52-003

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

April 1, 1996

Mr. Nicholas J. Liparulo
Nuclear Safety and Regulatory Activities
Westinghouse Electric Corporation
P.O. Box 355
Pittsburgh, Pennsylvania 15230

SUBJECT: FOLLOWON QUESTIONS CONCERNING THE AP600 HYDROGEN RECOMBINATION SUBSYSTEM

Dear Mr. Liparulo:

As a result of its review of the June 1992, application for design certification of the AP600, the staff has determined that it needs additional information in order to complete its review. Specifically, the enclosed questions are related to the AP600 hydrogen recombination subsystem.

You have requested that portions of the information submitted in the June 1992, application for design certification be exempt from mandatory public disclosure. While the staff has not completed its review of your request in accordance with the requirements of 10 CFR 2.790, that portion of the submitted information is being withheld from public disclosure pending the staff's final determination. The staff concludes that these followon questions do not contain those portions of the information for which exemption is sought. However, the staff will withhold this letter from public disclosure for 30 calendar days from the date of this letter to allow Westinghouse the opportunity to verify the staff's conclusions. If, after that time, you do not request that all or portions of the information in the enclosures be withheld from public disclosure in accordance with 10 CFR 2.790, this letter will be placed in the Nuclear Regulatory Commission's Public Document Room.

These followon questions affect nine or fewer respondents, and therefore is not subject to review by the Office of Management and Budget under P.L. 96-511.

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If you have any questions regarding this matter, you can contact me at (301) 415-1132.

Sincerely,

original signed by:

Joseph M. Sebrosky, Project Manager
Standardization Project Directorate
Division of Reactor Program Management
Office of Nuclear Reactor Regulation

Docket No. 52-003

Enclosure: As stated

cc w/enclosure:
See next page

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Mr. Nicholas J. Liparulo
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Docket No. 52-003
AP600

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REQUEST FOR ADDITIONAL INFORMATION
AP600 HYDROGEN RECOMBINATION SUBSYSTEM

Revision 5 to AP600 standard safety analysis report SSAR Subsection 6.2.4, "Containment Hydrogen Control System," provides the basis for evaluating the ability to prevent the hydrogen concentration, associated with a design basis loss-of-coolant accident (LOCA), from reaching the flammability limit.

480.416 Subsection 1.9.3 (2)(xvii) of the AP600 SSAR, "Three Mile Island Issues," states, "The AP600 post-accident monitoring system is described in Chapter 7, Considering the recommendations in Regulatory Guide (RG) 1.97,..." Will the three Class 1E hydrogen sensors described in Section 6.2.4.2.1 of the AP600 SSAR be designed to meet the guidance provided in RG 1.97?

480.417 Are there any interconnections or shared components between the Class 1E and non-Class 1E hydrogen sensors?

480.418 Subsection 6.2.4.2.1 describes the response time of the hydrogen sensor as 90 percent in 10 seconds. What is the required accuracy and tolerance for the hydrogen sensor beyond 10 seconds?

480.419 What surveillances or calibrations will be performed on the hydrogen sensors to verify instrument accuracy over time? What will be the frequency of these surveillances or calibrations?

480.420 Can the concentration of hydrogen exceed 4 v/o in the in-containment refueling water storage tank (IRWST) due to sump radiolysis and/or actuation of the automatic depressurization system? If so, why is not recombiner coverage provided for the IRWST?

480.421 What was the decay energy model used in the calculation of hydrogen and oxygen production from radiolysis of the emergency core cooling water and sump water? Was the decay energy model that was used equal to or more conservative than the decay energy model given in Branch Technical Position ASB 9-2 in SRP Section 9.2.5?

480.422 How does the reactor core source term given in Table 15A-3 of the AP600 Standard Safety Analysis Report compare with the reactor core source term corresponding to Branch Technical Position ASB 9-2 in SRP Section 9.2.5 (ANS-5.1 standard for two-year reactor operation)? What is the basis for Table 15A-3?

480.423 In meeting the requirements of GDC 4, structures, systems and components important to safety shall be designed to accommodate the effects of and be compatible with the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including LOCAs. It is the staff's understanding that Westinghouse will be using the first three phases of NUREG-1465, "Accident Source Terms for Light-Water Nuclear Power Plants," to define the environmental conditions associated with the design basis LOCA. Based on this environment, the staff disagrees with the position in Subsection 6.2.4.2.2 of the SSAR

that potential catalyst poisons would only be present at significant levels during a postulated severe accident. It is the staff's position that the passive autocatalytic recombiners (PARs) should be demonstrated to be operable when exposed to the environment described by the first three phases of NUREG-1465. How will the PAR be qualified to operate in such an environment? How would the PAR perform when exposed to the total integrated dose associated with this environment?

