

January 30, 1997

Mr. Nicholas J. Liparulo
Nuclear Safety and Regulatory Activities
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SUBJECT: STAFF UPDATE TO OPEN ITEMS (OIs) REGARDING THE WESTINGHOUSE AP600
STANDARD SAFETY ANALYSIS REPORT (SSAR) CHAPTER 11 ON RADIOACTIVE
WASTE SYSTEMS

Dear Mr. Liparulo:

As a result of recent efforts by the Nuclear Regulatory Commission's (NRC) Plant Systems Branch, the status of several draft safety evaluation report open items have changed. In NRC letter, "Open Items Status Regarding Several Plant Systems Branch Review Areas for the AP600 Advanced Reactor Design," dated July 24, 1996 (Reference 1), the staff identified the review status of AP600 SSAR Chapter 11 as of July 1996. Westinghouse responded in letter NSD-NRC-96-4849, "Open Items Status Regarding Several Plant Systems Branch Review Areas for the AP600 Advanced Reactor Design," dated October 17, 1996 (Reference 2), on those open items that were identified as Action-W in Reference 1. The staff reviewed the responses and those items identified as Action-N in Reference 1. Enclosed is an update of the NRC status for both Action-W and Action-N open items identified in Reference 1.

Please update the open item tracking system database to reflect this information. If you have any questions or would like to discuss the OIs further, you can contact me at (301) 415-8548.

Sincerely,

original signed by:

Diane T. Jackson, Project Manager
Standardization Project Directorate
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Office of Nuclear Reactor Regulation

Docket No. 52-003

Enclosure: As stated

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Docket No. 52-003
AP600

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OPEN ITEM STATUS FOR CHAPTER 11 OF THE
AP600 STANDARD SAFETY ANALYSIS REPORT (SSAR)

- Reference 1: NRC letter, "Open Items Status Regarding Several Plant Systems Branch Review Areas for the AP600 Advanced Reactor Design," dated July 24, 1996
- Reference 2: Westinghouse letter, NSD-NRC-96-4849, "Open Items Status Regarding Several Plant Systems Branch Review Areas for the AP600 Advanced Reactor Design," dated October 17, 1996

OI 11.1-2

Issue - This open item was raised from the review of Revision 6 to SSAR Chapter 11. P&IDs for the liquid waste management system, gaseous waste management system and solid waste management system were not provided.

Status in Ref. 1: Action N - Westinghouse provided seven simplified P&IDs in Revision 8 of the SSAR Sections 11.2 and 11.3. The staff is reviewing them.

The staff finds no design specifics in the AP600 radioactive waste systems that would justify AP600 for less complete SSAR P&ID information in accordance with the regulatory guidance in Regulatory Guide (RG) 1.70, Sections 11.2, 11.3, and 11.4. In reviewing the P&IDs in Sections 11.2 and 11.3, the staff finds that the notations and legends in Figure 11.2-2, and Figure 11.3-2 of SSAR Revision 8 are not legible. Therefore, the staff can not complete its review of P&IDs.

Status - Action W, Provide "legible" P&IDs in the SSAR, which should indicate system interconnections and seismic and quality group interfaces. Additionally, the instrumentation and controls that govern the operation should be described. The location of liquid seals should be shown on the P&IDs. The location of vents and secondary flow paths for each system should be indicated.

OI 11.1-3

Issue - In the draft safety evaluation report (DSER) Chapter 11 was prepared with the understanding that the responses to requests for additional information (RAIs) would be part of the SSAR documentation. Since Westinghouse decided not to include the responses in the SSAR, the responses that are not included may not be sufficient to be used as the bases for the staff finding. The SSAR should be revised to include the information that was provided in RAI responses and that was used by the staff as the bases for acceptance when preparing the DSER.

Status in Ref. 1: Action W
Westinghouse submitted a response, dated October 23, 1996.

Status - Action N, The submittal is under staff review.

