Enclosure 1 is to be withheld from public disclosure under 10 CFR 2.390. When Enclosure 1 is separated, this letter is decontrolled.

Tennessee Valley Authority, Post Office Box 2000, Spring City, Tennessee 37381-2000

March 24, 2011

10 CFR 50.4(b)(6)
10 CFR 50.34(b)

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555-0001

Watts Bar Nuclear Plant, Unit 2
NRC Docket No. 50-391

Subject: **WATTS BAR NUCLEAR PLANT (WBN) UNIT 2 - FINAL SAFETY ANALYSIS REPORT (FSAR) - RESPONSE TO CHAPTER 10 REQUEST FOR ADDITIONAL INFORMATION**

References:
1. TVA letter to NRC dated March 15, 2011, "Watts Bar Nuclear Plant (WBN) - Unit 2 - Final Safety Analysis Report (FSAR), Amendment 103"
2. NRC letter to TVA dated March10, 2011, "Watts Bar Nuclear Plant (WBN) Request for Additional Information Regarding Final Safety Analysis Report Amendment related to Section 10.2.3 (TAC No. ME4640)"

The purpose of this letter is to respond to a request for additional information (RAI) regarding the Unit 2 FSAR Chapter 10, Section 10.2.3 initially received via e-mail on March 4, 2011, and later received in Reference 2. The responses to these RAIs, provided in Enclosure 1, were based upon questions provided in the initial e-mail. A review of differences between the initial e-mail questions and the ones found in Reference 2 was done, and the differences were determined to be insignificant. The responses to these RAIs were supplied by TVA's Unit 2 turbine vendor, Siemens, via Letter No. WB2-TJM-059, "Submittal of Siemens Responses to NRC 04 Mar 2011 Requests for Additional Information - FSAR Section 10.2.3 - Turbine Rotor & Disk Integrity TVA Watts Bar #2 Completion, Upgrade & Startup Project," dated March 18, 2011.

Enclosure 1 contains information proprietary to Siemens Energy, Inc. TVA requests that the Siemens Energy, Inc., proprietary information be withheld from public disclosure in accordance with 10 CFR § 2.390. Enclosure 2 contains the corresponding non-proprietary version of the document. Enclosure 3 provides the corresponding affidavit for withholding proprietary information from public disclosure.

D030
NRR

There are no new commitments made in this submittal. If you have any questions, please contact Bill Crouch at (423) 365-2004.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 24th day of March, 2011.

Respectfully,

David Stinson
Watts Bar Unit 2 Vice President

Enclosures:

1. Submittal of Siemens Responses to NRC 04 Mar 2011 Requests for Additional Information - FSAR Section 10.2.3 - Turbine Rotor & Disk Integrity TVA Watts Bar #2 Completion, Upgrade & Startup Project (Proprietary Version)
2 Submittal of Siemens Responses to NRC 04 Mar 2011 Requests for Additional Information - FSAR Section 10.2.3 - Turbine Rotor & Disk Integrity TVA Watts Bar #2 Completion, Upgrade & Startup Project (Redacted - Non-Proprietary Version)
3. Affidavit for Withholding Proprietary Information from Public Disclosure

cc (Enclosures):

U. S. Nuclear Regulatory Commission
Region II
Marquis One Tower
245 Peachtree Center Ave., NE Suite 1200
Atlanta, Georgia 30303-1257

NRC Resident Inspector Unit 2
Watts Bar Nuclear Plant
1260 Nuclear Plant Road
Spring City, Tennessee 37381

Enclosure 2
Watts Bar Nuclear Plant, Unit 2

Submittal of Siemens Responses to NRC 04 Mar 2011 Requests for Additional Information - FSAR Section 10.2.3 - Turbine Rotor & Disk Integrity TVA Watts Bar #2 Completion, Upgrade & Startup Project (Non-proprietary Version)

SIEMENS CONFIDENTIAL INFORMATION (REDACTED VERSION)

