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U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

ATTENTION: T. R. QUAY

SUBJECT: WESTINGHOUSE RESPONSES TO NRC REQUESTS FOR ADDITIONAL INFORMATION ON THE AP600

Dear Mr. Quay:

Enclosed are three copies of the Westinghouse responses to NRC requests for additional information on the AP600 topics. Responses to RAIs on the SSAR including 231.33, 410.293 Revision 1 and 410.294 Revision 1. RAI 440.566 on PIRT and Scaling Closure is also included.

The NRC technical staff should review these responses as a part of their review of the AP600 design. These responses close the RAIs.

Please contact Brian A. McIntyre on (412) 374-4334 if you have any questions concerning this transmittal.

W. C. Lindgren / FOR
Brian A. McIntyre, Manager
Advanced Plant Safety and Licensing

/nja

Enclosures

cc: T. Kenyon, NRC (w/o enclosures)
C. Li, NRC
N. Liparulo, Westinghouse (w/o enclosures)

E004 1/1

Question 231.33

Re:

In Revision 7 of SSAR Section 1.2.2, "Site Description," Westinghouse states that the allowable site interface parameters bound a large percentage of potential sites. These interface parameters are listed in Table 2-1, "Site Interface Parameters," of the SSAR, Revision 8. However, the SSAR does not clearly define these parameters as the design parameters used for the design certification application. According to 10 CFR 52.47 which deals with the contents of application in 52.47(a)(i), technical data relevant to the standard design and not site-specific must be included. Therefore, the site parameters postulated for the design, and an analysis and evaluation of the design in terms of such parameters must be contained in the application for design certification. On this basis, Westinghouse should clearly define the site design parameters in the SSAR and not characterize them as site interface parameters.

Response:

Westinghouse understands the need to clearly define the site design parameters in the SSAR and is revising the SSAR as shown below. Note that site design parameters will continue to be listed in SSAR Table 1.8-1 (Summary of AP600 Plant Interfaces with Remainder of Plant). Listing of these parameters in the interface table is required by Appendix A of Regulatory Guide 1.70 and their interface type is "Site Interface" defined as "Site-related interface data upon which the AP600 design is based."

SSAR Revision:

Section 1.2.2, "Site Characteristics" portion, first sentence:

> The AP600 is a standard plant that is to be placed on a site with ~~the~~ parameters bounded by those used as a basis for design certification as described in Chapter 2, Site Characteristics.

Chapter 2, "SITE CHARACTERISTICS", second sentence:

> The site ~~interface~~ parameters used as a basis for design certification are in Table 2-1.

Table 2-1, Title, both sheets:

> SITE ~~INTERFACE~~ PARAMETERS USED AS A BASIS FOR DESIGN CERTIFICATION.

Question 410.293R1

Section 10.4.9.1.1 of the SSAR (Revision 4) states, in part, that the startup feedwater control valves (SFCVs) and startup feedwater isolation valves (SFIVs) are designed to close on an appropriate engineered safety signal (startup feedwater isolation signal) and the SFIV also serves as a containment isolation valve. Before the design change, Section 10.4.7.1.1 of the SSAR stated that the SFIV serves as a containment isolation valve and closes on a containment isolation signal. Explain why the SFIV should not close on a containment isolation signal. Containment isolation provisions require auxiliary feedwater isolation valves to have remote manually close feature whenever containment isolation is required.

Response:

SSAR subsections 10.4.7.1.1 and 10.4.9.1.1, Revision 6, include a consistent description of safety related functions of the main and startup feedwater control and isolation valves. Subsection 10.4.7.1.1 discusses only main feedwater system functions and components. Subsection 10.4.9.1.1 discusses only startup feedwater functions and components. Bullet sections of subsection 10.4.9.1.1 reinforce the first paragraph of the subsection. Note that the steam generators provide a first level of containment isolation with the valves providing a second. The design changes to the feedwater system have not modified the safety related logic for automatic isolation of the startup feedwater isolation valves. The startup feedwater isolation valve serves a containment isolation function and closes on an ESF signal indicative of the need to isolate startup feedwater while retaining the defense in depth function of the system. Section 7.3 provides the functional diagrams for closure and subsection 6.2.3 identifies each containment penetration and the ESF signal provided to close the remotely operated containment isolation valves. The valves can also be opened after isolation or closed by a remote manual signal. The SSAR Revision below clarifies the containment isolation function of the valves.

