuclear power plants without the costs or risks associated with the design of new systems and components. Disclosure of the information identified as proprietary would therefore have negative impacts on the competitive position of MHI in the U.S. nuclear plant market.

I declare under penalty of perjury that the foregoing affidavit and the matters stated therein are true and correct to the best of my knowledge, information and belief.

Executed on this 8h day of July, 2011.

K Yasuda

Kosuke Yasuda,
Project Manager- APWR Promoting Department
Mitsubishi Heavy Industries, LTD.

ENCLOSURE 2

Response to NRC RAI Letter 73

RAI 5811, Question 10.02.03-1

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

North Anna Unit 3

Dominion

Docket No. 52-017

RAI NO.: 5811 (RAI Letter 73)

SRP SECTION: 10.02.03 – TURBINE ROTOR INTEGRITY

QUESTIONS for Component Integrity, Performance, and Testing Branch 1 (AP1000/EPR Projects) (CIB1)

DATE OF RAI ISSUE: 06/3/2011

QUESTION NO.: 10.02.03-1

The MHI Report MUAP-10005-P, Revision 0 should specify which model turbine this analysis supports, since it appears to be very similar to MHI Report MUAP-07028. In addition, the proposed model for the turbine generator should be specified in the COL FSAR that corresponds to the turbine missile analysis, MHI Report MUAP-10005-P, Revision 0.

Dominion Response

MUAP-10005 has been revised to incorporate turbine model L54 into the title. The revised MUAP-10005 will be submitted by a separate letter (Serial No. NA3-11-043). The FSAR will be revised to reflect the revision to MUAP-10005.

Proposed COLA Revision

FSAR Section 3.5.1.3.2, 3.5.5, 10.2.6 and Table 19.1-205 will be revised as indicated on the attached markup.

Markup of North Anna COLA

The attached markup represents Dominion's good faith effort to show how the COLA will be revised in a future COLA submittal in response to the subject RAI. However, the same COLA content may be impacted by revisions to the DCD, responses to other COLA RAIs, other COLA changes, plant design changes, editorial or typographical corrections, etc. As a result, the final COLA content that appears in a future submittal may be somewhat different than as presented herein.

3.5.1.3.1 Geometry

NAPS DEP 9.5(1)

Replace the second sentence of the second paragraph of DCD Subsection 3.5.1.3.1 with the following:

In this orientation, all safety-related SSCs except the two PSFSVs are located outside the high velocity, low-trajectory missile strike zone. Because the PSFSVs are located within the low-trajectory missile strike zone, the Unit 3 turbine has an unfavorable orientation, as defined in NUREG-0800 Standard Review Plan (SRP) Section 3.5.1.3.

NAPS COL 3.5(6)

Replace the third paragraph of DCD Subsection 3.5.1.3.1.

[The site Plan (Figure 1.2-1R) reflects the placement of Unit 3 in relation to existing Units 1 and 2. The location and favorable orientation of Unit 3 relative to the Units 1 and 2 turbine generators as defined in SRP Section 3.5.1.3 and RG 1.115 (Reference 3.5-6) are such that Unit 3 is outside the low-trajectory turbine missile strike zone inclined at 25 degrees to the low pressure turbines, and therefore no postulated low-trajectory turbine missiles from Units 1 and 2 affect Unit 3 safety-related SSCs.] SOF-145

3.5.1.3.2 Evaluation

NAPS DEP 9.5(1)

Replace the first sentence of the first paragraph of DCD Section 3.5.1.3.2 with the following:

Protection against damage from turbine missiles to safety-related SSCs is provided by the orientation of the T/G (except for the PSFSVs), by the robust turbine rotors, and by the redundant and fail-safe turbine design control system as described in Section 10.2.

NAPS COL 3.5(2)

Replace the third paragraph of DCD Subsection 3.5.1.3.2.