Subject:
SECTION 10.2.3, "TURBINE ROTOR AND DISK INTEGRITY"
WATTS BAR NUCLEAR PLANT UNIT 2 FINAL SAFETY ANALYSIS REPORT
AMENDMENT NO. 99

TVA forwarded the subject document to Siemens by email from Mr. Jerry Schlessel to Mr. Peter Hosbein of Siemens on 04Mar2011, requesting that Siemens "answer these questions", presumably referring to the comments on the subject document from the NRC which was attached to that email. Siemens comments on those questions are provided below. For reference only, Siemens repeats the comments, by section, directly from the NRC report. That should not necessarily be construed as Siemens agreement with such comments.

This information is being furnished pursuant to and under Contract Number 65008 effective 08Nov2007.

NRC Request:
RAI-1

NRC Statement: The applicant addressed the turbine rotor integrity for the WBN-2 in Amendment 102 of FSAR, Section 10.2.3, "Turbine Rotor and Disk Integrity." The staff evaluated this section against the acceptance criteria specified in SRP 10.2.3, "Turbine Disk Integrity," dated 1981 for low-pressure turbine disks. The acceptance criteria cover five areas: materials selection, fracture toughness, preservice inspection, turbine disk design, and inservice inspection.

Regarding the second criterion (fracture toughness), SRP 10.2.3 requires the ratio of the fracture toughness (K_{IC}) of the rotor material to the maximum tangential stress at speeds from normal to design overspeed be at least 2 $\sqrt{in}$. Further, this criterion requires the K_{IC} be obtained through one of the four methods specified in the SRP. However, Section 10.2.3.1 of Amendment 102 does not indicate how fracture toughness values for the rotor shaft and disks were obtained. Please confirm whether fracture toughness is obtained indirectly through a test data based K_{IC} versus (T-FATT) curve, where T is the operating temperature and FATT is the 50 % fracture appearance transition temperature. If the answer is yes, provide the K_{IC} versus (T-FATT) curve applicable to the WBN 2 turbine; if the answer is no, provide information regarding fracture toughness values for the rotor shaft and disks and how they are obtained.

Siemens Comments: Siemens, in previous submittals to the NRC [Ref. 1 & 2], had used a value of [ ] for the maximum upper shelf mean fracture toughness in its disc burst analysis with [ ] percent of the mean fracture toughness value as standard deviation. This was addressed in Reference 2, Safety Evaluation Section 3.1.4, p. vii.

For procurement purposes, Siemens specifies minimum impact strength for rotor shafts as [ ] Siemens specifies minimum impact strength for LP turbine discs as [ ]. Applicable Siemens Technical Purchasing Specification (TLV) data are summarized in Table 1 for the Watts Bar 2 rotors and discs.

The impact strengths are based on the average of three (3) Charpy V-notch specimens. The TLV requires that the supplier provide the results of mechanical tests including these Charpy V-notch specimens, along with other data, in a Material Certification Report. This complies with criteria method "a", testing of the actual material of the turbine disc to establish the K_{Ic} value at normal operating temperature, per the SRP.

Because the receipt of these Material Certification Reports is typically after the Missile Analysis Report is required by the customer, the missile analysis is calculated using a Monte-Carlo simulation as described in Reference 3, Section 3.4 with a disc fracture toughness value of [ ] and standard deviation value of [ ] Mpa·√m. For comparison, the K_{Ic} values were calculated from these tensile and minimum Charpy data on the disc material using methods presented by Barsom-Rolfe [Ref. 4]. Fracture toughness values are computed and summarized in Table 1.