Enclosure

OI 11.1-4

- Issue - Westinghouse needs to revise the terminology in SSAR Section 11.1.3 and Tables 11.1-8 and 11.1-7 to be consistent, both "realistic source terms" and "normal plant operation source terms" are used and therefore, are not consistent.
- Status - Resolved, per SSAR Revision 9, where "realistic source terms" is used consistently.

OI 11.1-5

- Issue - The COL applicant may not be aware that the radioactive waste building is non-seismic.
- Status - Resolved, per SSAR Revision 9 Sections 11.2.4.1 and 11.4.6 explicitly state that the radioactive waste building is non-seismic.

OI 11.1-6

- Issue - This is a new item beyond Reference 1 relating SSAR Table 3.2-3 to radioactive waste systems.

SSAR Table 3.2-3 does not identify which components of the radioactive waste systems are housed in the seismically qualified auxiliary building, and which components are housed in the non-seismic radioactive waste building. As a result, the staff identifies the following specific problems.

1. SSAR Appendix 1A, RG 1.143, Item C.1.1.3 indicates that tanks in the liquid radioactive waste system are supposed to be in the Seismic Category I auxiliary building. In Table 3.2-3, p.49 of 51, tanks are listed as "NS," and it does not indicate whether those tanks are located in the auxiliary building or in the radioactive waste building.
2. SSAR Appendix 1A, RG 1.143, Item C.2.1.3 indicates that the guard bed and the delay beds in the gaseous radioactive waste system are supposed to be in the Seismic Category I auxiliary building. In Table 3.2-3, p.49 of 51, they are listed as "NS," and it does not indicate whether those beds are located in the auxiliary building or in the radioactive waste building.
3. SSAR Appendix 1A, RG 1.143, Item C.3.1.3 indicates that spent resin tanks in the solid radioactive waste system are supposed to be in the auxiliary building. Table 3.2-3 lists them as "NS."

4. SSAR Appendix 1A, RG 1.143, Item C.5.2: Westinghouse states that "those portions" of the radioactive waste systems that require seismic design by RG 1.143 are housed in the auxiliary building that is Seismic Category I. "those portions" are not defined. List "those portions" in Table 3.2-3.

Status - Action W, Explain why those components that need to be in the seismically qualified auxiliary building per RG 1.143 are listed as "NS" (non-seismic) in Table 3.2-3. Revise the Table 3.2-3 information in radioactive waste systems to be consistent with RG 1.143 and to include the related location information.

OI 11.2-5

Issue - Compliance with 10 CFR Part 20 Section 1302 for liquid effluent concentrations in unrestricted areas

Items 1 and 2 were resolved in Ref. 1.

3. Liquid release concentrations have to be based on 1 percent failed fuel for all fission products other than iodine which can be based on the AP600 technical specification (TS) limit of 0.4 $\mu\text{Ci/gm}$ I-131 dose equivalent for iodine isotopes primary coolant concentrations. Concentrations of all other radionuclides can be based on GALE output for releases of these radionuclides.

Status in Ref. 1: Action W - On June 10, 1996, Westinghouse provided a draft markup of that would give a bases on "one-percent fuel defects for fission product nuclides, except for a TS limit based on 0.25-percent fuel defects for the iodine and noble gas nuclides." Formal submittal was provided in SSAR Revision 8. It resolved the concern of fail-fuel assumption. However, the revised fail-fuel assumption needs to be consistent throughout Chapter 11. On July 12, 1996, Westinghouse submitted draft markups of SSAR Section 11.1, Table 11.1-2, and Sections 11.2.1.2.4 and 11.3.1.2.4.1.

Status - Action W, The agreed one-percent fuel failure assumption should be reflected in the SSAR. The SSAR, Revision 10, still reads 0.25 percent fuel failure, which the staff found to be not acceptable.