NAPS DEP 9.5(1)
NAPS DEP 10.2(1)

Mathematically, $P_4 = P_1 \times P_2 \times P_3$, where RG 1.115 considers an acceptable risk rate for P_4 as less than 10^{-7} per year. For unfavorably oriented T/Gs, which is the case for Unit 3, SRP Section 3.5.1.3 estimates the product of P_2 and P_3 as 10^{-2} per year. The determination of P_1 is strongly influenced by the program for periodic testing and inspection. To maintain an acceptably low P_1, Technical Reports MUAP-10005-NP, "Probability of Missile Generation From Low Pressure Turbines for Model L54" (Reference 3.5-17R), and MUAP-07029-NP, "Probabilistic Evaluation of Turbine Valve Test Frequency"

3.5.4 Combined License Information

Replace the content of DCD Subsection 3.5.4 with the following.

STD COL 3.5(1)**

3.5(1) ***Prevent unsecured equipment from becoming potential hazard***

This COL item is addressed in Subsection 3.5.1.1.4.

NAPS COL 3.5(2)

3.5(2) ***Maintain P_1 within acceptable limit***

This COL item is addressed in Subsection 3.5.1.3.2.

NAPS COL 3.5(3)

3.5(3) ***Presence of potential hazards and effects in vicinity of site, except aircraft***

This COL item is addressed in Subsection 3.5.1.5.

NAPS COL 3.5(4)

3.5(4) ***Site interface parameters for aircraft crashes and air transportation accidents***

This COL item is addressed in Subsection 3.5.1.6.

NAPS COL 3.5(5)

3.5(5) ***Other potential site-specific missiles***

This COL item is addressed in Subsection 3.5.2.

NAPS COL 3.5(6)

3.5(6) ***Orientation of T/G of other unit(s)***

This COL item is addressed in Subsection 3.5.1.3.1.

3.5.5 References

Replace the following reference in DCD Subsection 3.5.5.

3.5-17R Probability of Missile Generation From Low Pressure Turbines for Model L54, MUAP-10005-P, Rev. ~~0~~ 1 (Proprietary) and MUAP-10005-NP, Rev. ~~0~~ 1 (Non-Proprietary), Mitsubishi Heavy Industries, Ltd., Tokyo, Japan, ~~June 2010~~ July 2011.

3.5-18R Probabilistic Evaluation of Turbine Valve Test Frequency, MUAP-07029-P Rev. 1 (Proprietary) and MUAP-07029-NP Rev. 1 (Non-Proprietary), Mitsubishi Heavy Industries, Ltd., Tokyo, Japan, June 2010.

10.2 Turbine-Generator (T/G)

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

10.2.2.2.5 Low-Pressure Turbine (LPT)

NAPS DEP 10.2(1)

Replace the first sentence of the first paragraph of DCD Subsection 10.2.2.2.5 with the following.

There are three double flow LPTs with 54-inch last stage blades.

10.2.3.5 Inservice Inspection

STD 10.2(1)

Replace the last paragraph of DCD Subsection 10.2.3.5 with the following.

A turbine maintenance and inspection procedure will be established prior to fuel load.

10.2.5 Combined License Information

Replace the content of DCD Subsection 10.2.5 with the following.

STD COL 10.2(1)

10.2(1) ***Inservice Inspection***

This Combined License (COL) item is addressed in Subsection 10.2.3.5.

10.2.6 References

Replace References 10.2-9 and 10.2-10 of DCD Subsection 10.2.6 with the following.

10.2-9R Probability of Missile Generation from Low Pressure Turbines for Model L54, MUAP-10005-P, Rev. ~~0~~ 1 (Proprietary) and MUAP-10005-NP, Rev. ~~0~~ 1 (Non-Proprietary), Mitsubishi Heavy Industries, Ltd., Tokyo, Japan, ~~June 2010~~ July 2011.

10.2-10R Probabilistic Evaluation of Turbine Valve Test Frequency, MUAP-07029-P Rev. 1 (Proprietary) and MUAP-07029-NP Rev. 1 (Non-Proprietary), Mitsubishi Heavy Industries, Ltd., Tokyo, Japan, June 2010.

