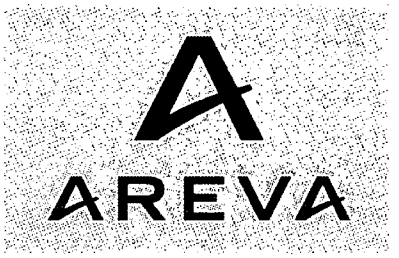

December 18, 2008
NRC:08:101

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

Additional Information in Support of NRC Confirmatory Analysis Regarding the U.S. EPR Leak-Before-Break (LBB) Methodology

Ref. 1: Letter, Sandra M. Sloan (AREVA NP Inc.) to Document Control Desk (NRC), "Presentation Materials from the NRC – AREVA NP Audit regarding the U.S. EPR Leak-Before-Break (LBB) Methodology," NRC:08:049, July 2, 2008.

On June 26, 2008, AREVA NP Inc. (AREVA NP) supported an audit with NRC staff regarding the U.S. EPR Leak-Before-Break (LBB) methodology at the AREVA NP office in Rockville, Maryland. Presentation materials from this audit were provided to the NRC in Reference 1. At this audit, the NRC indicated they would be performing a confirmatory analysis of the U.S. EPR LBB methodology. Subsequently, on November 18, 2008, a conference call was held with the NRC regarding their preliminary results of the confirmatory analysis that was performed on the LBB analyses for the U.S. EPR main steam line (MSL) and surge line (SL) piping. During this conference call, NRC requested the following information to support their confirmatory analysis:

- An indication of which JR curve equations were used in the SL flaw stability analysis.
- Results for the SL analysis generated from AREVA NP's KRAKFLO code.

The requested information is provided in Attachments 1 and 2, respectively.

AREVA NP considers some of the material contained in the attachments 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 attachments 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

D077
NRO

cc: J. Rycyna
G. Tesfaye
Docket No. 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, 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 *Additional Information in Support of NRC Confirmatory Analysis Regarding the U.S. EPR Leak-Before-Break (LBB) Methodology* 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 has 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 10th day of December, 2008.

Sherry L. McFaden
NOTARY PUBLIC, COMMONWEALTH OF VIRGINIA
MY COMMISSION EXPIRES: 10/31/2010
Registration # 7079129

SHERRY L. MCFADEN
Notary Public
Commonwealth of Virginia
7079129
My Commission Expires Oct 31, 2010

J-R Equations Used in the Surge Line Flaw Stability Analysis

As stated in U.S. EPR FSAR Tier 2, Section 3.6.3.5.7.2, the surge line (SL) flaw stability analyses were conducted at three locations; the associated lower bounding materials are provided in U.S. EPR FSAR Tier 2, Table 3.6.3-6 and are summarized below:

- Location1: pressurizer surge nozzle (Alloy 52)*
- Location 2: SL line piping near pressurizer (stainless steel (SS) base metal) and,
- Location 3: hot leg (HL) nozzle (SS base metal)

* Corresponds to fusion line toughness

The following J-R equations are used for a given location:

1. The Alloy 52 J-R equation at location 1.
2. The base metal J-R equation with C = [ ] and N = [ ] at location 2.
3. The base metal J-R equation with C = [ ] and N = [ ] at location 3.

For clarification, for the flaw stability analysis at each of the above three locations, AREVA NP used the applicable tensile properties as described in U.S. EPR FSAR Tier 2, Table 3.6.3-5 and summarized below:

- For the pressurizer nozzle the Alloy 52 fusion line toughness properties are used with the tensile properties listed under the header "Pressurizer Nozzle" in column 3.
- For the SL piping the J-R equation of item (b) above is used with tensile data under column 2.
- For the HL nozzle the J-R equation of item (c) above is used with tensile data from column 4.

Results for the Surge Line LBB Analysis in U.S. EPR FSAR Tier 2, Section 3.6.3

The leakage circumferential crack sizes versus applied minimum moment and axial leakage crack sizes for 5gpm leak rate obtained using the KRAKFLO code are provided below:

- U.S. EPR FSAR Tier 2, Table 3.6.3-10 - min. moment versus circumferential crack sizes for 5 gpm (surge nozzle & HL nozzle).
- U.S. EPR FSAR Tier 2, Table 3.6.3-11 - axial leakage crack sizes for 5gpm (surge nozzle and HL nozzle).

