



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

April 29, 1994

Docket No. 52-003

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

Dear Mr. Liparulo:

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION ON THE AP600

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. The additional information is needed in the area of reactor systems (Q440.74-Q440.84).^{*} Enclosed are the staff's questions. Please respond to this request by June 30, 1994, to support the staff's review of the AP600 design.

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 this request for additional information does 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 NRC's Public Document Room.

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^{*}The numbers in parentheses designate the tracking numbers assigned to the questions.

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Mr. Nicholas J. Liparulo

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This request for additional information affects nine or fewer respondents, and therefore is not subject to review by the Office of Management and Budget under P.L. 96-511.

If you have any questions regarding this matter, you can contact me at (301) 504-1120.

Sincerely,

(Original signed by)

Thomas J. Kenyon, Project Manager
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and License Renewal
Office of Nuclear Reactor Regulation

Enclosure:
As stated

cc w/enclosure:
See next page

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Mr. Nicholas J. Liparulo
Westinghouse Electric Corporation

Docket No. 52-003
AP600

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REQUEST FOR ADDITIONAL INFORMATION
ON THE WESTINGHOUSE AP600 DESIGN

- 440.74 Section 5.2.2.2 of the SSAR states that an over-pressure protection report is prepared according to Article NB-7300 of Section III of the ASME Code. Provide this report.
- 440.75 Section 5.2.2.1 of the SSAR states that the sizing of the pressurizer safety valves for over-pressure protection of the RCS during power operation and transients is based on the analysis of a complete loss of steam flow to the turbine, with the reactor operating at 102 percent of rated power.
- a. The acceptance criteria in Section 5.2 of the SRP states that the safety valves should be designed with sufficient margin available to account for uncertainties in the design and operation of the plant, assuming that the reactor scram is initiated by the second safety grade signal from the reactor protection system. Have these been included in the analysis?
 - b. Table 5.4-17 of the SSAR provides the design parameters for the pressurizer safety valve. What are the uncertainties of the set pressures of the pressurizer safety valve?
 - c. Provide the result of the analysis, including the sequence of events of the design basis incidents for sizing the pressurizer safety valves.
- 440.76 Section 5.4.9.2 of the SSAR states that the routing of pipe between the pressurizer and the safety valves does not include a loop seal, and that any condensation of steam in the connecting pipe up to the valve will drain back to the pressurizer and not collected as a slug of water to be discharged during the initial opening of the valves.
- a. Though the safety valves are designed for relief of saturated steam, they may still be subject to water discharge. Provide a discussion regarding the effects of passage of a water slug on the safety valves, such as water hammer.
 - b. What are the water relief rates assumed in the loading analysis? Are the water relief rates used consistent with test results obtained from similar valves?
- 440.77 Table 5.4-17 of the SSAR lists the environmental conditions for the pressurizer safety valves and the relief valve in the normal residual heat removal system (NRHRS) suction line to be 50 to 120°F (ambient temperature) and to be at a relative humidity of 0 to 100 percent. Does this ambient temperature condition envelop the accident conditions?

Enclosure

440.78 The NRHRS relief valve, which provides for the low temperature over-pressure protection (LTOP), is sized to prevent over-pressure of those credible events with a water-solid pressurizer. Section 5.2.2.1 of the SSAR states that the makeup/letdown flow mismatch and the inadvertent start of an active reactor coolant pump events, respectively, are the limiting mass and heat input conditions to size the relief valve. However, no analysis is provided in the Chapter 15 safety analysis regarding LTOP.

- a. Provide the safety analyses and results for both the mass and energy input overpressurizing design basis transients that demonstrate proper sizing of the NRHRS relief valve for LTOP. The results should include transient curves that demonstrate that the peak RCS pressures are within the design pressure-temperature (P/T) limits determined for the AP600.
- b. Provide the limiting single active failures and instrumentation uncertainties assumed in these analyses and the bases for these assumptions.
- c. Provide the basis for the assumption made for the energy input transient that the water in the secondary side of steam generator is 50°F hotter than the primary side.
- d. The nil-ductility reference temperature of the reactor vessel material increases as exposure to neutron fluence increases due to neutron embrittlement effect. Therefore, the operating P/T limit curves need to be periodically adjusted to accommodate the actual shift in the nil-ductility temperature, and the LTOP system must be re-evaluated to ensure that its functional requirements can still be met using the NRHRS suction relief valve. Does the relief valve sizing analysis take this into consideration? Are the sizing and setpoint of the relief valve based on bounding P/T curves that are applicable to the life of the plant?
- e. The NRHRS is not designed to be a safety-related system. Because the NRHRS relief valve is required for LTOP, confirm that the relief valve as well as piping in the NRHRS are designed to meet safety-related criteria.