OI 11.2-6

Issue - Not meeting the guidelines of RG 1.143 in its entirety

1. Westinghouse's response to Q460.20 was identified as inadequate in the DSER. Also, the DSER Section 1.9.1 discussion of conformance with RG 1.143 is not at all detailed. A lot of information provided in Westinghouse's response to Q460.20 which the staff finds acceptable as recorded in the DSER must be incorporated in the applicable SSAR Section, namely 11.2, 11.3, 11.4 or 11.5.

Absent this incorporation, the staff can not conclude that the waste management systems and process and effluent monitoring and sampling systems meet the RG 1.143 guidelines.

Status in Ref. 1: Action N - Westinghouse provided additional information in Appendix 1A of the SSAR in Revision 7. The staff will review this information.

The staff reviewed Appendix 1A, RG 1.143, and has one comment on Item C.4.2. The statement on the quality assurance, "The quality assurance program applied to the radioactive waste system is discussed in Chapter 17," is not a true statement.

Status: Action W, The quality assurance (QA) program in Chapter 17 does not address the radioactive waste system. Westinghouse needs to reword the statement according to the revised Chapter 11 that the quality assurance program applied to the radioactive waste system is in accordance with the overall quality assurance program described in Chapter 17 (see Item 5 below).

2. An earlier SSAR version (Section 11.2.2.4) refers to alarm provisions for tank levels both in the liquid radioactive waste system panel and in the main control room (MCR). However, SSAR Table 11.2-3, Revision 6 indicates alarm provisions only in the MCR. Level indication availability for CST should be identified in SSAR Section 11.2 also.

Status in Ref. 1: Action N

On May 24, 1996 and June 10, 1996, Westinghouse provided a markups of SSAR 11.2.2.4 and Table 11.2-3 to describe the local display provided by portable devices that plug into a monitoring bus. This is in Revision 8 of the SSAR. Westinghouse added CST local level indicator information, in Section 9.2.4.6 of Revision 8 to the SSAR similar to the radioactive waste tank indicator.

Note: Westinghouse does not consider the CST part of the waste system. The CST is described in Section 9.2.4.6.

Status - Resolved, The staff reviewed the above changes in Revision 8 and finds it acceptable.

3. It is not clear whether monitor tanks are also in the shielded areas where personnel occupancy is minimal.

Status - Resolved per Appendix 1A under RG 1.143, C.1.2.1.

4. No information on whether the CST has a dike or retention pond since it is located in the yard area.

Status - Resolved, Westinghouse informed the staff that the CST does not have a dike around it because it is clean water. Also, the CST is not considered by Westinghouse to be part of the waste system and is not described in this section.

5. There is no COL requirement that the COL applicant should provide details of the quality assurance (QA) program as it relates to the construction and operation of liquid waste management system components. SSAR Section 17.1 is not sufficient.

Status - Resolved, SSAR Revision 8 Section 11.2.3.6 states that "The QA program for design, fabrication, procurement, and installation of the liquid radioactive waste system is in accordance with the overall quality assurance program described in Chapter 17."

OI 11.2-8

Issue - This open item was raised from the staff's review of Revision 6 of the SSAR. The following concerns were identified:

1. An earlier SSAR Section 11.2.2.1.2 assigned two names to two subsystems, namely, effluent waste subsystem and general waste subsystem. There is no justification for deleting the identification of these subsystems.
2. There is no justification for deleting 1 monitor tank from a total of 4 monitor tanks, 2 each for each of the above 2 systems (The 4 tanks are listed in the earlier SSAR version).

Status on Items 1 & 2 - Resolved,
The SSAR changes are justified because they reflect a design change.

3. SSAR Section 11.2.2.5.4 states the following: "when combined with detergent wastes, they may be suitable for processing and discharge." The subject section also states the following: "when not suitable for processing, they can be treated by use of mobile equipment or by shipment offsite."

The SSAR Section deals with chemical wastes. It is not clear what the above statements mean.

