September 16, 1997

Mr. Nicholas J. Liparulo, Manager
Nuclear Safety and Regulatory Analysis
Nuclear and Advanced Technology Division
Westinghouse Electric Corporation
P.O. Box 355
Pittsburgh, PA 15230

SUBJECT: AP600 INSPECTIONS, TESTS, ANALYSES, AND ACCEPTANCE CRITERIA (ITAAC)

Dear Mr. Liparulo:

The enclosure to this letter contains requests for additional information or corrections concerning Revision 3 of the AP600 Certified Design Material including the ITAAC. 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 Public Document Room.

If you have any questions regarding this matter, you may phone me at (301) 415-3145.

Sincerely,

original signed by:

Jerry N. Wilson, Senior Policy Analyst
Standardization Project Directorate
Division of Reactor Program Management
Office of Nuclear Reactor Regulation

Docket No. 52-003

Enclosure: As stated

cc w/encl: See next page

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Docket No. 52-003
AP600

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640.80 2.6.1 - Main AC Power System

Revise Item 2.6.1.4.a to also include **Class 1E loads** along with the nonsafety -related loads which will be powered from onsite sources (ZOS).

640.81 2.6.1 - Main AC Power System

Item 2.6.1.4.b states: "The 4160 Vac circuit breakers in switchgear ECS-ES1 and ECS-ES-2 open after receiving a signal from the onsite standby power system." Clarify what type of signal is referred to in 2.6.1.4.b. What component of the onsite standby power system originates this signal?

640.82 2.6.1 - Main AC Power System

Item 2.6.1.4.c states: "Each standby diesel generator 4160 Vac circuit breaker closes after receiving a signal from the onsite standby power system." Clarify what type of signal is referred to in 2.6.1.4.c. What component of the onsite standby power system originates this signal?

640.83 2.6.1 - Main AC Power System

Revise Item Nos. 4.b) and 4.c) in Table 2.6.1-4 (ITAAC) to reflect the changes which will be made in RAI Nos. 640.81 and 640.82.

640.84 2.6.2 - Non-Class 1E dc and interruptible power supply system

Item No. 2.6.2.2.b) states "Each EDS load group 1, 2, and 3 battery supplies the corresponding dc switchboard bus load for a period of **1 hour** without recharging." This contradicts the statement given in SSAR Section 8.3.2.1.2, which states that the batteries are sized to supply the system loads for a period of at least two hours.

This was an Action Item in our review of Pilot ITAAC for the AP600 design and the Westinghouse response to this item was unacceptable. Revise ITAAC 2.6.2 to incorporate the commitment made in the SSAR.

640.85 Correct Item #6.c) in Table 3.3-5 to read that: Separation is maintained ... as identified in **Table 3.3-3 and not Table 3.3-4.** Also, correct Table # for item #7 in Table 3.3-5.

640.86 Clarify the next-to-last ITA in ITAAC Table 3.3-5 Item # 6.d) " Separation distances less than those specified above are based those specified above are based on analysis." Correct this statement.

640.87 Clarify the last paragraph in the Acceptance Criteria in ITAAC Table 3.3-5 Item # 6.d) " Non-Class 1E wiring that is not separated from Class 1E or associated wiring by the minimum separation distance or by a barrier or analyzed meets the requirements listed above." Correct this statement.

640.88 Revise the ITA in ITAAC Table 2.6.3-2, Item Nos. 4.c), 4.d) and 4e) to also include the following:

"The tests of each Class 1E battery will be conducted which envelope the analyzed battery design duty cycle."

640.89 Revise the Acceptance Criteria in ITAAC Table 2.6.3-2 Item # 4.f) to include that the input to each EDS is at 105 Vdc, i.e. the battery is at the end of design duty cycle.

640.90 Revise the Acceptance Criteria in ITAAC Table 2.6.3-2 Item # 4.l) to include that the battery at the end of design duty cycle, i.e. at 105 Vdc.

640.91 Add Design Description including the ITAAC for the following:

The Class 1E dc battery and battery charger circuit breakers, and dc distribution panels, MCC, and their circuit breakers and fuses, are sized to supply their load requirements.

640.92 Add Design Description including the ITAAC for the following:

The Class 1E battery, battery chargers, and dc distribution panels, and MCCs are rated to withstand fault currents for the time required to clear the fault from its source.