NAPS COL 19.3(4)

Table 19.1-205 External Events Screening and Site Applicability

Category	Event	SSAR/ FSAR Section Disposition	Description	Screening and Applicability: Criteria	Freq. (/yr)	Site Appl.
Nearby Industrial, Transportation and Military facilities *(continued)*	Site Proximity Missiles	FSAR 3.5.1.5	No potential site-proximity missile hazards are identified except aircraft, which are evaluated in Section 3.5.1.6.	3	None	No
	Turbine Missile	FSAR 3.5.1.3.2	Technical Reports MUAP-10005-NP, "Probability of Missile Generation From Low Pressure Turbines for Model L54" (Reference 3.5-17R), and MUAP-07029-NP, "Probabilistic Evaluation of Turbine Valve Test Frequency," (Reference 3.5-18R) are used to establish the procedures and criteria for preservice inspection, inservice inspection intervals, and turbine valve test frequencies. Additionally, procedures implement the applicable operating criteria specified in SRP 3.5.1.3. These actions maintain the probability of turbine failure resulting in the ejection of turbine rotor (or internal structure) fragments through the turbine casing such that the acceptable risk rate is maintained at less than 10^{-7} per year.	2,3	$<10^{-7}$	No
Meteorology	Extreme Winds	SSAR 2.3.1.3.1	According to American National Standard, ANSI 58.1-1982, the operating basis wind velocity at 33 feet (10 meters) above ground level in the Unit 3 site area associated with a 100-year return period is 64 miles per hour (mph). The fastest-mile-wind speed is defined as the passage of one mile of wind with the highest speed for the day. The actual observed fastest-mile-wind speed at Richmond (68 mph) was recorded at that station in October 1954. The 3-second gust wind speed that represents a 100-year return period is 96 mph at 10 meters above ground. This wind speed was determined in accordance with the guidance in SEI/ASCE 7-02, Revision of ASCE 7-98, and is selected as a conservative basic wind speed site characteristic.	1,4	None	No

ENCLOSURE 3

Response to NRC RAI Letter 73

RAI 5811, Question 10.02.03-2

(Non-Proprietary Version)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

North Anna Unit 3

Dominion

Docket No. 52-017

RAI NO.: 5811 (RAI Letter 73)

SRP SECTION: 10.02.03 – TURBINE ROTOR INTEGRITY

QUESTIONS for Component Integrity, Performance, and Testing Branch 1 (AP1000/EPR Projects) (CIB1)

DATE OF RAI ISSUE: 06/3/2011

QUESTION NO.: 10.02.03-2

Provide a discussion similar to the information provided in the US-APWR DCD on the material to be used for the LP rotors if it differs from the material used for the standard US-APWR LP rotors. Also, explain why the fracture toughness used in the analysis in Section 3.3 of MHI Report MUAP-10005-P, Revision 0 is different than that used in the standard US-APWR LP rotor analysis, MHI Report MUAP-07028. Also, include technical basis for the different fracture toughness to ensure the integrity of the rotor as outlined in NUREG-0800, Section 10.2.3, subparagraph III.2.

Dominion Response

The material used for the LP rotors in the US-APWR North Anna Unit 3 design is the same as the material used for the US-APWR DCD standard plant design, including the chemical composition and heat treatment. Therefore, the material specification for the US-APWR DCD will be applicable to the North Anna Unit 3 design.

In the Low Cycle Fatigue (LCF) analysis (Section 3.3 of MUAP-10005-P), the temperatures at the evaluation point (i.e., the center of the rotor located directly beneath the L-0 disc) are higher for the Unit 3 rotor compared to the standard plant rotor temperature. The temperature distributions at the rated condition are shown in Figure 1 for Unit 3 and Figure 2 for the standard plant design. The fracture toughness is dependent on the temperature of the evaluation point, as shown in Figure 3. Therefore, the fracture toughness used in Unit 3 is different than that used in the standard plant design.

[ ] (4)

The fracture toughness, K_{IC}, used in the fracture analysis is calculated using the mechanical properties of the rotor material, in accordance with the [ ] (4) (Figure 3) noted in NUREG-0800, Section 10.2.3, subparagraph II.2.

Since the metal temperature at the evaluation point of Unit 3 is higher than standard plant design, the fracture toughness of Unit 3 is slightly higher than the standard plant design, which will have a positive impact in terms of rotor integrity. Therefore, the integrity of the Unit 3 LP rotor is improved compared with that of the standard plant design.

