Westinghouse Electric Corporation

Energy Systems

Box 355
Pittsburgh Pennsylvania 15230-0355

NSD-NRC-97-4972
DCP/NRC0732
Docket No.: STN-52-003

February 6, 1997

Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, DC 20555

TO: T. R. QUAY

SUBJECT: RESPONSE TO RAIs 630.11 THROUGH 630.14

REFERENCE: LETTER FROM NRC TO WESTINGHOUSE (HUFFMAN TO LIPARULO), "REQUEST FOR ADDITIONAL INFORMATION ON WESTINGHOUSE AP600 TECHNICAL SPECIFICATIONS OPTIMIZATION METHODOLOGY", DATED DECEMBER 12, 1996.

Enclosed for NRC review are the Westinghouse responses to the following Technical Specification RAIs, provided by the above Reference.

630.11	Completion Time Anchor Point
630.12	Surveillance Frequency Baseline
630.13	Request for Response to RAI 630.10
630.14	Differences Between the Proposed Tech Specs Approach and Tech Specs Rev. 2

This completes Westinghouse activity for Open Item Tracking System items 4224 through 4227, a report for which is attached. Please advise as to the NRC status for these items. If you have any questions regarding this transmittal, please contact Robin K. Nydes (412) 374-4125.

Brian A. McIntyre, Manager
Advanced Plant Safety and Licensing

/jml
enclosure
attachment

E004/1

cc: W. Huffman, NRC (w/enclosure/attachment)
A. Chu, NRC (w/enclosure/attachment)

3075A

ATTACHMENT TO WESTINGHOUSE LETTER NSD-NRC-97-4972

FEBRUARY 6, 1997

AP600 Open Item Tracking System Database: Executive Summary

Selection: [item no] between 4224 And 4227 And [apsl coord] = 'Nydes' Sorted by Item #

Item No.	Branch	DSER Section/ Question	Type	Title/Description Detail Status	Resp Engineer	(W) Status	NRC Status	Letter No. /	Date
4224	NRR/TSB	16.1	RAI-OI		TechSpec/Suggs	Closed	Action W	NTD-NRC-97-4972	2/12/97
				Respond to RAI 630.11 rec'd 12/12/96					
				in progress to mgt review 2/5 OTD Feb 6 by NTD-NRC-97-4972. rkn					
4225	NRR/TSB	16.1	RAI-OI		TechSpec/Suggs	Closed	Action W		2/12/97
				Respond to RAI 630.12 rec'd 12/12/97.					
				in progress to mgt review 2/5 OTD Feb 6 by NTD-NRC-97-4972. rkn					
4226	NRR/TSB	16.1	RAI-OI		TechSpec/Suggs	Closed	Action W		2/12/97
				Respond to RAI 630.13 rec'd 12/12/96.					
				in progress (closes with providing response to RAI 630.10 and final PRA report) to mgt review 2/5 OTD Feb 6 by NTD-NRC-97-4972. rkn					
4227	NRR/TSB	16.1	RAI-OI		TechSpec/Suggs	Closed	Action W		2/12/97
				Respond to RAI 630.14 rec'd 12/12/96.					
				in progress to mgt review 2/5 OTD Feb 6 by NTD-NRC-97-4972. rkn					

 Total Records: 4

ENCLOSURE TO WESTINGHOUSE
LETTER NSD-NRC-97-4972

FEBRUARY 6, 1997

Question 630.11

A detailed discussion needs to be proposed about how from a 72 hours "anchor point" for the Completion Time Logic of Figure 1, the four other possible outcomes were selected. That discussion should address specifically how repair times were arrived at, how uncertainties in such judgements were accounted for, how and why thermal-hydraulic criteria varied from the precedents of the STS, specifically how PRA was used to justify the selection of longer completion times and where that was done, and finally a discussion of the differences between the "conservative" and "realistic" analysis referred to in the Notes to Figure 1.

