

May 3, 2001

MEMORANDUM TO: William H. Bateman, Chief  
Materials and Chemical Engineering Branch  
Division of Engineering

FROM: C. E. Carpenter, Jr., Lead Project Manager */ra/*  
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Division of Engineering

SUBJECT: SUMMARY OF MARCH 20 AND 21, 2001, MEETINGS WITH BWRVIP  
AND GENERAL ELECTRIC TO DISCUSS TECHNICAL ISSUES  
INVOLVED IN STAFF REVIEW OF BWRVIP CRACK GROWTH RATE  
AND MITIGATION SUBMITTALS, AND GE-NE PLEDGE

The staff and its contractor, Argonne National Laboratory (ANL), met with members of the BWR Vessel and Internals Project (BWRVIP), the Electric Power Research Institute (EPRI) and General Electric Nuclear Energy (GE-NE) on March 20 and 21, 2001, to discuss the technical review of the several BWRVIP mitigation reports (BWRVIP-14, -59, -60, -62) and the water chemistry open items in the BWRVIP-75 report, and the technical review of the GE-NE unirradiated PLEDGE report, respectively. The meeting attendees are listed in Attachment 1. The BWRVIP's handout (Attachment 2) deals with information that the staff has found to be proprietary, and is withheld from public distribution.

Discussions for the Tuesday, March 20 meeting, began with a review of the BWRVIP-62 report, "Technical Basis for Inspection Relief for BWR Internal Components with Hydrogen Injection," and the open items in the staff's initial safety evaluation (SE), dated January 30, 2001, which evaluated the inspection relief for hydrogen water chemistry (HWC) and noble metal chemical application (NMCA). The following details the areas of agreement reached during this meeting:

SE Open Items 3.1.1 and 3.1.2

- The BWRVIP agreed with the staff's SE comment that the BWRVIP-62 report applies to fluence regimes below  $5 \times 10^{20}$  n/cm<sup>2</sup>.
- The BWRVIP will address Open Item 3.1.1, Role of Fluence, and 3.1.2, Crack Propagation Rate, in a separate BWRVIP report similar to the BWRVIP-14 report, for high fluence regimes, that will be provided for staff review later this year.

SE Open Item 3.2

- Regarding Open Item 3.2, Physical Chemistry Aspects of the Inspection Relief Request, the BWRVIP proposed to clarify that a minimum of two reference electrodes (ECP probes) will be installed by licensees using electrochemical corrosion potential (ECP) as a primary parameter.

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- It was clarified that secondary parameter data will be collected, maintained and correlated to supplement ECP reference electrode data, as necessary, but that licensee reporting of these secondary parameters to the NRC is not being requested; rather, the secondary parameter data should be maintained for verifying ECP data if no reference electrodes are available. A single reference electrode, verified against secondary parameters, is sufficient to assess the effectiveness of HWC.
- ◇ It was agreed that a minimum of two secondary parameters (preferably feedwater hydrogen concentration and main steam line radiation levels) will need to be monitored by licensees, and that correlated secondary parameter data may be used if no ECP probes are available for Category 1 plants.
- ◇ The staff agreed that licensees will not need to monitor multiple locations or the most conservative locations in order to determine overall ECP once a bounding calculation or measurement has been performed.
- ◇ The BWRVIP agreed that ECP uncertainties for Category 1 plants will be addressed in the BWRVIP's response to the staff's SE on BWRVIP-62.
- The BWRVIP agreed that there is no need to exclude the first 10 hours of interrupted HWC when calculating HWC availability.

#### SE Open Item 3.2 (NMCA Plants)

- The BWRVIP agreed to a monitoring program to determine if NMCA is being maintained during plant operation.

#### SE Open Item 3.2.1

- The BWRVIP agreed that the threshold for intergranular stress corrosion cracking (IGSCC) initiation shall remain at -230 mV for irradiated metals.

#### SE Open Item 3.2.4

- The staff's contractor stated that the BWRVIP's BWRVIA model results presented appears to be in good agreement with chemistry measurements for the recirculation and steam lines.