Table 1 – LP Rotor Shaft and Discs Calculated Fracture Toughness from Barsom-Rolfe Correlation[4]

Metric Units	**TLV 9123**	**Min/Max**	**Yield Strength (Mpa)**	**Impact Strength (J)**	**Toughness, (Mpa-m^0.5)**
Discs 2 and 3	34	Min	[ ]	[ ]	[ ]
		Max	[ ]	[ ]	[ ]
Disc 1	35	Min	[ ]	[ ]	[ ]
		Max	[ ]	[ ]	[ ]
Shaft	60	Min	[ ]	[ ]	[ ]
		Max	[ ]	[ ]	[ ]
English Units	**TLV 9123**	**Min/Max**	**Yield Strength (ksi)**	**Impact Strength (ft-lbf)**	**Toughness, (ksi-in^0.5)**
Discs 2 and 3	34	Min	[ ]	[ ]	[ ]
		Max	[ ]	[ ]	[ ]
Disc 1	35	Min	[ ]	[ ]	[ ]
		Max	[ ]	[ ]	[ ]
Shaft	60	Min	[ ]	[ ]	[ ]
		Max	[ ]	[ ]	[ ]

NRC Request:
"RAI-2

Regarding the fourth criterion (turbine rotor design), SRP 10.2.3 requires (1) the combined stresses of the low-pressure turbine rotor at design overspeed should not exceed 0.75 of the minimum specified yield strength of the material, and (2) the natural frequencies (critical speeds) of the turbine shaft assemblies should be controlled so as to cause no distress to the unit during operation. The CT-27467 report, which supports Section 3.5.1.3 of Amendment 102, contains the stress distribution of the rotor assembly at a speed exceeding the design overspeed. Section 10.2.3.1 of Amendment 102 contains yield strength ranges for the rotor and the disks. Therefore, Item 1 of this criterion is addressed. However, Amendment 102 does not address Item 2 of this requirement, please provides this information.

Siemens Comments: Siemens interprets the Item 2 requirement to state that the natural frequencies (critical speeds) of the turbine shaft assemblies should be controlled so as to cause no distress to the unit during operation. As reported in the LP Design Analysis Report for Watts Bar 2 [Ref. 5], the critical speeds as calculated by Siemens are listed as summarized in Table 2.

In Siemens view, the calculated critical speeds show a separation acceptable to Siemens from running speed of 1800 RPM and are sufficiently damped.

Table 2 – Siemens Calculated Critical Speeds – BB281-13.9m2 Rotor

Mode	Critical Speeds (RPM)
LP First Horizontal	[ ]
LP First Vertical	[ ]
LP Second Horizontal	[ ]
LP Second Vertical	[ ]

NRC Request:

RAI-3

Regarding the last criterion (inservice inspection), SRP 10.2.3 requires disassembly of the turbine at approximately 10-year intervals and complete inspection of all normally inaccessible parts, such as couplings, coupling bolts, turbine shafts, low-pressure turbine blades, low-pressure disks, and high-pressure rotors. Amendment 102 does not address this requirement, please provides this information.

Siemens Comments: The NRC Safety Evaluation of the Siemens 13.9m^2 LP retrofit [Ref. 1] accepted LP rotor disc inspection intervals for up to 100,000 operating hours. At the first outage

following the 100,000 operating hours, it would be recommended that the LP turbine rotors be inspected by NDE, including the following areas:

