

REQUEST FOR ADDITIONAL INFORMATION

AREVA NP, INC. (AREVA) TOPICAL REPORT ANP-10326P, REVISION 1 “ENVIRONMENTALLY ASSISTED FATIGUE: MODIFIED EFFECTIVE CORRECTION FACTOR FOR AUSTENITIC STAINLESS STEELS TOPICAL REPORT”

RAI 1

Section 3.0 of ANP-10326P, Revision 1 briefly describes AREVA’s experimental testing. Provide the following additional information:

- a. Summarize the air and water test procedures used and identify if any standardized test procedures (i.e., ASTM) were utilized.
- b. Page 3-17 describes the procedures used to control the applied strain amplitude. Describe the types, location, and orientation of the strain gages used and how the strain amplitude was recorded and verified.

RAI 2

The last sentence on page 3-1 of ANP-10326P, Revision 1 states, “This number of cycles typically produces an approximately 3 mm-deep crack in the test specimen.” The staff is concerned that strain data from these specimens may be inaccurate if cracks developed on the opposite side of the specimen from the strain gage. Describe how this potential situation was addressed, if applicable, and justify any use of data from such specimens, including pictures from representative cracks as appropriate.

RAI 3

Table 3-3 of ANP-10326P, Revision 1 identifies [] specimens were tested under PWR environmental conditions. AREVA divided [] into four categories for evaluation [] e.g., refer to Figure 3-11 in ANP-10326P, Revision 1), []

RAI 4

Page 3-6 of ANP-10326P, Revision 1 identifies that polished specimens used for testing had maximum surface roughness height, R_t , values in the range of $0.75 \text{ micrometer } (\mu\text{m}) \leq R_t \leq 2.7 \text{ }\mu\text{m}$, and that ground specimens had R_t values in the range of $39 \text{ }\mu\text{m} \leq R_t \leq 85 \text{ }\mu\text{m}$. []

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RAI 5

Table 3-10 of ANP-10326P, Revision 1 shows the complex loading signals used in the AREVA tests. Page 4-9 indicates that the modified rate approach of Section 3.2 was used to evaluate the F_{en} values for the complex loading signals. To enable the staff to perform a confirmatory calculation using these loading signals, provide the tabular stress and temperature time histories for each of the complex loading signals.

RAI 6

Figure 3-8 of ANP-10326P, Revision 1 shows the specimen geometry used by AREVA for the in-PWR environment fatigue tests, but does not include diameter (or wall thickness, if the specimens are hollow) as was provided in Figure 3-6 for the in-air environment. Provide a revised figure with this information.

RAI 7

The results of AREVA's tests for specimens in a pressurized water reactor (PWR) environment are summarized in Table 5-1 of ANP-10326P, Revision 1. [

] Verify if the staff's findings are correct [] and, if so, explain the impact of this error on the final report conclusions.

RAI 8

Table 6-1 of ANP-10326P, Revision 1 identifies AREVA's suggested values [] as shown by

Equation 16 of ANP-10326P, Revision 1. [

] This range aligns well with the NRC's research findings, as summarized from NUREG/CR-6909, Revision 0 in Table 2-1 of ANP-10326P, Revision 1, where it is shown that surface finish effects range from 2 to 3.5. [

] fall within the range of all NRC test results for 304L materials, thus indicating no apparent differences in specimen fatigue lives from AREVA's tests.

In view of the fact that AREVA's test results confirm the NRC's findings with respect to the effects of surface roughness, describe the basis for eliminating the surface finish factor and for not producing a new fatigue design curve as identified in item 4 on page 2-4.