Response:

Figure 1 Discussion - Application of STS Precedents to AP600 Logic

The AP600 Technical Specifications include several LCOs for which no STS examples exist. In order to specify Completion Times for these AP600 unique LCOs, a simple logic was developed based on review of STS (NUREG-1431) Completion Times. In general, the logic presented in Figure 1 (Reference 630.11-1) is consistent with the Completion Times specified in the STS. Inconsistencies occur where the STS specifies different times for basically the same conditions or where the STS times fall between the smaller set of standard times selected for the AP600 criteria. Each of the Figure 1 outcomes (logic tree branches) is discussed below.

Branch 1 - 168 hours (7 days)

The branch 1, 7-day, Completion Time is reached if the equipment which remains OPERABLE can mitigate all DBAs even with a single failure. STS examples fitting this situation are Conditions A and B of LCO 3.6.6B (inoperable spray train and inoperable cooling train).

Additionally, branch 1 applies to a parameter deviation (e.g., temperature, pressure, volume, concentration, etc.) in one component which would not prevent accident mitigation of all DBAs even with a single failure. This was applied in cases where the parameter deviation could be expected to be discovered while the out of limit deviation was small.

Branch 2 - 72 hours

The branch 2, 72-hour, Completion Time applies only to parameter deviations in all components such as boron concentration out of limit in both accumulators. For branch 2 cases, all DBAs can be mitigated, assuming a conservative analysis and a single failure. This portion of the logic is based on LCO 3.5.1 Condition A, boron concentration out of limit in one accumulator, for which the STS Bases discussion supports mitigation of all DBAs assuming a conservative analysis and a single failure.

Branch 3 - 72 hours

The branch 3, 72-hour, Completion Time is based on STS examples of two 100% train ECCS systems (i.e., LCO 3.5.2, Condition A, LCO 3.6.6.A, Condition A, and LCO 3.8.1, Condition B). For a case of one inoperable ECCS train, the figure logic requires the remaining train to be capable of mitigating all DBAs, based on a conservative analysis but without a single failure.

Branch 4 - 24 hours

The branch 4, 24-hour, Completion Time applies to conditions in which the remaining equipment can mitigate all DBAs based on a realistic analysis with a single failure. An STS example which is consistent with these conditions is LCO 3.6.2, Condition C (inoperable air lock(s)). Required Action C.1 specifies that compliance with the overall containment leakage limit be verified immediately. With the overall containment leakage limit met, the containment will perform as assumed in the accident analysis. Air locks are not subject to single failures.

The branch 4, 24-hour Completion Time logic was applied to only a few STS Conditions for AP600, including: one inoperable accumulator, containment pressure, and containment temperature.

Branch 5 - 8 hours

The branch 5, 8-hour, Completion Time applies to conditions in which the remaining equipment can mitigate all DBAs based on a realistic analysis but without a single failure.

There may not be any STS examples fitting the branch 5 logic, however, the branch was included to provide for the possibility that some AP600 Conditions would satisfy the logic.

Branch 6 - 1 hour

In the STS, times ranging from "Immediately" to 2 hours are applied to conditions in which the inoperability represents a loss of safety function. A standard Completion Time of 1 hour was selected for the AP600 standard Completion Time to provide a predictable amount of time in which an optimized set of shutdown preparations may be made.

Repair Times

Following application of the Completion Time Criteria, utility reviewers were provided the opportunity to comment, in the event their experience indicated that restoration could not normally be completed within the specified Completion Time. This utility input was taken into consideration when the final Completion Time determinations were made. There are no known cases where the logic Completion Time was extended based on the need for a longer repair time.

Use of PRA

The use of PRA to justify Surveillance Fre vencies and Completion Times is addressed in the response to RAI 630.10 (Reference 630.11-2).

Differences Between the "Conservative" and "Realistic" Analysis

As used in the Figure, conservative analysis refers to the analysis performed consistent with the worst case assumptions required by SSAR Chapter 15 methodologies. The realistic analyses permit use of nominal conditions such as volume, level, flow, temperature, pressure, response time, etc., rather than worst case assumptions.