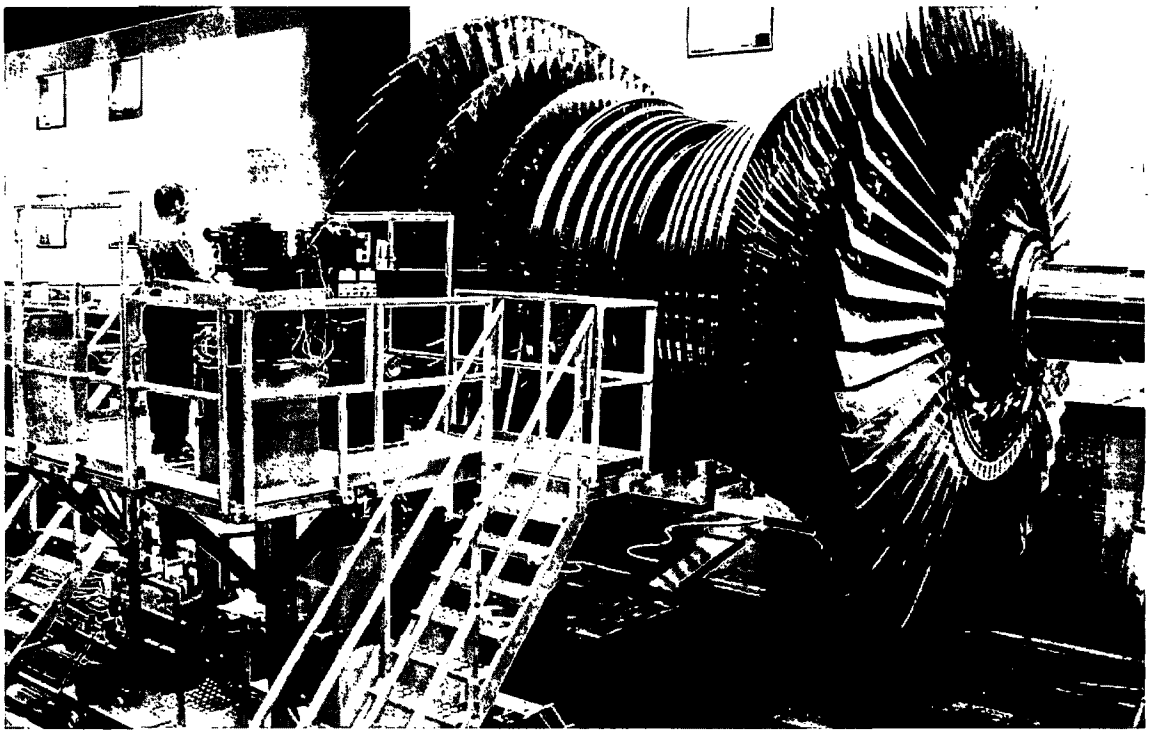
- Rotor journals and shafts are inspected by VT and MT methods
- LP blades and grooves are inspected by VT and MT methods
- Shrunk-on discs are inspected by VT and UT methods – See Figure 1
- Couplings are inspected by VT and MT methods
- Coupling bolts are inspected by VT, MT and UT methods
- Bearings are inspected by VT and PT methods

Where:

VT = visual examination
PT = liquid penetrant examination
MT = magnetic particle examination
UT = eddy current examination

The HP turbine monoblock rotor could be inspected by similar means.

Figure 1 – UT Disc Inspection of Advanced Disc Design LP Rotor



References:

1. Report TR-04108, "Missile Probability Analysis for the Siemens 13.9m^2 Retrofit Design of Low-Pressure Turbine by Siemens AG", June 7, 2004, submitted to the Nuclear Regulatory Commission as Topical Report TR-04108-P-A, Not for Public Record.
2. Report TR-03142, "Missile Analysis Methodology for GE Nuclear Steam Turbine Rotors by the SWPC", July 31, 2003, submitted to the NRC as TR-03142-P-A, Not for Public Record.
3. CT-27467, Missile Report for TVA Watts Bar 2, BB281-13.9m^2", October 6, 2009, Siemens Confidential.
4. J. M. Barsom and S. T. Rolfe, "Correlation Between K_{1c} and Charpy V-Notch Test Results in the Transition-Temperature Range", Impact Testing of Metals, ASTM STP 466, 1970, p. 281-302.
5. Report EC-09156, "BB281-13.9m^2 Low Pressure Turbine Design Analysis Report for Watts Bar #2", June 1, 2009, Siemens Confidential.

Enclosure 3
Watts Bar Nuclear Plant, Unit 2

Affidavit for Withholding Proprietary Information from Public Disclosure

AFFIDAVIT OF WITHHOLDING

I, John P. Musone hereby provide this Affidavit and state as follows:

1. I am Assistant Secretary for Siemens Energy, Inc., having its principle offices at 4400 Alafaya Trail, Orlando, Florida 32826 ("Siemens"), and Associate Chief Intellectual Property Counsel for its parent Siemens Corporation.