480.424 Although the PAR is not an electrical or a mechanical device, it is still expected to perform in response to a design basis event. Describe the approach to be used for equipment qualification of the PARs.

480.425 Why were the effects of fumes from welding or cable fires not addressed?

480.426 The design basis hydrogen control system is required to meet single failure criteria. This in combination with the fact that the data in support of the device does not demonstrate recombination prior to hydrogen concentrations of 3.5 percent, what is the basis for the statement that abundant margin exists? Is there data that supports start up prior to hydrogen concentrations of 3.5 percent in a post-LOCA atmosphere or that further supports that there is adequate margin?

480.427 What is the basis for start up of the PAR prior to hydrogen concentrations of 3.5 percent under conditions assumed in Subsection 6.2.4.2.2 of the AP600 SSAR for a design basis accident? It is the staff's understanding that tests are currently being conducted by EDF that show the PAR has difficulty starting in cold, wet conditions with low hydrogen concentrations. What are the implications of these tests for the AP600 design?

480.428 It is the staff's understanding that PAR performance is sensitive to pressure and temperature. What pressure and temperature were assumed for the depletion analyses in support of Figures 6.2.4-1 and 2? How do the pressure and temperature assumed in the analyses compare to the supporting data? It appears from the figures that the hydrogen concentration inside containment reaches 3.5 percent approximately 19 days after accident initiation. What are the temperature and pressure inside containment at this time and are these conducive to start up of the PAR assuming a saturated or wet PAR?

480.429 How would the PARs respond to the following scenario? After some period of time the hydrogen concentration inside containment reaches 3.5 percent, the PAR starts up and reaches a temperature that destroys the hydrophobic coating. The PARs the drive the hydrogen concentration to a relatively low level and the operating temperature of the PARs cools. Hydrogen and steam continue to build up inside a saturated containment. When would the PAR

restart? What is the basis for continuous long term operation at hydrogen concentrations of approximately 0.5 percent as shown in Figures 6.2.4-1 and 2?

480.430 It appears that the addition of hydrophobic coating to the catalyst enhances the start up capability of the PAR. What is the data base that supports this conclusion? It is the staff's understanding that the method now being used to apply hydrophobic coating to the catalyst is different than the one used during the performance test. How will this effect the above referenced database?

480.431 Subsection 6.2.4.1.2 of the AP600 SSAR states in part that the portion of the containment hydrogen control system required for the design basis LOCA is designed to withstand the dynamic effects associated with postulated accidents, and the environment existing inside the containment following the postulated accident. How would the debris generated during a design basis LOCA affect the operability of the PAR?

480.432 The staff is unable to locate Reference 21 of Subsection 6.2.6, "WCAP-14407 [Proprietary] and WCAP-14408 [Non-Proprietary] WGOTHIC Application to AP600", 7/95." When will it be provided?

480.433 It is the staff's understanding that Westinghouse is now taking a conservative bounding approach for analyzing containment mixing with WGOTHIC. It appears that the approach to be used in the WGOTHIC application report, as outlined in NSD-NRC-96-4652, dated February 26, 1996, will focus on heat sink utilization during the first 24 hours to control pressure and temperature. Can this approach be used to justify adequate mixing for the PAR design which is more concerned with the time period following the first 24 hours when the heat sinks have reached equilibrium? Is sufficient mixing provided in the long term as containment temperature approaches the temperature of the water flowing over the PCCS (decrease in driving force)?

480.434 If the PCCS is necessary to provide sufficient mixing what measures are in place to assure its operability beyond three days?

480.435 The staff met with Westinghouse on February 27, 1996, to discuss the PAR database that directly supports the use of PARs for design basis hydrogen control in the AP600. As stated by Westinghouse during the March 19, 1996, senior management meeting one action item resulting from the February 27, meeting was that Westinghouse would identify the PAR tests to be included as part of the AP600 application. The staff believes, that in order to satisfactorily address the above RAIs, the database submitted as part of Westinghouse's January 11, 1996, submittal would need to be expanded. Please provide the revised database.