440.79 10 CFR 50.34(f)(2)(x) requires an applicant to provide a test program and associated model development, and conduct tests to qualify RCS relief and safety valves for all fluid conditions expected under operating conditions, transients, and accidents. Clarify and provide the bases for the statement in Section 5.2.2.4 of the SSAR that these requirements do not apply to relief valves of the size and type represented by the relief valve on the NRHRS.

440.80 Section 5.2.2.1 of the SSAR states that administrative controls and plant procedures aid in controlling the reactor coolant system during low temperature operation, and that normal plant operating procedures maximize the use of a steam or gas bubble in the pressurizer during

periods of low pressure, low temperature operation. Discuss the operator actions required for low temperature operation for the conditions when a steam bubble or gas bubble exists in the pressurizer and for a water-solid pressurizer.

- 440.81 Technical Specification LCO 3.4.13 for the LTOP system requires that, with the accumulators isolated, either the NRHRS suction relief valve or the RCS depressurized with an open RCS vent of greater than or equal to 5.4 square inches be operable.
- a. This appears to allow the use of an RCS vent when the RCS is depressurized in lieu of the NRHRS relief valve for LTOP. Discuss this matter in Section 5.2.2 of the SSAR? How is the RCS vent size determined?
 - b. As a resolution of Generic Issue 94 regarding LTOP, Generic Letter (GL) 90-06 states that the LTOP availability should be ensured by limiting the allowable outage time to 24 hours for a single LTOP channel while operating in Modes 5 and 6. Explain how LCO 3.4.13 requiring operability of either the relief valve or the RCS depressurization comply with GL 90-06.
 - c. If the NRHRS suction relief valve is inoperable, Action Item C of LCO 3.4.13 requires either that the relief valve be restored to operable status or that the RCS be depressurized and the RCS vent be established within 8 hours. Has an analysis been made to determine whether the RCS can be overpressurized within the 8 hours when the relief valve is inoperable and the RCS depressurization is not initiated? Address this concern.
- 440.82 Action A of Technical Specification LCO 3.4.13 requires that, if an accumulator is not isolated when the accumulator pressure is greater than or equal to the maximum RCS pressure for the existing cold leg temperature allowed in the pressure-temperature limit report (PTLR), the affected accumulator must be isolated within one hour. If not, Action B.1 requires that the RCS cold leg temperature be increased to a level acceptable for the existing accumulator pressure allowed in the PTLR within 12 hours. However, LCO 3.4.13 prohibits starting the RCS pump when the RCS temperature is greater than 200°F, if the pressurizer level is greater than or equal to 92 percent. What is the means of increasing the RCS temperature?
- 440.83 Section 5.2.2 of the SSAR states that the steam system over-pressure protection during power operation is provided by the main steam safety valves (MSSVs), which have the capacity of providing enough relief to remove 102 percent of rated steam flow to limit the steam system pressure to less than 110 percent of the steam generator shell side design pressure. Section 10.3.2.2.2 of the SSAR states that a total MSSV-rated capacity of 105 percent of the design steam flow meets the

requirement for preventing the steam system pressure from exceeding 110 percent of the main steam design pressure following a turbine trip. Clarify the difference in the required MSSV relieving capacity in these two statements.

- 440.84 Position B-6 in the Branch Technical Position (BTP) RSB 5-2 states that the LTOP system should meet the requirements of Regulatory Guide (RG) 1.26 on quality group classifications and standards for the components of nuclear power plants. In Revision 1 to WCAP-13054, Westinghouse takes exception to some of the RG 1.26 guidelines for the LTOP system because of the way in which the AP600 provides safety-related functions. Provide a detailed discussion on these exceptions and provide justification for the acceptability of these exceptions.