2. This statement is under 10 C.F.R. 2.390 and NRC Regulatory Issue Summary 2004-11.

3. 10 C.F.R. 2.390(a)(4) provides for nondisclosure of information provided to the Nuclear Regulatory Commission that constitutes "trade secrets and commercial or financial information obtained from a person and privileged or confidential."

4. 10 C.F.R. 2.390(b)(1)(ii) and (iii) provide for submission of an Affidavit as the mechanism by which such nondisclosure is affected, and specifies that the Affidavit --

A. Identifies the document or part sought to be withheld;

B. Identifies the official position of the person making the affidavit;

C. Declares the basis for proposing the information be withheld, encompassing considerations set forth in Sec. 2.390(a);

D. Includes a specific statement of the harm that would result if the information sought to be withheld is disclosed to the public; and

E. Indicates the location(s) in the document of all information sought to be withheld;

F. Contain a full statement of the reason for claiming the information should be withheld from public disclosure. Such statement shall address with specificity the consideration listed in paragraph (b)(4) of this section.

5. Following the Overview, this Affidavit tracks the affidavit organization and requirements of 10 C.F.R. 2.390.

Overview

6. Siemens contracted with Tennessee Valley Authority, (TVA) to design, fabricate, deliver and install improvements to TVA's Watts Bar #2 Nuclear Power Plant in Rhea County, Tennessee pursuant to Contract Number 65008 effective November 8, 2007, TVA Watts Bar #2 Completion, Upgrade & Startup Project (the Project) As part of the Project, the Nuclear Regulatory Commission (NRC) submitted a Request for Additional Information (RAI) to Siemens on March 4, 2011, pertaining to Final Safety Analysis Report Section 10.2.3 (Turbine Rotor & Disk Integrity) of the TVA Watts Bar #2 Completion, Upgrade & Startup Project. Siemens provided responses to the RAI's, under terms of strict confidentiality.

7. TVA has requested Siemens permission to provide the responses to the RAI's to the NRC. Siemens is amenable to provide a redacted version of the responses to the RAI's.

8. The responses to the RAI's contains highly sensitive and confidential design information which embodies Siemens' state-of-the-art design parameters for Siemens turbine rotor trains.

9. Public disclosure of the responses to the RAI's would (i) provide a windfall shortcut for Siemens competitors to obtain Siemens' rotor design parameters and thereby replicate Siemens components, and (ii) allow Siemens competitors to glean the capabilities and limits of Siemens' technology. This confidential information is invaluable when competing and akin to having the opposing team's playbook before and during the big game.

Document or Part Sought to be Withheld

10. The responses to the RAI's provided by Siemens to TVA under TVA contract number 65008, in response to the NRC's Request for Additional Information to Siemens on

March 4, 2011, pertaining to Final Safety Analysis Report Section 10.2.3 (Turbine Rotor & Disk Integrity) of the TVA Watts Bar #2 Completion, Upgrade & Startup Project.

Official Position of Person Making the Affidavit

11. The person making this Affidavit is John P. Musone, Assistant Secretary for Siemens Energy, Inc., having its principle offices at 4400 Alafaya Trail, Orlando, Florida 32826 ("Siemens"), and Associate Chief Intellectual Property Counsel for its parent Siemens Corporation.

Basis for the Information to be Withheld

12. The basis for the information to be withheld, is Section 2.390(a)(4) – "trade secrets and commercial or financial information obtained from a person and privileged and confidential." The person to provide the information is Siemens via TVA. The trade secret information is the content of the responses to the RAI's that is confidential and proprietary to Siemens and only provided to TVA under strict terms of confidentiality.

Specific Statement of Harm Due to Public Disclosure

13. The general public has no defined interest in the responses to the RAI's and would not undergo any harm due to its nondisclosure. The general public presumably is not interested in replicating Siemens components. The responses to the RAI's provide no newsworthy or publicly-relevant information regarding the Watts Bar Nuclear Plant. A false argument could be made that Siemens' competitors are "the public" and that they would be harmed because they would then not obtain a windfall shortcut to replicate Siemens components and glean Siemens capabilities.

