Review of Actions from June 30, 2016 Meeting

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NRC Public Meeting on Environmentally Assisted Fatigue (EAF) Research and Related ASME Activities
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NRC Headquarters - Rockville, MD

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June 30, 2106 EAF Meeting

- The last NRC EAF public meeting was held on June 30, 2016
- The meeting summary is available in ADAMS at ML16197A023
- 7 presentations were made:
  1. EPRI Overview (ML16183A045)
  2. Industry's Approach to EAF Testing (ML16183A099)
  3. Fatigue Usage Life and Gradient Factors for ASME Class 1 Piping Analyses (ML16183A066)
  4. Alternative Approaches for ASME Code Simplified Elastic-Plastic Analysis (ML16183A077)
  5. Fatigue Limit of Stainless Steel for Use in Vibration Evaluation (ML16183A084)
  6. Effects of Irradiation on Fatigue Life (ML16183A097)
  7. Environmentally-Assisted Fatigue Crack Growth in Irradiated Stainless Steels (ML16183A046)

Time	Topic	Speaker
8:30 am	Introductory Remarks	R. Tregoning, NRC
8:40 am	Overview of EPRI Fatigue Efforts and Roadmap	N. Palm, EPRI
9:10 am	EPRI Environmentally Assisted Fatigue Testing Efforts	D. Steininger, EPRI
10:10 am	Break	
10:25 am	Fatigue Usage Gradient and Life Factor Concept	S. Gosselin, LPI
12:00 pm	Lunch	
1:00 pm	Alternative Approaches for Simplified Elastic-Plastic Analysis	S. Ranganath, XGEN
2:30 pm	Break	
2:45 pm	Fatigue Limit of Stainless Steel for Use in Vibration Evaluation	S. Ranganath, XGEN
3:45 pm	Effects of Irradiation on Fatigue Life	R. Tregoning/N. Palm
4:15 pm	Public Comment Period	R. Tregoning, NRC
4:30 pm	Adjourn	

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Actions/Next Steps from Meeting (1/2)

- The following action items were identified during the meeting:
  a. Mr. Steininger of EPRI will provide the details of the analysis using the modified rate approach in NUREG/CR-6909 rev. 1 to predict the results of the complex strain transient tests conducted at MHI
     - **STATUS:** This action will be addressed in today's presentation at 10:15 am.
  b. Mr. Steininger of EPRI will determine if the factor on cycles was applied to the NUREG/CR-6909, rev 1 (draft) predictions of the complex strain transient tests conducted at MHI
     - **STATUS:** This action will be addressed in today's presentation at 10:15 am.
  c. Mr. Nathan Palm of EPRI will develop a strategy for implementing the life and gradient factor method within the ASME Code using a process that engenders early and frequent participation from NRC staff
     - **STATUS:** This action will be addressed in today's presentation at 1:00 pm.
  d. Dr. Ranganath of XGEN will revise the draft Code Case on alternative rules for simplified elastic-plastic analysis to ensure that it applies to both piping and reactor vessel components
     - **STATUS:** This action will be addressed in today's presentation at 1:30 pm.
  e. Dr. Ranganath of XGEN will determine if a draft Code Case for performing mean stress correction as a function of temperature would be more beneficial than simply using the method as the technical basis for supporting the use of the fatigue limit of 13.6 for stainless steels up to 343°C. Next, if appropriate, Dr. Ranganath will also develop a draft of such a Code Case
     - **ST ATUS:** This action will be addressed in today's presentation at 2:00 pm.
  f. Mr. Palm of EPRI will ask Dr. Pathania of EPRI to provide a brief description of the plots comparing crack growth in LWR environments, both with and without irradiation, with crack growth rates in laboratory air. This description will identify how the loading conditions are relevant to fatigue and how the results demonstrate that FCGRs are increased by fatigue compared with constant load CGRs
     - **STATUS:** See attached document "*EAFCG in Irradiated SS.pdf*".

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Actions/Next Steps from Meeting (2/2)

- The following action items were identified during the meeting (continued):
  - g. Dr. Tregoning will arrange a meeting among NRC, EPRI, and DOE to discuss possible research to address irradiation effects on fatigue after EPRI's study on irradiation effects on FCGRs is completed. This report is planned for completion in December 2016
    - **STATUS:** A meeting was not arranged. However, EPRI Report 3002007969 (not publicly available) was published in December 2016 to document EPRI's research efforts. EPRI considered writing an ASME PVP paper based on this final report, but did not do so because irradiated fatigue crack growth did not have high priority for the industry and funding was not available for the additional effort to do so. Work closely related to EPRI Report 3002007969 is publicly available in PVP Paper PVP2016-63640, *Crack Tip Strain Rate Models for Environmentally-Assisted Fatigue Crack Growth in Light Water Reactor Environments*, Proceedings of the ASME 2016 Pressure Vessels and Piping Conference, July 17-21, 2016, Vancouver, British Columbia, Canada. A brief description of this related work and relevant content is included in the file associated with the response to Item f.
  - h. In concert with previous action item, the next in-depth meeting on fatigue activities will be planned by Dr. Tregoning for early 2017. The exact date will be determined, after Dr. Pathania's work on irradiation effects has been completed
    - **STATUS:** This meeting.
  - i. Mr. Robin Dyle of EPRI will create a standing agenda item on metal fatigue to the quarterly call to discuss of NRC and industry activities related to materials issues. The objective of this agenda item is to provide a brief status on progress and identify the need and time-frame for future in-depth meetings on the topic
    - **STATUS:** EPRI discusses all significant materials issues during the quarterly call with NRC; although "fatigue" is not a standing agenda item, it is discussed whenever NRC or EPRI has any significant fatigue-related issues.

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