(4)

Figure 3: [ ](4)

Proposed COLA Revision

None

ENCLOSURE 5

Response to NRC RAI Letter 73

RAI 5811, Question 10.02.03-3

(Non-Proprietary Version)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

North Anna Unit 3

Dominion

Docket No. 52-017

RAI NO.: 5811 (RAI Letter 73)

SRP SECTION: 10.02.03 – TURBINE ROTOR INTEGRITY

QUESTIONS for Component Integrity, Performance, and Testing Branch 1 (AP1000/EPR Projects) (CIB1)

DATE OF RAI ISSUE: 06/3/2011

QUESTION NO.: 10.02.03-3

The differences, such as the number of discs, etc., between the North Anna site-specific LP rotor and the standard US-APWR LP rotor should be explained in detail, to ensure the appropriate information is used in the turbine missile analysis. Also, discuss whether the North Anna LP rotor is also a non-bored integral rotor design similar to the standard LP rotor design specified in the US-APWR DCD, or is a different design, including the blade attachment design (i.e., christmas tree, side entry type root blade attachment). If a different blade attachment design is used, discuss how the blade attachment changes the crack initiation and growth at the attachment area of the LP rotor, and whether ultrasonic inspection performed during inservice inspection in accordance with US APWR DCD, Tier 2, FSAR Section 10.2.3.5 can still be performed. Sketches/drawings may be helpful to illustrate the differences.

Dominion Response

Table 1 provides the comparison of the LP rotor characteristics between the North Anna Unit 3 and US-APWR standard plant design. The blade attachment design for Unit 3 and the US-APWR standard plant design is the same and, therefore, does not change the crack initiation and growth at the attachment area of the LP rotors. There is also no change to the ultrasonic inspection procedure performed during inservice inspection.

Table 1:

Comparison of LP rotor characteristics between Unit 3 and Standard Plant Design

(4)

Proposed COLA Revision

None.

ENCLOSURE 7

Response to NRC RAI Letter 73

RAI 5811, Question 10.02.03-4

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

North Anna Unit 3

Dominion

Docket No. 52-017

RAI NO.: 5811 (RAI Letter 73)

SRP SECTION: 10.02.03 – TURBINE ROTOR INTEGRITY

QUESTIONS for Component Integrity, Performance, and Testing Branch 1 (AP1000/EPR Projects) (CIB1)

DATE OF RAI ISSUE: 06/3/2011

QUESTION NO.: 10.02.03-4

Provide in detail what is different about this steam turbine design that can affect the valve test frequency analysis, MUAP-07029, for the destructive overspeed turbine failure. This should include, but not limited to:

- Differences in turbine control system and turbine protection system.
- Are these the same valves, solenoid, mechanical and electrical systems, etc. with similar common cause and common mode failures?

Discuss how these differences in the turbine design have been accounted for in the valve test frequency analysis MUAP-07029.

Dominion Response

There are no design differences in the turbine control system, turbine protection system (including electrical and mechanical trip devices), and main steam valves between the US-APWR standard design and the North Anna Unit 3 turbine design. The reliability of these turbine systems and components, including potential common cause and common mode failures, is expected to be the same for the Unit 3 turbine design as for the US-APWR standard plant design. MUAP-07029 is, therefore, applicable to both the US-APWR standard plant design and the Unit 3 design.

Proposed COLA Revision

None.

ENCLOSURE 8

Response to NRC RAI Letter 73

RAI 5811, Question 10.02.03-5

(Non-Proprietary Version)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

North Anna Unit 3

Dominion

Docket No. 52-017

RAI NO.: 5811 (RAI Letter 73)

SRP SECTION: 10.02.03 – TURBINE ROTOR INTEGRITY

QUESTIONS for Component Integrity, Performance, and Testing Branch 1 (AP1000/EPR Projects) (CIB1)

DATE OF RAI ISSUE: 06/3/2011

QUESTION NO.: 10.02.03-5

Explain why the average tangential stress for disc 1 in Table 3.1-1 of the MHI Report MUAP-10005-P for the North Anna specific LP rotor is much lower than the standard LP rotor design specified in the US-APWR DCD and the corresponding MHI Report MUAP-07028.