640.93 Add Design Description including the ITAAC for the following:

Circuit breakers and fuses in Class 1E battery, battery chargers, dc distribution panel, and MCC circuits are related to interrupt fault currents.

640.94 Add Design Description including the ITAAC for the following:

Class 1E dc electrical distribution system cables are sized to supply their load requirements.

640.95 Add Design Description including the ITAAC for the following:

Class 1E dc electrical distribution system cables are rated to withstand fault currents for the time required to clear the fault from its power source.

640.96 Add Design Description including the ITAAC for the following:

Retrievable safety-related displays are identified in Table 2.6.3-1 which lists only voltage for divisions A, B, C, and D switchboards. The following Class 1E dc power supply alarms and displays in the main control room should also be added to the ITAAC:

(1) Alarm for battery ground detection
(2) Parameter displays battery current, battery charger output current.
(3) Status indication for battery circuit breaker/disconnect position.

(4) Indication and alarm for overvoltage from the battery charger
(5) Battery high discharge rate alarm
(6) Battery charger trouble alarm

640.97 Your response to question 640.47 is unacceptable. CDM 3.7, "Design Reliability Assurance Program," (DRAP) should be revised to include the same commitments provided in the Tier 1 DRAP for the ABWR or System 80+ design. In addition, Tables 3.7-1 and 3.7-2 should be deleted. Future changes by Westinghouse or a combined license applicant to the probabilistic, deterministic, or other methods for determining risk significance could change the list of risk significant structures, systems, or components (SSC) for the AP600 design. Therefore, it is not appropriate to set forth the list of risk significant SSCs in Tier 1. Also, SSAR Section 16.2 should be moved to Section 17.3. This is the appropriate location for a description of the reliability assurance program.

640.98 Revise the second paragraph of CDM 3.2, "Human Factors Engineering," to resolve the following inconsistencies between "visual alerts" and "alarms" (as used in the SSAR in the minimum inventory list):

a. visual alerts are those safety-related displays used in the MCR (see note in CDM, Table 2.5.2-5).

b. visual alerts are those non-safety-related displays used in the RSW to identify challenges to CSFs (see CDM, note 1, table 2.5.4-1).

c. therefore, visual alerts are displays.

d. if a visual alert is a subset of the alarm system (per telecon on 8/25/97), how can a visual alert also be a display (per a and b above)?

e. CDM, Revision 3, p.2.5.2-13---if a visual alert is defined as a display (per a and b above), then design description #8a is incorrect because it says that, "the PMS provides for the minimum inventory of displays, visual alerts (which are also displays), and fixed position controls...". There now appears to be a redundancy in this ITAAC description.

f. Westinghouse should clearly define/distinguish among visual alert; alarm; and display and make all the necessary changes to the appropriate ITAAC and SSAR sections that are effected.

640.99 Westinghouse should clearly define/distinguish between "plant information system" and "display" and make all the necessary changes to the appropriate ITAAC and SSAR sections that are effected.

640.100 The response to question 640.21 regarding the Design Descriptions (DD) is not acceptable. The DD are presently a duplicate of the design commitment given in the ITAAC table. The DD should address the safety-significant aspects of each system

and be derived from the detailed design information contained in Tier 2. The level of detail in Tier 1 is governed by a graded approach to the structures, systems and components (SSCs) of the design and is based upon the safety significance of the functions that the SSC perform.

The DD should include a narrative and simplified schematic figures in Tier 1. The narrative should state the system purpose, significant performance characteristics and safety functions, whether it is safety-related or not, system location, key design features, seismic and ASME code classifications, description of system operation, major controls and displays, logic circuits, interlocks, Class 1E power sources and divisions, equipment to be qualified for harsh environments, and interface requirements, as applicable. Numeric performance values and key parameters in safety analyses should be specified in the DD based on their safety significance.

Figures should be provided for most systems, with the amount of information depicted based on the safety-significance of the SSCs. Where figures are not used, generally for simple non-safety significant systems, the narrative should be sufficient to describe the system. The figures are intended to depict functional arrangement of the significant SSCs of the design. Also, a legend for the figures should be provided to ensure common understanding of requirements, system boundaries, piping code breaks, electrical configurations, etc.

This is a generic comment that applies to all ITAAC.

