

Barry S. Allen  
Vice President - Nuclear

419-321-7676  
Fax: 419-321-7582

June 14, 2012  
L-12-217

10 CFR 54

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

**SUBJECT:**

Davis-Besse Nuclear Power Station, Unit No. 1  
Docket No. 50-346, License Number NPF-3  
Reply to Request for Additional Information for the Review of the Davis-Besse Nuclear Power Station, Unit No. 1, License Renewal Application (TAC No. ME4640)

By letter dated August 27, 2010 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML102450565), FirstEnergy Nuclear Operating Company (FENOC) submitted an application pursuant to Title 10 of the *Code of Federal Regulations*, Part 54 for renewal of Operating License NPF-3 for the Davis-Besse Nuclear Power Station, Unit No. 1 (Davis-Besse). By letter dated May 15, 2012 (ML12118A542), the Nuclear Regulatory Commission (NRC) requested additional information to complete its review of the License Renewal Application (LRA).

The Attachment provides the FENOC reply to the NRC request for additional information (RAI). The NRC request is shown in bold text followed by the FENOC response.

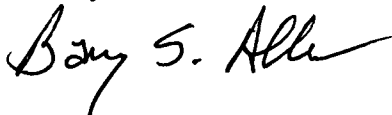
In response to the RAI, Enclosure B provides AREVA NP Inc. (AREVA NP) Calculation No. 32-9110426-000, "DB-1 EMA of RPV Inlet & Outlet Nozzle-to-Shell Welds for 60 Years." The calculation documents the equivalent margins analysis for the nozzle belt forging to bottom of reactor vessel inlet nozzle forging welds and nozzle belt forging to bottom of reactor vessel outlet nozzle forging welds (also known as reactor vessel inlet and outlet nozzle-to-shell welds). The AREVA NP equivalent margins analysis contains proprietary information that is to be withheld from public disclosure pursuant to 10 CFR 2.390. A nonproprietary version of the calculation does not exist. Enclosure B provides the AREVA NP affidavit to support the disclosure request for the proprietary equivalent margins analysis.

A145  
NRC

Attachment 2 identifies those actions committed to by FENOC for Davis-Besse in this document. Any other actions discussed in the submittal represent intended or planned actions by FENOC; they are described only as information and are not Regulatory Commitments. Please notify Mr. Clifford I. Custer, Project Manager – Fleet License Renewal, at (724) 682-7139 of any questions regarding this document or associated Regulatory Commitments.

I declare under penalty of perjury that the foregoing is true and correct. Executed on June 14, 2012.

Sincerely,



Barry S. Allen

Attachment:

1. Reply to Request for Additional Information for the Review of the Davis-Besse Nuclear Power Station, Unit No. 1 (Davis-Besse), License Renewal Application, Section 4.2.2
2. Regulatory Commitment List

Enclosure:

- A. Affidavit for Calculation No. 32-9110426-000, "DB-1 EMA of RPV Inlet & Outlet Nozzle-to-Shell Welds for 60 Years"
- B. Calculation No. 32-9110426-000, "DB-1 EMA of RPV Inlet & Outlet Nozzle-to-Shell Welds for 60 Years" (Proprietary)

cc: NRC DLR Project Manager  
NRC Region III Administrator

cc: w/o Attachment or Enclosure  
NRC DLR Director  
NRR DORL Project Manager  
NRC Resident Inspector  
Utility Radiological Safety Board

Attachment 1  
L-12-217

Reply to Request for Additional Information for the Review of the  
Davis-Besse Nuclear Power Station, Unit No. 1 (Davis-Besse),  
License Renewal Application,  
Section 4.2.2  
Page 1 of 4

**Section 4.2.2**

**Question RAI 4.2.2-4 – Upper Shelf Energy (USE) Evaluation**

**Background:**

LRA Table 4.2-2 lists a generic initial USE of 70 ft-lbs for all Linde 80 reactor vessel (RV) beltline welds (Weld Nos. WF-232, WF-233, and WF-182-1). In its April 15, 2011, response to RAI 4.2.2-2, the applicant stated that 70 ft-lbs is based on a statistical analysis of measured initial USE data from archived Linde 80 weld specimens from plant-specific surveillance capsules. The applicant stated that the initial USE data and the statistical analysis is reported in B&W Owners Group (B&WOG) Topical Report BAW-1803, "Correlations for Predicting the Effects of Neutron Radiation on Linde 80 Submerged-Arc Welds," Revision 1, May 1991.

**Issue:**

The staff has concerns with the use of a generic initial USE of 70 ft-lbs for Linde 80 welds for implementation in direct projections of end-of-license (EOL) USE for the period of extended operation (52 EFPY), for the following reasons:

1. The mean value from a database has generally not been acceptable to the staff for establishing a generic initial USE value for a specification, class, and/or type of RV material because generic mean values are not statistically defensible for embrittlement calculations. In the past, the staff has generally only accepted generic initial USE values if they are based on a statistically-conservative position, such as the mean value minus two standard deviations, or the lowest value in the database.
2. The BAW-1803 initial USE database has not been reviewed and approved by the staff as a statistical basis for the selection of any generic initial USE value for Linde 80 welds.