4. After detergent waste is processed, how is it disposed of?
5. Will chemical wastes ever be routed to general waste subsystem (this question arises since in the earlier proposed design, this was an option)?

Status of Items 3, 4, and 5: Resolved per SSAR Revision 8 Sections 11.2.2.5.3 and 11.2.2.5.4.

6. SSAR Section 9.2.9 states that secondary coolant system sampling drain wastes will be routed to the plant's waste water system. The plant's waste water, in turn, if detected to be radioactive, when sampled, will be diverted to the liquid radioactive waste system for processing. SSAR Section 9.2-9, and schematic 11.2-1 do not provide information on the specific subsystem to which the radioactive stream will be routed for processing.

Westinghouse provided the P&ID (Sheet 3 of Figure 11.2-2) in Revision 8 of the SSAR. However, the staff finds legends and notations of the referenced figure are not legible.

Status - Action W, Westinghouse provided larger, proprietary P&IDs on December 13, 1996, however, the SSAR needs to be revised to be legible.

OI 11.3-1

Issue - Instrumentation for gaseous radioactive waste system

Reason - Westinghouse response to Q460.10 (C), Revision 1 is acceptable. However, this is not included in SSAR Section 11.3 table.

Status - Resolved per Table 11.3-2 of SSAR Revision 8.

OI 11.3-3

Issue - Delay times for krypton and xenon in charcoal beds.

Reason - SSAR Table 11.3-1 (Revision 6) parametric values for the gaseous radioactive waste system are acceptable except for the dynamic adsorption coefficients (Kcc/gm) of 1050 and 38 for Xenon and Krypton. For the design bed conditions given in the table, in accordance with NUREG-0017, Revision 1, Page 1-28, K should be 330 and 18.5 cc/gm for Xenon and Krypton, respectively. Also, a carbon delay bed mass of 4600 lbs can be used. With the above parametric values, the calculated delay times for Xenon and Krypton turn out to be 33.4 days and 1.9 days, respectively.

Status - Resolved, based on the test report (ORNL CF59-6-47) provided by Westinghouse.

OI 11.3-8

Issue - This open item was raised from the staff's review of Revision 6 of the SSAR. The following design changes in the heating, ventilation, and air conditioning (HVAC) systems were identified in the draft text of the SSAR Section 9.4, which was provided to staff by Westinghouse during the June 21, 1995, meeting. These are (1) combining Annex I and Annex II buildings into a single Annex building with its ventilation exhaust released to the environment via the monitored plant vent and (2) replacing originally proposed

permanent high efficiency particulate air (HEPA) filter system on the exhaust from the radioactive waste building (to the plant vent) by a mobile HEPA filtration system. To date, these changes have not been incorporated in the SSAR by appropriate revision of SSAR Section 9.4.

Status - Item 1, Resolved per SSAR Section 9.4.7.
Item 2, Resolved per SSAR Section 9.4.8 on mobile HEPA filters.

OI 11.4-1

Issue - Lack of packaging details for secondary system wet wastes

Reasons -

1. SSAR Section 10.4.6.3 contains the following statements:
 - (a) "Spent resin is transferred directly from the polisher vessel to the spent resin tank (SRT) until it can be removed offsite."
 - (b) "Radioactive resin is transferred from the spent resin tank to a truck for offsite removal."

However, SSAR Section 11.4.2.1 contradicts the above statements:

"Should the resins become radioactive, the resins are transferred from the condensate polishing vessel directly to a temporary processing unit. The processing unit, located outside the turbine building, dewateres and processes the resins as required for off-site disposal."

2. No information on how the radioactive secondary spent resins are packaged after they are processed.
3. Is there a portable tank via which the radioactive spent resins are transported from the polisher vessels to the temporary processing unit as originally stated in SSAR Section 10.4.6.3.
4. No information on where non-radioactive secondary spent resins will be collected and how they will be disposed.
5. No information on collection, processing and packaging of radioactive spent resins arising from treatment of steam generator (SG) blowdown.
6. No information on collection and disposal of non-radioactive spent resins arising from treatment of SG blowdown.