640.101 Important parameters, such as valve opening times assumed in the accident analyses, should be verified by the ITAAC. This is a generic comment that applies to ITAAC. All valve opening times and ADS minimum valve flow areas specified in SSAR Tables 15.0-4b and 15.6.5-11 should be verified by ITAAC.

2.1.2 REACTOR COOLANT SYSTEM

640.102 The steam generator, shown in Figure 2.1.2-1, is oversimplified. Add to the steam generator figure showing the connected systems, as shown in the System 80+ ITAAC. The Steam generator is a major component in a PWR.

640.103 The ADS valve capacities, first stage-4 inch valves, second and third stages-8 inch and fourth stage-10 inch squib valves, should be verified by ITAAC (Ref: SSAR 5.4.6.2).

640.104 RCP flywheel test at overspeed conditions should be in the ITAAC.

640.105 Add pressurizer heater function because credit is taken for the "off" function in the SGTR analyses.

640.106 The Steam Generator System does not include the steamline flow restrictors in the Design Description and the ITAAC. These flow restrictors, which are installed in the outlet nozzle as an integral part of steam generators, limit the steam flow rate during a steamline break and are credited in SSAR 15.1.5 steam line break analysis. They should be included in the design description, in Figure 2.1.2-1, and in the ITAAC table.

640.107 In ITAAC Table 2.1.2-4, the acceptance criterion for Item 9a for the reactor coolant system flow rate post-fuel load is listed as 189,600 gpm, which is the vessel thermal design flow rate indicated in SSAR Table 4.4-1. This ITAAC acceptance criterion is inconsistent with the vessel minimum measured flow rate of 193,000 gpm specified in technical specification LCO 3.4.1 and SR 3.4.1.3. A clarification should be made in ITAAC to ensure that the ITAAC analysis to determine the post-fuel load RCS flow takes into account appropriate allowance for flow measurement uncertainties.

640.108 ITAAC Table 2.1.2-4, the acceptance criterion for item #9(b) is given as 166 KW. Identify the SSAR Section from where this value is taken. If this value is not in the SSAR, include this value in the SSAR.

640.109 In Table 2.1.2-1, change equipment names from "sensor" to "transmitter" for all flow, pressure, and level instruments since the specified listed equipment consists of transmitters.

640.110 In Table 2.1.2-4, item #8(c), ADS piping flow resistance values given in the acceptance criterion cannot be found in the SSAR.

2.1.3 REACTOR SYSTEM

640.111 The reactor vessel material specimens taken from the actual material from which the vessel was fabricated are inserted in capsules and the number of capsules shall be specified in ITAAC.

640.112 Each direct vessel injection nozzle cross sectional area is limited and should be added to the ITAAC.

2.2.3 PASSIVE CORE COOLING SYSTEM

640.113 The following significant features of the application upon which the staff is relying to reach its safety conclusion should be included in the ITAAC:

(a) For events not involving LOCA, the system is designed to cool the reactor coolant system to 420 degrees F within 36 hours with or without RCP operation. This should be included in the ITAAC. A report/analysis should be prepared as part of design commitment to verify this.

(b) The passive RHR HX and IRWST are designed to delay significant steam release to the containment for at least one hour. This should be verified in the ITAAC. A report/analysis should be prepared as part of the design commitment to verify this.

(c) Each sparger is sized to discharge at a flow rate that supports ADS performance, which in turn, allows adequate passive core cooling system injection. This should be included in the ITAAC.

640.114 The purpose or function of the system is not described completely. In addition to the function listed in item # 8, the system is also used as a back-up to Normal RHR system. Include all the functions of the system in ITAAC.

640.115 System operation and key design features of the system such as the heat exchanger, accumulators, inside containment refueling water storage tank, core makeup tanks should be described in the Design Description.

640.116 Add the following to the design commitment: "The two mechanical divisions of the PXS system are physically separated."

640.117 The orifices R01B and R02B are used to establish the required flow rates assumed in the CMT tanks and the accumulators design. They should be shown in the Figure and their sizes should be verified by ITAAC.

