AREVA

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

Response to U.S. EPR Design Certification Application RAI No. 15, Supplement 2

Ref. 1: E-mail, Getachew Tesfaye (NRC) to AREVA NP Inc., "U.S. EPR Design Certification Application RAI No. 15, FSAR Ch 4," June 23, 2008.

Ref. 2: E-mail, Ronda M. Pederson (AREVA NP) to Getachew Tesfaye (NRC), et al., "Response to U.S. EPR Design Certification Application RAI No. 15, FSAR Ch 4," July 17, 2008.

Ref. 3 Letter, Ronnie L. Gardner (AREVA NP Inc.) to Document Control Desk (NRC), "Response to U.S. EPR Design Certification Application RAI No. 15, Supplement 1," NRC:08:061, August 22, 2008.

In Reference 1, the NRC provided a request for additional information (RAI) regarding the U.S. EPR design certification application. As noted in Reference 2, AREVA NP Inc. (AREVA NP) indicated that the response to RAI No. 15, Questions 04.05.01-2, 04.05.01-4, and 04.05.01-5 would be submitted to the NRC by October 30, 2008. Accordingly, technically correct and complete responses to RAI No. 15, Questions 04.05.01-2, 04.05.01-4, and 04.05.01-5 are enclosed with this letter. Technically correct and complete responses to the remainder of the questions for RAI No. 15 were provided in Reference 3.

The enclosed response consists of the following:

Question #	Start Page	End Page
RAI 15—04.05.01-2	2	3
RAI 15—04.05.01-4	4	5
RAI 15—04.05.01-5	6	6

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NRO

AREVA NP INC.
An AREVA and Siemens company

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AREVA NP considers some of the material contained in the attachments to this letter to be proprietary. As required by 10 CFR 2.390(b), an affidavit is enclosed to support the withholding of the information from public disclosure. Proprietary and non-proprietary versions of the enclosures to this letter are provided.

If you have any questions related to this submittal, please contact me by telephone at (434)832-2369 or by e-mail at sandra.sloan@areva.com.

Sincerely,

Sandra M. Sloan

Sandra M. Sloan, Manager
New Plants Regulatory Affairs
AREVA NP Inc.

Enclosures

cc: J. Rycyna
G. Tesfaye
Docket 52-020

AFFIDAVIT

COMMONWEALTH OF VIRGINIA)
) ss.
CITY OF LYNCHBURG)

1. My name is Ronda M. Pederson. I am Licensing Manager, U.S. EPR Design Certification, Regulatory Affairs for New Plants Deployment, for AREVA NP Inc. and as such I am authorized to execute this Affidavit.

2. I am familiar with the criteria applied by AREVA NP to determine whether certain AREVA NP information is proprietary. I am familiar with the policies established by AREVA NP to ensure the proper application of these criteria.

3. I am familiar with the AREVA NP information contained in "Response to U.S. EPR Design Certification Application RAI No. 15, Supplement 2," and referred to herein as "Document." Information contained in this Document has been classified by AREVA NP as proprietary in accordance with the policies established by AREVA NP for the control and protection of proprietary and confidential information.

4. This Document contains information of a proprietary and confidential nature and is of the type customarily held in confidence by AREVA NP and not made available to the public. Based on my experience, I am aware that other companies regard information of the kind contained in this Document as proprietary and confidential.

5. This Document has been made available to the U.S. Nuclear Regulatory Commission in confidence with the request that the information contained in this Document be withheld from public disclosure. The request for withholding of proprietary information is made in accordance with 10 CFR 2.390. The information for which withholding from disclosure is

requested qualifies under 10 CFR 2.390(a)(4) "Trade secrets and commercial or financial information".

6. The following criteria are customarily applied by AREVA NP to determine whether information should be classified as proprietary:

(a) The information reveals details of AREVA NP's research and development plans and programs or their results.

(b) Use of the information by a competitor would permit the competitor to significantly reduce its expenditures, in time or resources, to design, produce, or market a similar product or service.

(c) The information includes test data or analytical techniques concerning a process, methodology, or component, the application of which results in a competitive advantage for AREVA NP.

(d) The information reveals certain distinguishing aspects of a process, methodology, or component, the exclusive use of which provides a competitive advantage for AREVA NP in product optimization or marketability.

(e) The information is vital to a competitive advantage held by AREVA NP, would be helpful to competitors to AREVA NP, and would likely cause substantial harm to the competitive position of AREVA NP.

The information in the Document is considered proprietary for the reasons set forth in paragraphs 6(b) and 6(c) above.