Dominion Response

The average tangential stress depends on the centrifugal force and the disc cross-sectional area. Comparing the Unit 3 design with the US-APWR standard plant design, as shown Figures 4 and 5, the centrifugal force loaded at disc 1 in the Unit 3 design is smaller than the standard plant design because: 1) disc 1 of the Unit 3 design supports 2 LP stages, while disc 1 of the standard design supports 4 LP stages, and 2) the additional disc material needed for installing 4 LP stages at the outer diameter of disc 1 is not necessary for Unit 3. Therefore, since the Unit 3 disc 1 has less mass overall, the centrifugal force on the disc is lower.

However, the cross-sectional area of the Unit 3 disc 1 is less than the standard plant design disc 1. Since tangential stress is inversely proportional to the cross-sectional area, the Unit 3 reduced disc 1 cross-section would increase tangential stress.

For the Unit 3 disc 1, the decrease in the tangential stress due to the reduction in centrifugal force is significantly larger than the increase in the tangential stress due to

the decrease in cross-sectional area. Therefore, the average tangential stress for the Unit 3 disc 1 design is smaller than for the standard plant design disc 1.

(4)

Figure 4 LP rotor for Unit 3

(4)

Figure 5 LP rotor for standard plant design

Proposed COLA Revision

None.

ENCLOSURE 10

Response to NRC RAI Letter 73

RAI 5811, Question 10.02.03-6

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

North Anna Unit 3

Dominion

Docket No. 52-017

RAI NO.: 5811 (RAI Letter 73)

SRP SECTION: 10.02.03 – TURBINE ROTOR INTEGRITY

QUESTIONS for Component Integrity, Performance, and Testing Branch 1 (AP1000/EPR Projects) (CIB1)

DATE OF RAI ISSUE: 06/3/2011

QUESTION NO.: 10.02.03-6

Explain why the high cycle fatigue peak alternating stresses, and the corresponding failure stresses (σ_{fail}) in Table 3.2-1 of the MHI Report MUAP-10005-P are different than the standard US-APWR LP rotors.

Dominion Response

In the High Cycle Fatigue (HCF) analysis, the failure stress (σ_{fail}) is obtained by the Goodman Diagram, based on the static stress, which is calculated by the transferred torque and the shaft sectional area at the evaluation point. There are no significant differences in the LP rotor failure stresses when comparing the North Anna Unit 3 design and the standard plant design.

However, the high cycle fatigue peak alternating stress is based on the bending stresses created by the weight of the LP rotor due to gravity. Therefore, the high cycle fatigue peak alternating stress of the Unit 3 design is relatively less than the standard plant design because the weight of LP rotor in the Unit 3 design is less than the standard design.

Proposed COLA Revision

None.

ENCLOSURE 11

Response to NRC RAI Letter 73

RAI 5811, Question 10.02.03-7

(Non-Proprietary Version)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

North Anna Unit 3

Dominion

Docket No. 52-017

RAI NO.: 5811 (RAI Letter 73)

SRP SECTION: 10.02.03 – TURBINE ROTOR INTEGRITY

QUESTIONS for Component Integrity, Performance, and Testing Branch 1 (AP1000/EPR Projects) (CIB1)

DATE OF RAI ISSUE: 06/3/2011

QUESTION NO.: 10.02.03-7

Figure 3.3-1 in the MHI Report MUAP-10005-P is difficult to read. Therefore, provide color copy of report and details of Figure 3.3-1. Also, explain why there seems to be a large difference in the temperature distributions between the two LP turbine designs.

Dominion Response

An enlarged color copy of Figure 3.3-1 from MUAP-10005-P is attached.