640.118 Add accumulator discharge valves MOV27A and B to Table 2.2.3-1 (p2.2.3-5).

640.119 Add IRWST injection valves MOV 121A and B to Table 2.2.3-1, Page 2.2.3-6.

640.120 The CMT level sensors (PXS-011, 012, 013, 016, 017, 018) onTable 2.2.2-1, Page 2.2.3-7,8 are not shown in SSAR Figures 6.3-1,2. Also containment flood-up level sensors (PXS-050,051,052) are not shown in SSAR Figure 6.3-1,2. Since all the information given in Tier 1 should also be in Tier 2, revise the SSAR Figures to show the CMT level sensors and containment flood-up level sensors.

640.121 Add IRWST injection line number PXS-L123A and B to Table 2.2.3-2 (p. 2.2.3-9).

640.122 Valves PZS-PL-VO22A and B are relief valves, therefore they should not be in Table 2.2.3-3, Page 2.2.3-10. Add valves VO27A and B to the table. Valves V116A and B can not be found in SSAR Figure 6.3-1,2. The correct valves are V117A and B and they should be added to the table.

640.123 Accumulator level sensors PXS-021, 022, 023, and 024 (Table 2.2.3-3, Page 2.2.3-11) are not shown in SSAR Figure 6.3-1,2. Because all of the information provided in Tier 1 should also be in Tier 2, revise the SSAR Figure to show the accumulator level sensors.

640.124 The calculated flow resistance values given for CMTs, accumulators and the IRWST in the acceptance criteria (Table 2.2.3.4, Page 2.2.3-15, items #8.c and #9) can not be found in the SSAR. Identify the section in SSAR where these values exist or include these values in the SSAR.

640.125 CMT inlet isolation valves are identified as VO13A and B [Figure 2.2.3-1 (sheet 2 of 2). Page 2.2.3-20]. The figure must be corrected to show the correct valve numbers [VO-002A and B]. Also show accumulator discharge valves MOV VO27A and B and IRWST injection line MOVs V121A and B in the figure.

3.3.7 NORMAL RESIDUAL HEAT REMOVAL SYSTEM

640.126 Add the following non-safety-related functions to item #9: Provide cooling for the in-containment refueling water storage tank, provide reactor coolant system and refueling cavity purification flow to the chemical and volume control system during refueling operations, and provide backup for cooing the spent fuel pool.

640.127 The following design features addressing mid-loop operation should be verified in the ITAAC:

(a) Loop piping effect, reactor coolant system hot legs and cold legs are vertically offset.

(b) Step-nozzle connection, system employs a step-nozzle connection to the reactor coolant system hot leg.

(c) Self-venting suction line, pump suction line is sloped continuously upward from the pump to the reactor coolant system hot leg with no local high points.

640.128 The following design features addressing intersystem LOCA should be in ITAAC:

(a) The design pressure of the system is 900 psig.

(b) The reactor coolant system isolation valves are interlocked to prevent their opening at reactor coolant system pressures above 450 psig.

640.129 Since the Normal RHR system is a RTNSS system, the following should be added to ITAAC:

(a) RNS pumps can be tested at design flow during normal operation.

(b) RNS pump minimum flow lines should be shown in the figure.

(c) RNS pumps' NPSH requirements should be specified to state that the available NPSH is greater than required NPSH. Actual NPSH values need not be specified, since they depend upon the pump type which will be specified in the future.

640.130 RNS heat exchanger B channel head drain valve RNS-PL-VO48 and RNS-PL-VO29 connecting valve to CVS letdown HX [Table 2.3.6-1, Page 2.3.6-5] should be added to the table.

640.131 Line numbers LOO3A,B, LOO8A,B and LO21 [Table 2.3.6-2, Page 2.3.6-6] should be added to the table.

640.132 Table 2.3.6-3, Page 2.3.6-8 is incomplete. Add the following: RNS-TE013A and B, TE014A and B, and PT012A and B.

640.133 It is not clear how item #1 of Table 2.3.6-4, Page 2.3.6-11, satisfies the acceptance criteria for item #8(b), flow path for long term, post-accident makeup to the RCS.

640.134 The LTOP relief valve capacity and opening pressure [Table 2.3.6-4, Page 2.3.6- 12, item # 9 (a)] is already finalized and given in the SSAR. Therefore, these values should be given in the acceptance criteria.

640.135 The cross connections to spent fuel pool system and CVS letdown HX with valve V029 should be shown in Figure 2.3.6-1, Page 2.3.6-14.

DISTRIBUTION: Letter to Nicholas J. Liparulo, Dated: September 16, 1997

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