SSAR Revision:

Section 10.4.7.1.1, sixth bullet, third sentence, revise to state: Both valves are designed to close automatically on main feedwater isolation signals, an appropriate engineered safety features (ESF) isolation signal as indicated on Figure 7.2-1, within the time established within the Technical Specification, Section 16.1.

Section 10.4.9.1.1, fifth bullet, second sentence, revise to state: Both valves are designed to close on a startup feedwater isolation signal, an appropriate engineered safeguards features (ESF) signal as indicated on Figure 7.2-1, within the time established in the Technical Specifications, Section 16.1.

Revision 1

AP600

Question 410.294r1

Section 10.4.9 of the SSAR (Revision 4) does not address water hammer problem in the startup feedwater system. Westinghouse added a paragraph in Section 5.4.2.2 of the SSAR (Revision 4) to address the design change by using a separate startup feedwater delivery system connected to the steam generator. However, the information provided in the section regarding water hammer occurrence in the startup feedwater piping is not adequate. Section 5.4.2.2 states, in part, that prevention and mitigation of feedline-related water hammer has been accomplished through an improved design and the layout of the startup feedwater piping includes the same features as the main feedwater line to minimize the potential for water hammer. Provide information on the improved design and design features for water hammer prevention for the startup feedwater system.

Response:

The Main Feedwater Line portion of SSAR Appendix 3B, subsection 3B.2.3, Revision 7, provides a more detailed discussion of the AP600 design features for minimizing water hammer, including piping layout features. The statup feedwater piping layout includes similar features as the main feedwater piping layout, indicated in SSAR subsection 5.4.2.2. These features include: a downward elbow in close proximity to the steam generator startup feedwater nozzle, exclusion of high points limiting void collection, redundant positive isolation to prevent back leakage, and delivery of startup feedwater to steam generator independent of feed rings.

The following information is provided for comparison to NRC "rules of thumb" related to water hammer in feedwater systems. These "rules of thumb" were provided informally by the NRC and do not cositute a regulation or regulatory guidance.

	Main Feedwater	Startup Feedwater
Length of "horizontal" run (ft)	45	80
Slope of "horizontal" run	1/8"/ft (0.6°)	0
Diameter of main header, ID (in)	13.56	5.19
Flow velocity (fps)	22.3	13.5
Fluid Temperature (F)	435[1]	250[2]
Fluid Pressure (psi)	917[1]	1092[2]
Vapor Content	0%	0%

Notes: [1] Full power conditions
[2] Startup conditions

SSAR Revision: NONE

Question 440.566

Re: PIRT and Scaling Closure

As discussed at the meeting between Westinghouse and the NRC staff on December 18, 1995, the issue of scaling requires "closure" based on evaluation of the data from the design certification test program. While the specific procedure for accomplishing this closure is to be determined by the applicant, some of the technical areas that need to be addressed include:

a. "Validation" of the AP600 PIRTs; i.e., an examination of the PIRTs for the various events and phases thereof to determine if the test data support the phenomena and their associated importance (ranking).

b. Demonstration that the important phenomena are reflected in the scaling analyses for the tests facilities, and that significant distortions suggested by the facility scaling analyses and/or observed during testing can be explained and accounted for. This is equivalent to "validating" the assumptions made in performing the scaling analyses.

c. Along with (b), demonstration that the appropriate dimensionless parameters, especially those representing phenomena determined to be of "high" importance, are within a thermal-hydraulic range in the test programs consistent with that expected in the AP600 plant. In addition, code models that address these phenomena must be shown to be validated over the appropriate thermal hydraulic parametric range.

Response:

The requested information is addressed in WCAP-14727, "AP600 Scaling and PIRT Closure Report". This report was provided to NRC staff via Westinghouse letter NSD-NRC-96-4822, dated September 18, 1996.

SSAR Revision: NONE