The reasons for the differences in temperature distribution in the LP rotor between the Unit 3 design and the standard plant design that are shown in Figures 6 and 7 are as follows:

The LP end blades, number of discs, and discs arrangement are different between the Unit 3 design (54-inches) and the standard plant design (74-inches). Therefore, the steam conditions between each disc are different, which results in a higher inlet steam temperature at L-0R in the Unit 3 design as compared to the standard plant design. Therefore, the temperature distribution of the LP rotor (L-0R disc) is different between the Unit 3 design and the standard plant design.

Proposed COLA Revision

None.

(4)

Figure 6 Unit 3 Temperature Distributions in the LP Rotor (at Rated Condition)

(4)

Figure 7 Standard Plant Temperature Distributions in the LP Rotor (at Rated Condition)

Proposed COLA Revision

None.

(4)

Figure 3.3-1 Temperature Distributions in the LP Rotor (At Rated Condition)

ENCLOSURE 13

Response to NRC RAI Letter 73

RAI 5881, Question 10.02.03-8

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

North Anna Unit 3

Dominion

Docket No. 52-017

RAI NO.: 5811 (RAI Letter 73)

SRP SECTION: 10.02.03 – TURBINE ROTOR INTEGRITY

QUESTIONS for Component Integrity, Performance, and Testing Branch 1 (AP1000/EPR Projects) (CIB1)

DATE OF RAI ISSUE: 06/3/2011

QUESTION NO.: 10.02.03-8

Revision 3 of the North Anna COL FSAR revised Section 10.2.3.5 to state that a turbine maintenance and inservice inspection procedure will be established prior to fuel load. However, the description of the inspection program, including the inspection intervals that follow the guidance of NUREG-0800, SRP Sections 3.5.1.3 and 10.2.3 were not provided in this revised COL FSAR Section 10.2.3.5 in order to meet the requirements of General Design Criterion (GDC) 4, "Environmental and Missile Dynamic Effects Design Bases" of 10 CFR Part 50. Therefore, provide the following in order to meet the requirements of General Design Criterion 4 of 10 CFR Part 50:

a) The guidelines in Section C.I.10.2.3.5 of Part I to RG 1.206 specify that if the plant-specific inspection program is not available at the time of the COL application, the representative information (description of the inspection program and inspection interval) may be submitted for staff review as part of the COL application. Therefore, describe the inservice inspection program and inspection intervals in the COL FSAR, or specify in the COL FSAR that the inspection procedure will be consistent with the inspection program and inspection intervals identified in Section 10.2.3.5 of the US-APWR DCD FSAR.

b) The submittal and implementation of the inservice inspection procedure for COL Item 10.2(1), which is based on the as-built properties of the turbine rotor, should be included as a proposed license condition in Section 1.8.1.2 and Table 1.8-201 of the North Anna S-COL FSAR application since this item will not be resolved prior to the issuance of the license. The proposal of a license condition, as discussed in Section C.I.10.2.3.5 of Part I to RG 1.206, ensures that the as-built plant is consistent with the design reviewed during the licensing

process, and is consistent with a Luminant Generation Company letter dated August 9, 2010, for the R-COL application, Comanche Peak, Units 3 and 4.

Dominion Response

a) FSAR Section 10.2 incorporates by reference DCD Tier 2 Section 10.2, with various departures and supplements. The ISI program and inspection intervals are described in DCD Section 10.2. FSAR Section 10.2.6 replaced DCD References 10.2-9 and 10.2-10 with Unit 3 specific references for applicable turbine missile generation probabilities due to either material failure or failure of the overspeed protection system, respectively. The probabilities and resulting conclusions in the Unit 3 specific references do not alter the program content or inspection frequencies presented in the DCD. Therefore, FSAR Section 10.2 includes a description of the turbine inservice inspection program.

b) The North Anna Unit 3 S-COLA does not contain proposed license conditions. The NRC is currently developing model license conditions for use in a COL. Dominion expects that the NRC will use these model license conditions, when finalized, in preparing the North Anna Unit 3 COL.

   The turbine inservice inspection program will be implemented as described in FSAR Section 10.2.3.5. As identified in Table 1.8-201 for item COL 10.2(1), the resolution category stated for this item is via plant procedures. If the model license conditions include the turbine inservice inspection program, then it will be included in the Unit 3 COL.

Proposed COLA Revision

None.