June 14, 2001

MEMORANDUM TO: File

FROM: Steven D. Bloom, Project Manger, Section 2
Project Directorate I ***/RA/***
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION (RAI) RELATED TO WCAP-12472, ADDENDUM 2, "BEACON CORE MONITORING AND OPERATION SUPPORT SYSTEM"

The attached contains the RAI that will be discussed during the meeting between Westinghouse and the NRC staff on June 25, 2001, on WCAP-12472, Addendum 2, "BEACON Core Monitoring and Operation Support System." These questions have been forwarded to Westinghouse Electric Company.

Project No. 700

Attachment: Request for Additional Information

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REQUEST FOR ADDITIONAL INFORMATION ON WCAP-12472, ADDENDUM 2,

BEACON CORE MONITORING AND OPERATION SUPPORT SYSTEM

1. In response to staff's RAI for Addendum 1 review, Westinghouse stated that if the BEACON system is used at Babcock or Combustion Engineering plants, it will be necessary to include a BEACON Operability specification in the Technical Requirement (TR) Manual associate with either the NUREG-1430 or NUREG-1432 format Technical Specifications. This TR specification will address the minimum number and distribution of plant sensor inputs required for BEACON to properly monitor the core power distribution. Please provide sample TR manual information for Addendum 2 application.

2. As stated in Addendum 2 to WCAP-12472, the Platinum detectors are sensitive to the gamma flux and the Vanadium detectors are neutron sensitive. It also stated that the Platinum and Vanadium detectors can be mixed in the core with each other or with Rhodium incore detectors. Please explain how to predict the detector responses with different detector configurations at the plant.

3. Figure 4 shows that the Platinum detectors are arranged with four detectors in a string. It is not clear from Figure 5 to understand how the Vanadium detectors are arranged?

4. Please explain why the surface spline fitting methodology does not require minimum number of detectors in a detector string to obtain predicted power.

5. Table 1 listed three plants that had installed experimental self-powered detectors (SPDs). Plants A and B had Platinum detectors, while plant C had Vanadium detectors. Number of SPD maps analyzed at plants A and B are 15 and 14 respectively. Number of SPD maps analyzed at plant C is 230. Why the Vanadium detectors take so many maps to be analyzed in compare with so few for Platinum detectors? What is the meaning of the number listed at the last column of Table 1, "Max BU GWD/MTU"?

6. What is the meaning of the number listed at the last column of Table 2, "Measurement Variability σ_m." What is the bounding measurement variability used by the BEACON system?

7. What are the failure rates of the Platinum detectors and Vanadium detectors? Do you have sufficient data to support that these detectors can be considered as non-depleting detectors.

8. Reference 4, "The Advanced PHOENIX and POLCA Codes for Nuclear Design of Boiling Water Reactor" methodology was used to predictimg the Platinum reaction rate as a new feature added to BEACON. Please explain the applicability of this code for the Pressurized Water Reactor application.

9. On page 5 of the submittal, equation 3, how does the power distribution calculated by BEACON at the current core conditions, differ from the measured power distribution?

10. On the same page as question 9, the last sentence of the 4th paragraph states that "no minimum No. of detectors in a detector string is required." How is the interpolation carried out if there are no detectors in a string (presumed to have failed).

11. Will the different type of detectors have an impact on the BEACON interpolation scheme?

12. In the case of mixed cores, will the removal and installation of the same detectors from one of fuel into a different type of fuel effect the detector response??

13. With the inclusion of three different types of detectors (and possibly more), what is the probability that the wrong detector string is loaded into BEACON? How can the staff be assured that this situation cannot occur, and what would be the consequences if it did??

14. Figures 2 and 3 provide some insight into the uncertainties associated with the Platinum and Vanadium detectors. How ever, no data was provided as to the uncertainties associated with the "combined uncertainties" associated with the case of have Rhodium, Vanadium, and Platinum detectors in the same core. Please provide statistics associated with different combined configurations i.e., measurability uncertainty, standard deviations, etc. etc.

15. On page 7 Of 16, of the sunmittal, in the middle of paragraph 2, it is stated that "If the current rhodium detector assemblies are gradually replaced by the similarly configured platinum detector assemblies------" What if the detector configuration is not the same, will the BEACON power distribution measurement uncertainty remain the same??