#### SE Open Item 3.2.5

- The BWRVIP agreed to revise Table 3-5 to address primary and secondary parameters that will be monitored by licensees.
- ◇ The staff cautioned the BWRVIP that the acceptability of Category 2 plants will be contingent on NRC acceptability of model.
- ◇ For Category 3 plants, utilizing NMCA, the staff agreed that no additional margins need to be added to the ECP for measurement uncertainties.

#### SE Open Item 3.2.6

- The BWRVIP agreed that licensees utilizing moderate HWC will perform radiolysis calculations at the start and end of the fuel cycle.

The following action items were agreed to:

- The BWRVIP will determine ECP uncertainties for Category 1 and 2 plants.
- The staff agreed to review the proposed factor of improvement (FOI) approach, including addressing conductivity transients  $> 0.3\mu\text{S}/\text{cm}$ .
- The BWRVIP will provide additional information to the staff to justify a reduction in the  $\text{H}_2:\text{O}_2$  molar ratio from at least 4:1 to  $>2:1$  in order to ensure protection in NMCA plants and minimize N-16 carry-over. The staff will meet with the BWRVIP after the data has been provided to discuss, if needed.
- The staff agreed to expedite its review of the recently submitted BWRVIP-64 report.
- The BWRVIP agreed to provide additional information on power densities, size, and BWR classifications in order to compare the BWRVIA model to actual chemistry measurements. The staff has requested that the BWRVIP submit the BWRVIA model for staff review.
- The BWRVIP will provide additional comments on international radiolysis models.
- The staff's acceptability of Category 2 plants (HWC-M with no ECP measurements) is contingent upon its review and acceptance of the BWRVIA ECP model on a plant-specific basis.
- The BWRVIP will propose additional margins to account for ECP uncertainties for Category 1 and 2 plants

In the discussion of the BWRVIP-75 Open Items 3.7 and 3.8, the staff agreed that the resolution of the applicable BWRVIP-62 open items will address these issues, and that the BWRVIP will specify what portions of the Water Chemistry Guidelines will be met by the licensee to utilize the BWRVIP-75 report for power operations.

In the discussion of the BWRVIP-14 report, the staff agreed to expedite a review of the BWRVIP's July 11, 2000, letter on the BWRVIP's response to the staff's December 3, 1999, SE.

In the discussion of the BWRVIP-59 report, the staff informed the BWRVIP that the staff's review is ongoing, but that an initial SE should be completed in the near term. The staff also agreed to expedite the review of the BWRVIP's February 19, 2001, letter on an interim crack growth rate of  $2.5 \times 10^{-5}$  in/h for Ni-base austenitic alloys in BWRs under HWC and NMCA conditions.

The March 20 meeting ended with an agreement that future meetings with the BWRVIP will be arranged as needed and required.

The staff and its contractor ANL met with members of the GE-NE, BWRVIP and EPRI on Wednesday, March 21, 2001, to discuss the technical review of the GE-NE unirradiated PLEDGE report. The unirradiated PLEDGE model was submitted by GE-NE for informational purposes, and was reviewed by ANL, which provided comments on several areas of interest.

The GE-NE staff gave an overview of the unirradiated PLEDGE model, and briefly discussed the effects of high levels of fluence. After the overview was completed, the ANL staff gave a review of the major concerns found in the review of the unirradiated PLEDGE model, and a discussion of these open items was held. The issues discussed included a review of the model fundamental principles, issues key to the irradiated model, a discussion of the additional information needed to address specific concerns, and a comparison of the predictions of the unirradiated PLEDGE model against various IGSCC data sets. The ANL staff agreed that, while it appears that the unirradiated PLEDGE model is conservative, it does not appear to be so for all data. The informal discussion of the irradiated PLEDGE model indicated a need for sufficient data to validate the results in the future PLEDGE submittal.

It was further agreed that, for data that will be used in establishing the irradiated PLEDGE models, fluence measurements pedigrees / uncertainties will be discussed at a future meeting.

The above meetings ended with agreements that future meetings with the BWRVIP and/or GE-NE will be arranged as needed and required.

Attachments: As stated

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