In some cases, experienced analysts familiar with the AP600 conservative analysis results have evaluated the significance of the potentially out of limit parameters and the margin available due to conservative assumptions and determined if the accident would be mitigated using the realistic conditions. These conclusions are summarized, where applicable, in the AP600 Bases. An example of an AP600 Bases summary is provided for LCO 3.5.1, Accumulators, Action B.1 (inoperable accumulator for a reason other than boron concentration, nitrogen pressure, or volume).

Reference

630.11-1 Westinghouse letter, NSD-NRC-96-4699, dated May 3, 1996, "Westinghouse AP600 Technical Specifications Approach."

630.11-2 Westinghouse letter, NSD-NRC-97-4939, dated January 14, 1997, "Westinghouse Response to RAI 630.10."

Question 630.12

A detailed discussion needs to be provided about how 31 days was established as the "baseline" for surveillance frequency and what constitutes a "baseline chance". The discussion should provide justification for the other three possible outcomes on the upper branch of Figure 2, as well as an answer to the question in our June 6, 1996 letter concerning the appropriateness of only having a 24 hour frequency outcome for the lower branch of Figure 2.

June 6 question:

"The staff noted in your optimization methodology that the shortest surveillance frequency requirement would be 24 hours, while the STS includes a 12-hour frequency. It is not clear that the AP600 instrumentation and control system warrants the longer surveillance interval. You should consider whether a loss of self-diagnosis capability and failure alarm functions might be sufficient cause for a 12-hour surveillance frequency".

Response:

The AP600 Technical Specifications include several LCOs for which no STS examples exist. In order to specify surveillance frequencies for these AP600 unique LCOs, a simple logic was developed based on review of all of the STS (NUREG-1431) times. To the extent possible, the AP600 logic presented in Figure 2 (Reference 630.12-1) was developed to be consistent with the surveillance frequencies specified in the STS. Inconsistencies occur where the STS specifies different times for basically the same surveillances or where the STS times fall between the smaller set of standard times selected for the AP600 criteria. The AP600 logic is considered to be justified by its basis on STS Surveillance Frequency precedents as presented below.

Discussion - AP600 Logic Based on STS Precedents

The Surveillance Frequency Criteria discussion attached to Reference 630.12-1 used an evaluation of the 31-day STS accumulator boron concentration surveillance as an example of the elements considered in the application of the criteria. The AP600 Surveillance Frequency Criteria is more thoroughly explained in the following discussion of STS examples of boron/ solution concentration surveillances.

STS Examples:

SR 3.5.1.4	Accumulator boron	31 days & Within 6 Hours after volume increase of []%
SR 3.5.4.3	RWST boron	7 days
SR 3.5.6.3	BIT boron	7 days
SR 3.6.6E.3	Casing cooling tank boron	7 days
SR 3.6.7.3	Spray additive tank solution	184 days
SR 3.7.16.1	Spent fuel pool boron	7 days

The criteria was developed considering that the differences in the STS frequencies for these similar surveillances should relate to the likelihood that the concentration may change and the ability of the operator to detect conditions associated with a concentration change.

Each STS surveillance was evaluated considering:

1. The performance location of the surveillance. Surveillances were classified as being performed in the control room or locally.

2. If the surveillance is performed locally (not in the control room), the surveillance was classified according to the indirect monitoring available in the control room. If the control room monitor can detect changes in conditions associated with important changes in the primary variable, then the monitor was classified as "effective." If the indirect control room monitor could be slow to dete or unable to detect some types of degradation, the monitor was classified as "less effective."

3. The surveillance was classified according to the likelihood of change in the monitored condition. **(BASELINE DEFINITION)** The likelihood of change is established as either "low" or "baseline" with longer surveillance intervals being assigned to low change likelihood parameters. The STS 31 day accumulator boron concentration surveillance is classified as having a baseline chance of changing rapidly. The accumulator boron concentration was selected as a well understood example, against which other surveillances could be compared as having a similar or lower chance of changing rapidly. By comparison to the accumulator boron concentration, parameters which have a much lower chance of changing rapidly, such as Spray Additive Tank concentration, would be classified as having a "low" likelihood of changing rapidly.