Status - Items 1 and 3, Resolved per SSAR Revision 9, Section 11.4.2.1 (page 11.4-5) and Section 10.4.6.3 (page 10.4-19).

Items 2, 4, 5, and 6, Resolved per SSAR Sections 11.4.2.1 for radioactive resins, and SSAR Sections 10.4.6.3 and 10.4.8.2.3.6 for non-radioactive wastes.

OI 11.5-2

Issue - SSAR Table 3.2-3 does not list the radiation monitoring system (RMS).

Status - Action W, Westinghouse should list the RMS in Table 3.2-3 to include both safety-related and non-safety-related radiation monitors.

OI 11.5-4

Issue - The SSAR does not explain why the containment atmosphere particulate detector (part of reactor coolant pressure boundary leak detection system) is non-seismic Category I and receives power from non-E power supply

Reason - In SSAR Revision 3, Westinghouse stated that the containment atmosphere radiation monitor measures not only N_{13}/F_{18} and gaseous concentrations in the containment atmosphere (these are also included in the Revision 6 version) but also iodine and airborne particulate activities in the containment atmosphere. RG 1.45 requires a containment atmosphere airborne particulate activity monitor as one of the reactor coolant pressure boundary leakage detection devices. There is no justification for omitting the iodine and particulate activity monitoring devices.

Status in Ref. 1: Action W - Westinghouse will provide justification based on leak-before-break consideration.

In a letter dated October 17, 1996, Westinghouse provided justification.

Status - Action N, The staff is reviewing the justification relating to SSAR Section 5.2.5 on reactor coolant system leakage detection.

OI 11.5-7

Issue - Non-inclusion of grab sampling provision for turbine gland seal system exhaust

Reason - In Revision 4 SSAR Figure 10.4.12-1, Westinghouse showed grab sampling provision for the turbine gland seal system exhaust and closed out the above DSER open item. However,

in Revision 6 SSAR Figure 10.4.3-1, Westinghouse does not show any such provision. Therefore, the DSER open item 11.5-7 is re-opened.

Status - Resolved per SSAR Revision 9 Figure 10.4.3-1.

OI 11.5-9

Issue - Non-inclusion of grab sampling and continuous sampling provision for iodine activity in the containment purge exhaust.

Reason - The downstream provision for grab sampling of iodine activity in the containment purge exhaust is available as stated above for OI 11.5-8. Therefore, this part of OI 11.5-9 is resolved. However, the downstream provision for continuous sampling of iodine activity in the purge exhaust (i.e., plant vent has continuous sampling capability for iodine activity) is not adequate. Therefore, DSER Open Item 11.5-9 as it relates to continuous sampling provision for iodine activity in the containment purge exhaust continues to remain open.

Status in Ref. 1: Action W - Westinghouse will review its position on this issue.

Westinghouse responded in a letter dated October 17, 1996, by referring to SSAR Revision 8, Tables 9.3.3-2 and 11.5-1 and Figure 9.4.7-1. Further, in a telephone conference on November 21, 1996, Westinghouse clarified that Item 33 of Table 9.3.3-2 identifies the grab sampling and continuous sampling provision for iodine activity at plant vent. It is shown in Figure 9.4.7-1 that sampling at the plant vent is the same as sampling at the containment purge exhaust. However, Figure 9.4.7-1 is not legible, which hinders the staff to confirm this information.

Status - Action W, Provide legible Figure 9.4.7-1 in the SSAR.