7. In accordance with AREVA NP's policies governing the protection and control of information, proprietary information contained in this Document have been made available, on a limited basis, to others outside AREVA NP only as required and under suitable agreement providing for nondisclosure and limited use of the information.

8. AREVA NP policy requires that proprietary information be kept in a secured file or area and distributed on a need-to-know basis.

9. The foregoing statements are true and correct to the best of my knowledge, information, and belief.

SUBSCRIBED before me this 27th

day of October, 2008.

Kathleen A. Bennett
NOTARY PUBLIC, COMMONWEALTH OF VIRGINIA
MY COMMISSION EXPIRES: 8/31/2011

KATHLEEN ANN BENNETT
Notary Public
Commonwealth of Virginia
110864
My Commission Expires Aug 31, 2011

Response to

Request for Additional Information No. 15, Supplement 2, Revision 0

6/13/2008
U.S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 04.05.01 - Control Rod Drive Structural Materials
Application Section: 4.5.1
CIB1 Branch

Question 04.05.01-2:

The FSAR identifies that the latch unit compression springs and drive rod compression springs (non-Reactor Coolant Pressure Boundary components) are fabricated from W.Nr. 2.4669 (Alloy X-750). The FSAR indicates that this alloy will be supplied in the solution annealed (followed by quenching) and thermally aged condition for optimum resistance to stress corrosion cracking. In order for the staff to evaluate the acceptability of the applicant's thermal treatment (which is needed to achieve optimal stress-corrosion-cracking resistance), the staff requests that the applicant discuss its solution-annealing and thermal-aging requirements and provide a description of any testing that has been performed to demonstrate the effectiveness of thermal treatments in optimizing the material's resistance to stress-corrosion cracking.

Response to Question 04.05.01-2:

References for Question 04.05.01-2:

1. S. Hattori, Y. Mori, I. Masaoka, H. Itoh, R. Watanabe, "Study on Stress Corrosion Cracking of Inconel Alloy X-750 and 718 in Oxygenated High Temperature Water," EPRI-Workshop on Nickel Base Alloys, June 18, 1981, Charlotte, NC.

2. Ph. Berge, "Experience with Alloy X 750 Cracking in PWR's," EPRI-Workshop on Advanced High Strength Materials, March 12-13, 1986, Clearwater Beach, FL.

3. T. R. Mager, "Fastener and Bolting Material for Westinghouse Design Internals," EPRI-Workshop on Advanced High Strength Materials, March 12-13, 1986, Clearwater Beach, FL.

4. C. Benhamou, P. Poitrenaud, "Framatome Experience and Programs in Relation with Guide Tube Support Pin Cracking," EPRI-Workshop on Advanced High Strength Materials, March 12-13, 1986, Clearwater Beach, FL.

5. P. Skeldon, P. Hurst, "Environmentally Assisted Cracking on Inconel X750," Proceedings of the Third International Symposium on Environmental Degradation of Materials in Nuclear Power Systems – Water reactors, August 30 – September 3, 1987, Traverse City, Michigan.

6. SAE/AWS 5698G, "Nickel Alloy, Corrosion and Heat-Resistance Wire 72Ni-15.5Cr-0.95Cb-2.5Ti-0.70Al-7.0Fe No. 1 Temper, Precipitation Hardenable," Society of Automotive Engineers, Reaffirmed August 2007.

7. T. Yonezawa, K. Onimura, N. Sakamoto, H. Nakata, H. Susukida, "Effect of Heat Treatment on Stress Corrosion Cracking Resistance of High Nickel Alloys in High Temperature Water," Proceedings of the International Symposium on Environmental Degradation of Materials in Nuclear Power Systems – Water reactors, August 22 – 25, 1983, Myrtle Beach, South Carolina.

8. T. R. Mager, I. L. W. Wilson, "Improved Stress Corrosion Resistance of NiCrFe Alloys," Interim Report of EPRI project 2182-2, EPRI NP-6908-M, July 1990, Pittsburgh, PA.

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

Question 04.05.01-4:

FSAR Section 4.5.1 indicates that latch-unit pins and the drive-rod spreader button are fabricated from WNr. 2.4967. The applicant also indicated that this material is comparable to Haynes 25 (UNS R30605). The staff was unable to locate a material WNr. 2.4967 that is comparable to Haynes 25. However, the staff identified WNr. 2.4964 which is comparable to Haynes 25 and is a Co-Ni-Cr-W alloy. The applicant stated that this material is delivered in the solution-annealed condition. In order for the staff to complete its review of the use of Haynes 25, the staff requests the following information be addressed. Provide a clarification regarding the listing of WNr. 2.4967 in lieu of WNr. 2.4964 which is similar to Haynes 25, and discuss any corrosion and mechanical testing that has been performed to verify that this material is acceptable for its intended use.