Figure 2 Discussion - Application of STS Precedents to AP600 Logic

Branch 1 Once per fuel cycle

Local Surveillance
Effective Control Room Monitor
Low Likelihood of Change

The STS Spray Additive Tank solution surveillance (SR 3.6.7.3) frequency of 184 days is considered to be consistent with the ability to detect (in the control room) changes associated with dilution and the very low likelihood that leakage would occur. For the AP600 logic, it was felt that under these conditions where there were no likely dilution (change) mechanisms, that surveillance each refueling would be adequate.

Branch 1 (continued)

An AP600 surveillance which meets this criteria is the verification that the pH Adjustment baskets are filled with 145 ft^3 of trisodium phosphate (TSP) each 24 months (SR 3.6.9.1). The volume of TSP must be verified **locally**, in containment. **Effective Control Room** monitors are available for a variety of containment conditions as well as RCS leakage which might affect volume. (The TSP baskets are located slightly above the floor such that minor leaks will not affect the TSP volume.) Additionally, since access to containment is limited during power operations, there is a very **low likelihood that the TSP volume will change.**

Branch 2 31 days

Local Surveillance
Effective Control Room Monitor
Baseline Likelihood of Change

For the Accumulators the normally available instrumentation can effectively detect changes associated with dilution. Since accumulator boron concentration has been known to have been diluted by leakage, the change potential is considered to be a "**baseline**" likelihood of change. The 31 day STS frequency is consistent with the effective control room means of dilution detection.

For AP600 several electrical system surveillances, including category A battery cell parameters, inverters, and distribution systems meet this criteria. In each of these cases **local surveillances** are required; however, **effective control room monitors**, such as for voltage, provide an excellent indication of the equipment status. These parameters have been known to have exceeded limits and are, therefore, categorized as having a **baseline likelihood of change**.

Branch 3 31 days

Local Surveillance
Less Effective Control Room Monitor
Low Likelihood of Change

Local surveillances of parameters with a low likelihood of change, but with indirect control room monitoring of a less effective variable receive a 31-day frequency with the AP600 logic. Branch 3 is similar to branch 1 (once per fuel cycle), except that the available indirect variable(s) monitored in the control room are not always as capable of detecting degradation in the primary variable as branch 1 control room monitors. It is not considered that any STS or AP600 surveillances met this criteria.

Branch 4 7 days

Local Surveillance
Less Effective Control Room Monitor
Baseline Likelihood of Change

In general, the STS 7-day frequency is associated with solution volumes (RWST, BIT, Spent Fuel Pool) for which available control room monitoring is not especially effective in detecting conditions associated with a concentration change. In these cases the dilution water sources may not be at temperatures significantly different from the volume (temperature monitoring would only be effective in extreme cases of dilution) and level monitoring may not detect small but important changes. Additionally, these volumes are considered to be vulnerable to dilution by leakage.

For AP600 the Core Makeup Tank boron concentration (SR 3.5.2.5) and Refueling boron concentration (SR 3.9.1.1) surveillances met this criteria and are basically the same as the STS examples.

Branch 5 24 hours

Control Room Monitor

A frequency of 24 hours was selected for AP600 parameters which are measured directly in the control room, even for parameters which have a base line or low likelihood of change, because the surveillance is easy to perform. This standard frequency for all control room variables is considered to simplify operations, according to utility input.

Response to June 6 question:

The STS applies the 12-hour frequency to the Channel Check instrumentation surveillance. In the AP600 TS, 24 hours has been specified for a Channel Check. The reliability of instrumentation systems designed and built in the 1970's (or earlier) is considered the source of the 12-hour frequency. Based on engineering judgement, the reliability of the AP600 instrumentation is at least twice as good as 1970's technology and warrants a 24-hour frequency for the Channel Check surveillance.

Additionally, utility reviewers have indicated that the control room staff will read the instruments each shift and recognize any inconsistencies, but only having to document the Channel Check surveillances once each 24 hours will provide relief from the administrative burden.

Reference

630.12-1 Westinghouse letter, NSD-NRC-96-4699, dated May 3, 1996, "Westinghouse AP600 Technical Specifications Approach."