OI 11.5-10

Issue - Lack of continuous sampling and analysis provisions for service water system effluent

Reason - November 28, 1995, Open item tracking system (OITS) Item No. 1195 states the following: "The SWS (Service Water System) includes provisions for continuous sampling and analysis of the blowdown using temporary equipment connected to grab sampling connection shown on the system P&ID." The P&ID (Revision 6) identified the grab sampling provision by Note 15 to SSAR Figure 9.2.1-1. The proprietary figure for SWS shows the local grab sample provision. But there is no note to the figure mentioned above that continuous sampling and analysis of the blowdown for activity can be achieved by temporary equipment connected to grab sampling connection shown in the figure. Also, SSAR Table 9.3.4-1 (Revision 4)

does not explicitly state that the SWS effluent will be continuously sampled and analyzed for gross radioactivity, identification of principal radionuclides, and concentration of alpha emitters (S&A).

Status in Ref. 1: Action W - Westinghouse will provide justification for its position.

The staff reviewed the Westinghouse responses, dated October 17, 1996, which provided reasons not to have continuous sampling for SWS. The staff finds it unacceptable because there is no significant design differences in SWS that would justify AP600 being treated differently from other pressurized water reactors.

Status - Action W, provide continuous sampling for SWS effluent.

OI 11.5-12

Issue -

- (1) Westinghouse has not explained the purpose for grab sampling and analysis provisions for the component cooling water system, SWS effluent stream, turbine building drains, and waste water drain.
- (2) Westinghouse does not indicate if grab sampling and analysis provisions for tritium activity are included for the system, streams and drains mentioned in (1) above.

Reason -

November 28, 1995, OITS information for Item No. 1197 which deals with the above concerns is unsatisfactory. Further SSAR Table 9.3.4-2 (Revision 4) does not include the above system stream and drains, and does not state that these are grab sampled and analyzed for gross radioactivity and identification and determination of concentrations of principal radionuclides and alpha emitters and tritium. Further, revised SSAR Table 9.3.3-1 (Revision 4) does not include grab sampling of component cooling water system for tritium activity.

Status in Ref.1 - Action W

Westinghouse responded in Reference 2 indicating that SSAR Table 9.3.3-2, Revision 8 addresses the staff concern. In a telephone conference on November 21, 1996, Westinghouse further explained that the purposes of sampling is described in SSAR Sections 9.3.3 and 9.3.4 for primary and secondary sampling. The specific systems (CCW, SWS, turbine building drains, and waste water drains) are included according to the standard review plan (SRP). Therefore, the staff finds Item (1) to be resolved.

On Item (2), Westinghouse explained in the telephone conference on November 21, 1996, the following clarifications with respect to Table 9.3.3-2:

- a. Grab sampling for CCS is in Item 12 and 13.
- b. Grab sampling for turbine building drains and waste water drains is in Item 24.
- c. Grab sampling for SWS effluent could not be identified in the table. However, Westinghouse believed that Item 23, SES blowdown, might be an error that actually meant for SWS.

Status - Action W, Revise Table 9.3.3-2, as necessary, to reflect the above clarification on Item 2b and 2c.

OI 11.5-14

Issue - Westinghouse has not included grab sampling and analysis provisions for secondary resin slurry.

Status in Ref. 1: Action W

In a letter dated October 17, 1996, Westinghouse responded to the issue by referring to SSAR Revision 8, Table 9.3.3-2. Further in a telephone conference of November 21, 1996, Westinghouse clarified that Item 22, WSS spent resin tank, and Item 25, CPS spent resin sluice line, of the table address the grab sampling for secondary resin slurry. The staff finds the response acceptable.

Status - Resolved

OI 11.5-19

Issue - This open item was raised from the staff's review of Revision 6 of the SSAR. Table 11.5-2 does not list the principal isotopes measured by the area radiation monitors.

Status in Ref. 1: Action W - Westinghouse needs to provide justification for this position.

In a letter of October 17, 1996, Westinghouse states that there is no requirement to list principal isotopes measured by area monitor and to do so could be misleading. The staff concurs with Westinghouse.

Status - Resolved