Response to Question 04.05.01-4:

As noted in the response to RAI 15, Supplement 1 (Reference 1), [ ], and U.S. EPR FSAR Tier 2, Table 4.5-1 was revised accordingly.

While specific corrosion or mechanical testing has not been performed by AREVA NP on Haynes 25, long term operating experience in Germany is available for approximately 15 plants over a period of more than 30 years without any reported failures. Material selection for parts manufactured from Haynes 25 alloy was done in the past based on original design of control rod drive mechanisms (CRDM). Haynes 25 was also used in the CRDMs of Babcock & Wilcox (B&W) designed PWRs (Reference 2). The Babcock & Wilcox Owners Group (B&WOG) performed periodic inspections of CRDMs removed from service under the B&WOG CRDM LIFEX program. Each selected CRDM was completely disassembled and inspected for degradation. The roller nuts made of Haynes 25 were inspected and measured for wear. Some of the CRDMs have logged more than 20 years of service at the inspection time. Except for the expected wear on the surface in contact with the leadscrew due to CRDM travel, the roller nuts did not experience corrosion related degradation during the LIFEX inspections. Therefore the resistance of Haynes 25 in high purity water is confirmed for temperatures up to 680°F (Reference 3).

References for Question 04.05.01-4:

1. Letter, Ronnie L. Gardner (AREVA NP Inc.) to Document Control Desk (NRC), "Response to U.S. EPR Design Certification Application RAI No. 15, Supplement 1," NRC:08:061, August 22, 2008.

2. H. Xu, S. Fyfitch, R. C. Pillow, "In-Service Wear Measurement of B&WOG CRDM Roller Nut," Wear, Volume 255, Issues 7-12, Pages 1251-1255, August-September 2003.

3. "Korrosions- und chemische Beständigkeit von Werkstoffen - Dechema-Werkstoff-Tabellen, 51. Ergänzungslieferung, Hochreines Wasser", DECHEMA Gesellschaft für Chemische Technik und Biotechnologie e.V., 2005, Frankfurt a. M., Germany.

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

Question 04.05.01-5:

FSAR Section 4.5.1 indicates that the materials used to fabricate the Control Rod Drive Mechanism are selected based on a proven German design with 30 years of operating experience. The staff requests that the applicant verify that all of the materials listed in Table 4.5-1 have significant (i.e., 30 years) operating experience in Pressurized Water Reactors and describe the extent to which evidence of general corrosion, stress-corrosion cracking or other forms of degradation were discovered in operating foreign nuclear plant applications.

Response to Question 04.05.01-5:

The CRDM design used for the U.S. EPR is a proven German design used in Kraftwerk Union (KWU) Pressurized Water Reactor (PWR) Nuclear Power Plants (NPP) since 1969. The materials noted in Table 4.5-1 of the FSAR are the same materials that have been used in the German design for the past 30 years. Seventeen KWU PWR designed plants employ the same CRDM design and materials as the U.S. EPR. Currently, 937 CRDMs have been installed and 856 CRDMs remain in service in KWU NPPs. The same materials are used for the CRDMs in the KWU NPPs; the only differences are physical dimensions (diameter and length) of the CRDM assembly due to the plant size. No evidence of general corrosion, stress-corrosion cracking (SCC), or other types of degradation has been noted in the operating CRDM KWU PWR fleet.

In the KWU plants built before 1988, **[ ]** latch units have been replaced or repaired due to a mechanical failure of the Alloy X-750 compression spring in the lifting armature. The combination of the effects of manufacturing techniques prior to 1988, the dynamic loadings, and the ambient conditions during operation led to reduced life time and damage of the compression springs. Since 1988, the manufacturing process of the compression springs has been modified and the springs have been redesigned such that lower mechanical stresses develop in the springs during operation. The redesigned compression spring has been in operation since 1988 with no repair or replacements. No other mechanical failures of any component part have been identified.

Furthermore, should a break in the compression spring occur, it would have no impact on the release function of the latch unit for rod drop for the CRDM design. The latches are retracted from the drive rod by the gripping or holding armature depending on the stepping condition. The spring of the lifting armature does not influence the movement of the gripping or holding armature section of the latch unit since they are mechanically independent of each other.

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.