Question 630.13

The discussion of the sections labeled "Probabilistic Risk Assessment - AP600 Baseline" and "Probabilistic Risk Assessment - AP600 Importance Ranking" can only be fully evaluated by the staff after the submittal of the response to RAI 630.10 (which the first section implies has been made, when in fact, it has not been) and the finalization of the PRA Final Report. Therefore, those submittals need to be made and the response to the RAI should include not only the original information requested but also, as discussed in our November 20, 1996 meeting, a discussion of how PRA information was used in the TS and on what basis its use was justified.

Response:

See the response to RAI 630.10 in Reference 630.13-1.

Reference:

630.13-1 Westinghouse letter, NSD-NRC-97-4939, dated January 14, 1997, "Westinghouse Response to RAI 630.10."

Question 630.14

There are a number of differences between Table 1 and the AP600 TS Rev. 2 that need to be explained as does the difference between the MODE 4 time of Table 2 and that of the STS.

Response:

Differences between Reference 630.14-1, Table 1 and the AP600 TS Rev. 2

		System	W Letter Table 1	AP600 Rev. 2
1.	MODE 5 RCS closed	Containment	No Req'mt	Closure Capability
2.	MODE 5 RCS closed, shutdown < [100] hrs.	PCS	No Req'mt	2 Water Flow Paths OPERABLE
3.	MODE 5 RCS open	ADS	Stages 1, 2, and 3 open	Stages 1, 2, and 3 open Stage 4 OPERABLE
4.	MODE 5 RCS open, reduced inventory	ADS	Stages 1, 2, and 3 open	Stages 1, 2, and 3 open Stage 4 OPERABLE
5.	MODE 6 internals in place, cavity not full	ADS	Stages 1, 2, and 3 open	Stages 1, 2, and 3 open Stage 4 OPERABLE
6.	MODE 6 internals removed, cavity full	Containment	No Req'mt	Closure Capability

In each of the 6 differences listed above, the AP600 Technical Specification, Rev. 2 requirements are <u>more restrictive</u> and are explained in the Technical Specification Bases. The Rev. 2 requirements followed Reference 630.14-1 by approximately 3 months and represent results of recent analysis of shutdown events.

For differences #1 and #6 above, containment closure capability was specified for additional Applicability conditions. In MODE 5 with the pressure boundary closed and in MODE 6 with the reactor internals removed and the cavity full, the time to boiling to is much greater (hours) than for reduced inventory conditions. Originally, it was considered that the extended time to boiling would allow operation without any requirements for these cases. Following submittal of Reference 630.14-1, it was decided that containment closure should apply in all of MODES 5 and 6.

For difference #2 above, OPERABILITY of 2 Passive Containment Cooling flow paths has been added for MODE 5 with the RCS closed. The AP600 Applicability for Passive Containment Cooling System - Shutdown, LCO 3.6.7 in Rev. 2 is MODES 5 and 6 with the reactor shut down less than [100 hours]. This revised Applicability is consistent with the availability of the PCS assumed in accident analyses.

For differences #3, #4, and #5 above, OPERABILITY of Stage 4 flow paths has been added to the LCO applicable in MODE 5 and 6 with the RCS Open. The addition of the Stage 4 flow paths provides vent path redundancy such that a Completion Time of 72 hours may be specified in the event one required flow path is closed or inoperable.

Difference between the MODE 4 time of Table 2 and that of the STS.

The MODE 4 shutdown time for AP600, specified in Table 2 of Reference 630.14-1, is 24 hours. The corresponding time specified in the STS is 12 hours. The MODE 4 shutdown time for AP600 represents a compromise between the time expected using the passive systems (i.e., 36 hours) and the time using the non-Technical Specification active systems (i.e., 12 hours). Although only the passive system OPERABILITY is provided by the Technical Specifications, the active systems will be used when available. The AP600 MODE 4 shutdown time, 24 hours, provides for initiation of plant cooldown using the passive systems and completion of the cooldown using the active systems.

Reference

630.14-1 Westinghouse letter, NSD-NRC-96-4699, dated May 3, 1996, "Westinghouse AP600 Technical Specifications Approach."