**Request:**

To demonstrate acceptable USE for the RV beltline materials, WF-232 and WF-233, provide a response to either (a) or (b):

- (a) Provide a direct projection of USE through 52 EFPY based on either (i) measured heat-specific initial USE values from certified material test reports (CMTRs), or (ii) a statistically-based conservative generic initial USE value, along with a technical justification for the value.
- (b) Provide EMAs for weld materials WF-232 and WF-233 in the shell region of the RV, which may use the existing methods developed in B&WOG Topical Reports BAW-2191P-A and BAW-2178P-A, or the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, Appendix K, accounting for neutron embrittlement through 52 EFPY. EMAs for non-shell welds must use applied J-integral values based on the specific weld geometry.

RESPONSE RAI 4.2.2-4 – Upper Shelf Energy (USE) Evaluation

The following is provided in response to request (b), above.

- (b) To demonstrate acceptable upper-shelf energy (USE) for the reactor vessel (RV) beltline welds, FENOC has elected to qualify the welds by equivalent margins analysis (EMA) for the period of extended operation. The subject welds are listed as follows.
  - Nozzle Belt Forging to Bottom of RV Inlet Nozzle Forging Welds
  - Nozzle Belt Forging to Bottom of RV Outlet Nozzle Forging Welds
  - Upper Shell Forging to Lower Shell Forging Circumferential Weld
  - Nozzle Belt Forging to Upper Shell Forging Circumferential Weld
  - Lower Shell Forging to Dutchman Forging Circumferential Weld

**Nozzle Belt Forging to Bottom of RV Inlet/Outlet Nozzle Forging Welds**

The equivalent margins analysis for the nozzle belt forging to bottom of RV inlet nozzle forging welds and nozzle belt forging to bottom of RV outlet nozzle forging welds (also known as reactor vessel inlet and outlet nozzle-to-shell welds) is documented in AREVA NP Calculation 32-9110426-000, "DB-1 EMA of RPV Inlet & Outlet Nozzle-to-Shell Welds for 60 Years," date May 2010. The reactor vessel inlet and outlet nozzle-to-shell welds were evaluated for low upper-shelf energy levels by linear elastic fracture mechanics analytical techniques to satisfy the requirements of Appendix K of the American Society of Mechanical Engineers Boiler and Pressure

Vessel Code (ASME Code). The primary coolant 28 inch inlet and 36 inch outlet nozzles are similar in that the full penetration attachment welds are located in the 12 inch thick nozzle belt forging (NBF) section of the reactor vessel shell. Enveloping stresses from outlet and inlet nozzles for attached pipe loads were considered. Due to the close proximity of the larger diameter outlet nozzle to the reactor core, the outlet nozzle-to-shell weld is subjected to higher levels of fluence than the inlet nozzle and therefore, results in a lower J-integral. Stresses were used to characterize Level A and B service loadings. Previously derived pressure stresses were used to analyze the nozzle-to-shell interface area for Level C and D Service loadings. Thermal stresses for Level C and D Service loadings were developed for the most limiting transient for the nozzle belt forging section.

The reactor vessel nozzle-to-shell welds satisfy all acceptance criteria of the ASME Code, Section XI, Article K-2000. For Level A and B service loadings, the applied J-integral of the material at 1.15 times the accumulation pressure, plus thermal loadings is less than the J-integral of the material at a ductile flaw extension of 0.10 inch, by a margin of 1.27. The applied J-integral for Level C Service loadings is less than the required measure of J-integral resistance by a margin of 1.20. Furthermore, the criterion for ductile and stable flaw extensions is satisfied for all Level A, B, C and D service loadings.

See Enclosure B to this letter for a copy of AREVA NP Calculation 32-9110426-000, "DB-1 EMA of RPV Inlet & Outlet Nozzle-to-Shell Welds for 60 Years." This calculation document contains information that is classified by AREVA NP as proprietary, and is requested to be withheld from public disclosure pursuant to 10 CFR 2.390. See Enclosure A to this letter for an AREVA NP Affidavit requesting the withholding of the proprietary information in Enclosure B from public disclosure in accordance with 10 CFR 2.390.

#### Upper Shell Forging to Lower Shell Forging Circumferential Weld

The upper shell forging to lower shell forging circumferential weld (WF-182-1) has been qualified by an EMA to demonstrate acceptable USE for the period of extended operation with the results provided in License Renewal Application (LRA) Section 4.2.2.3.

#### Nozzle Belt Forging to Upper Shell Forging Circumferential Weld and Lower Shell Forging to Dutchman Forging Circumferential Weld

Weld WF-182-1 has been historically treated as the limiting weld in the reactor vessel based on material alone. However, since this circumferential seam weld is remote from structural discontinuities, other locations may control due to higher stresses, even with higher toughness values for the weld material. Specifically, the nozzle belt forging to upper shell forging circumferential weld and lower shell forging to Dutchman forging circumferential weld at thickness transitions above

and below the traditional beltline shell need to be assessed using local stresses and material properties specific to these locations. Therefore, an equivalent margins analysis is required for both the nozzle belt forging to upper shell forging circumferential weld and the lower shell forging to Dutchman forging circumferential weld.