Additionally, these results along with the associated maximum moments and additional external applied axial load for the generation of the ALL diagram, are provided in the U.S. EPR FSAR tables listed below:

- U.S. EPR FSAR Tier 2, Table 3.6.3-21 - ALL for pressurizer surge nozzle at fusion line of Alloy 52 weld with pressurizer nozzle tensile properties.
- U.S. EPR FSAR Tier 2, Table 3.6.3-22 - ALL for SL piping using SS base metal tensile and toughness properties.
- U.S. EPR FSAR Tier 2, Table 3.6.3-23 - ALL for HL nozzle using SS base metal tensile and toughness properties.
- U.S. EPR FSAR Tier 2, 3.6.3-24 - critical axial crack size at SL piping locations.

Prior to the development of minimum moment versus leakage crack size, KRAKFLO was used to develop leak rate versus crack length curves as a function of an applied bending moment with operating pressure. These results are provided below to further assist the NRC in performing the confirmatory analysis. The tabulated results with associated figures are summarized and provided in the following pages:

- Tables 1 through 6—surge nozzle leakage tabulated results.
- Tables 7 through 12—HL nozzle leakage tabulated results.
- Figures 1 through 6—surge nozzle leakage plots.
- Figures 7 through 12—HL nozzle leakage plots.

Table 1—Surge Nozzle Leakage Results (Pressure only to Pressure + 1.0E+6 in-lbs)

[ ]

Table 2—Surge Nozzle Leakage Results (Pressure + 1.0E+6 in-lbs to Pressure + 2.0E+6 in-lbs)

[ ]

Table 3—Surge Nozzle Leakage Results (Pressure + 2.0E+6 in-lbs to Pressure + 3.0E+6 in-lbs)

[ ]

Table 4—Surge Nozzle Leakage Results (Pressure + 3.0E+6 in-lbs to Pressure + 4.0E+6 in-lbs)

[ ]

Table 5—Surge Nozzle Leakage Results (Pressure + 4.0E+6 in-lbs to Pressure + 6.5E+6 in-lbs)

Table 6—Surge Nozzle Leakage Results (Pressure + 6.5E+6 in-lbs to Pressure + 9.0E+6 in-lbs)

[redacted]

Table 7—Hot Leg Nozzle Leakage Results (Pressure only to Pressure + 1.0E+6 in-lbs)

Table 8—Hot Leg Nozzle Leakage Results (Pressure + 1.0E+6 in-lbs to Pressure + 2.0E+6 in-lbs)

[redacted]

Table 9—Hot Leg Nozzle Leakage Results (Pressure + 2.0E+6 in-lbs to Pressure + 3.0E+6 in-lbs)

[ ]

Table 10—Hot Leg Nozzle Leakage Results (Pressure + 3.0E+6 in-lbs to Pressure + 4.0E+6 in-lbs)

[ ]

Table 11—Hot Leg Nozzle Leakage Results (Pressure + 4.0E+6 in-lbs to Pressure + 6.5E+6 in-lbs)

[ ]

Table 12—Hot Leg Nozzle Leakage Results (Pressure + 6.5E+6 in-lbs to Pressure + 9.0E+6 in-lbs)

[ ]

Figure 1—Surge Nozzle Leakage Results (Pressure only to Pressure + 1.0E+6 in-lbs)

Figure 2—Surge Nozzle Leakage Results (Pressure 1.0E+6 in-lbs to Pressure + 2.0E+6 in-lbs)

Figure 3—Surge Nozzle Leakage Results (Pressure 2.0E+6 in-lbs to Pressure + 3.0E+6 in-lbs)

Figure 4—Surge Nozzle Leakage Results (Pressure 3.0E+6 in-lbs to Pressure + 4.0E+6 in-lbs)

Figure 5—Surge Nozzle Leakage Results (Pressure 4.0E+6 in-lbs to Pressure + 6.5E+6 in-lbs)

Figure 6—Surge Nozzle Leakage Results (Pressure 6.5E+6 in-lbs to Pressure + 9.0E+6 in-lbs)

Figure 7—Hot Leg Nozzle Leakage Results (Pressure only to Pressure + 1.0E+6 in-lbs)

Figure 8—Hot Leg Nozzle Leakage Results (Pressure 1.0E+6 in-lbs to Pressure + 2.0E+6 in-lbs)

Figure 9—Hot Leg Nozzle Leakage Results (Pressure 2.0E+6 in-lbs to Pressure + 3.0E+6 in-lbs)

Figure 10—Hot Leg Nozzle Leakage Results (Pressure 3.0E+6 in-lbs to Pressure + 4.0E+6 in-lbs)

Figure 11—Hot Leg Nozzle Leakage Results (Pressure 4.0E+6 in-lbs to Pressure + 6.5E+6 in-lbs)

Figure 12—Hot Leg Nozzle Leakage Results (Pressure 6.5E+6 in-lbs to Pressure + 9.0E+6 in-lbs)