Locations in the Document of Information to be Withheld

14. The portions of the responses to the RAI's identified in brackets that illustrate confidential rotor design parameters and criteria (e.g. fracture toughness, material data and rotor dynamic response data) for the Watts Bar #2 Completion, Upgrade and Startup Project associated with the Low Pressure turbine has been withheld.

Full Statement of Reason for Claiming the Information Should be Withheld

15. Through its own innovation, substantial investment in research and development and by virtue of its long established experience as a world renowned going-concern in the power generation industry, Siemens successfully developed the turbine design embodied in the Watts Bar #2 Completion, Upgrade and Startup Project delivered to TVA. As part of the Project, the Nuclear Regulatory Commission submitted a Request for Additional Information to Siemens on March 4, 2011, pertaining to Final Safety Analysis Report Section 10.2.3 (Turbine Rotor & Disk Integrity) on the TVA Watts Bar #2 Completion, Upgrade & Startup Project. Siemens provided responses to the RAI's,, which in turn discloses the specific design information (e.g. fracture toughness, material data and rotor dynamic response data) from which Siemens' turbine is designed and manufactured. Public disclosure of the responses to the RAI's would (i) provide a windfall shortcut for Siemens competitors to obtain Siemens' rotor design parameters and thereby replicate Siemens components, and (ii) allow Siemens competitors to glean the capabilities and limits of Siemens' technology. This confidential information is invaluable when competing and akin to having the opposing team's playbook before and during the big game.

16. Siemens' specific turbine design information as embodied in the responses to the RAI's is valuable, confidential and proprietary business assets of Siemens and constitute trade secrets. They derive independent economic value from not being generally known and not being readily ascertainable by proper means by other persons who can obtain economic value from their disclosure or use. It is Siemens' understanding that the specific turbine design information as embodied in the responses to the RAI's is customarily held in confidence throughout the industry and is not made publicly available.

17. Siemens has adopted reasonable measures to maintain the secrecy of its trade secrets; to-wit: securing their business offices and facilities with private fences and borders restricting access via key pads requiring individual access codes, locking main building doors, locking file cabinets, password-protecting computer files, using automated e-mail encryption, and locking portable computers. Siemens also shreds confidential documents that are no longer in use.

18. In addition, Siemens requires its employees with access to Siemens trade secrets, to execute confidentiality agreements agreeing to maintain the confidentiality of the trade secrets. Further, Siemens employees are required to complete instruction modules covering, *inter alia*, protection of corporate confidential information and the importance of maintaining the secrecy of Siemens' trade secrets. Siemens' employees are also required to participate in routine security programs and checks directed by company security officers to ensure that the security measures are being followed.

19. Siemens further requires that, prior to any provision of Siemens confidential information to a third party, Siemens's management must authorize such disclosure and the third party must first execute a confidentiality agreement agreeing to maintain Siemens's confidential information in confidence. Siemens included a confidentiality provision in its contract with TVA.

20. For the foregoing reasons, Siemens' specific turbine design information as embodied in the responses to the RAI's comprise its confidential, proprietary and trade secret information. The general public has no defined interest in this design information and would not undergo any harm due to its nondisclosure. On the other hand, public disclosure of this design information would (i) provide a windfall shortcut for Siemens competitors to obtain Siemens' rotor design parameters and thereby replicate Siemens components, and (ii) allow Siemens competitors to glean the capabilities and limits of Siemens' technology. It is therefore respectfully requested that the Siemens responses to the RAI's remain in confidence.

SIGNED UNDER THE PAINS AND PENALTIES OF PERJURY THIS 23 DAY OF March, 2010.

John P. Musone
Assistant Secretary; Siemens Energy, Inc.
Associate Chief Intellectual Property Counsel; Siemens Corporation