The following activities will be completed on or before September 14, 2012:

FENOC commits to submit an equivalent margins analysis for the nozzle belt forging to upper shell forging circumferential weld and the lower shell forging to Dutchman forging circumferential weld.

The following License Renewal Application Sections will be revised to include the results of the equivalent margins analyses for the nozzle belt forging to upper shell forging circumferential weld, the lower shell forging to Dutchman forging circumferential weld, nozzle belt forging to bottom of RV inlet nozzle forging welds and nozzle belt forging to bottom of RV outlet nozzle forging welds:

- 4.2.2.2, "USE Projections,"
- 4.2.2.3, "Equivalent Margins Analyses,"
- Table 4.2-2, "USE Values at 52 EFPY for Davis-Besse Reactor Vessel Beltline Materials," and
- A.2.2.2, "Upper-Shelf Energy."

See Attachment 2 to this letter for the regulatory commitment.

Attachment 2  
L-12-217

Regulatory Commitment List  
Page 1 of 1

The following list identifies those actions committed to by FirstEnergy Nuclear Operating Company (FENOC) for the Davis-Besse Nuclear Power Station, Unit No. 1 (Davis-Besse) in this document. Any other actions discussed in the submittal represent intended or planned actions by FENOC; they are described only as information and are not Regulatory Commitments. Please notify Mr. Clifford I. Custer, Project Manager – Fleet License Renewal, at (724) 682-7139 of any questions regarding this document or associated Regulatory Commitments.

Regulatory Commitment	Due Date
<p>1. FENOC commits to submit an equivalent margins analysis for the nozzle belt forging to upper shell forging circumferential weld and the lower shell forging to Dutchman forging circumferential weld.</p> <p>The following License Renewal Application Sections will be revised to include the results of the equivalent margins analyses for the nozzle belt forging to upper shell forging circumferential weld, the lower shell forging to Dutchman forging circumferential weld, nozzle belt forging to bottom of RV inlet nozzle forging welds and nozzle belt forging to bottom of RV outlet nozzle forging welds:</p> <ul style="list-style-type: none"><li>• 4.2.2.2, "USE Projections,"</li><li>• 4.2.2.3, "Equivalent Margins Analyses,"</li><li>• Table 4.2-2, "USE Values at 52 EFPY for Davis Besse Reactor Vessel Beltline Materials," and</li><li>• A.2.2.2, "Upper-Shelf Energy."</li></ul>	September 14, 2012

**Enclosure A**

**Davis-Besse Nuclear Power Station, Unit No. 1 (Davis-Besse)**

**Letter L-12-217**

**Affidavit for**  
**Calculation No. 32 - 9110426 - 000,**  
**"DB-1 EMA of RPV Inlet & Outlet Nozzle-to-Shell Welds for 60 Years"**

3 pages follow



## AFFIDAVIT

COMMONWEALTH OF VIRGINIA   )  
  ) ss.  
CITY OF LYNCHBURG            )

1. My name is Gayle F. Elliott. I am Manager, Product Licensing, for AREVA NP Inc. (AREVA NP) 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 Calculation Summary Sheet (CSS) 32-9110426-000 entitled "DB-1 EMA of RPV Inlet and Outlet Nozzle-to-Shell Welds for 60 Years," dated May 2010 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:

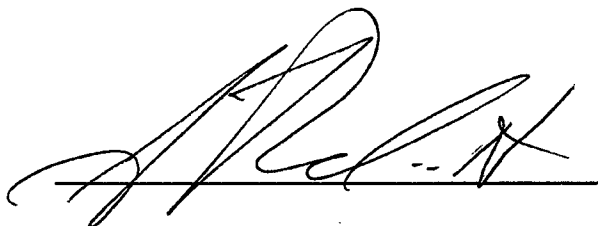
- (a) The information reveals details of AREVA NP's research and development plans and programs or their results.
- (b) Use of the information by a competitor would permit the competitor to significantly reduce its expenditures, in time or resources, to design, produce, or market a similar product or 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.

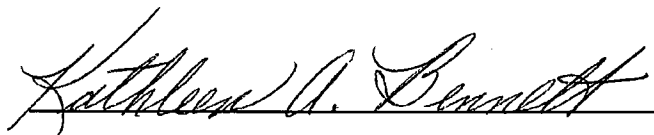
7. In accordance with AREVA NP's policies governing the protection and control of information, proprietary information contained in this Document have been made available, on a limited basis, to others outside AREVA NP only as required and under suitable agreement providing for nondisclosure and limited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

A handwritten signature in black ink, appearing to be 'J. R. ...', written over a horizontal line.

SUBSCRIBED before me this 11<sup>th</sup>  
day of May 2012.

A handwritten signature in black ink, reading 'Kathleen A. Bennett', written over a horizontal line.

Kathleen Ann Bennett  
NOTARY PUBLIC, COMMONWEALTH OF VIRGINIA  
MY COMMISSION EXPIRES: 8/31/15  
Reg. # 110864

