



UNITED STATES
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

May 12, 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

The staff has reviewed your responses to the staff's requests for additional information Q460.1-Q460.16,* dated November 30, 1992, and January 14, January 22, February 9, March 18, and December 9, 1993 regarding radioactive waste management. In many cases, the staff does not completely agree with your responses. Enclosure 1 is a table describing the staff's concerns. We propose that a meeting be set up to discuss these concerns and comments.

In addition, as a result of its review, the staff has developed more requests for additional information (Q460.17-Q460.26). Enclosure 2 lists these questions. Please be prepared to discuss these questions at the proposed meeting to expedite the staff's review.

The discussion in the standard safety analysis report (SSAR), figures (e.g., liquid waste processing schematics), and tables in Chapter 11 should be revised, as appropriate, to address the resolution of all of the issues raised in this package.

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.

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

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Mr. Nicholas 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 contact me at (301) 504-1120.

Sincerely,

Original Signed By:

Thomas J. Kenyon, Project Manager
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Docket No. 52-003
AP600

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COMMENTS ON WESTINGHOUSE'S RESPONSES TO RAIS ON CHAPTER 11 OF THE SSAR FOR AP600

No.	Question No.	Description of the Question	Applicant's Response	Disposition/Comments
1	460.1	The staff requested the applicant to demonstrate compliance with 10 CFR Sections 20.1001-20.2402, Appendix B, Table 2, Columns 1 and 2 for gaseous and liquid effluent concentrations in unrestricted area.	The response is based on 0.25 percent failed fuel, same as SRP Section 12.2 criterion for shielding. One percent FF, only review guidance in SRP Sections 11.2 and 11.3	The staff believes that the shielding criterion is not a valid basis. Evaluation findings in SRP Section 11.3 does refer to 1% FF. The EPRI Requirements Document for Passive Reactors also uses 1% FF for radwaste systems design and demonstration of subject compliance. Tables 11.2-7 and 11.3-4 of the SSAR should be revised to demonstrate subject compliance for effluent concentrations in unrestricted areas. Effluent concentrations can be based on annual average.
2	460.2	The staff requested the applicant to clarify the two different SG blowdown rates in the SSAR.	The response indicated that the higher value was for calculating liquid effluents and the lower value was for in-plant evaluations.	Because the SG blowdown is expected to be recycled normally (Section 10.4.8 and Table 11.2-6 of the SSAR), the staff believes that the response of the higher value being used for calculating effluents is unsatisfactory. Moreover, even if there is a discharge, lowered secondary concentration as a result of increased blowdown may not significantly increase discharged radioactivity. The SSAR should be revised to give a consistent value.
3	460.3	The staff requested the applicant to provide schematics for various waste streams and explanation of DFs.	The schematics were provided, but the DFs were not explained.	NUREG-0017, Rev. 1, Figure 2-1 shows the purification demineralizers upstream of the shim bleed while Figure 11.2-3 of the SSAR shows the bleed downstream of the subject demineralizers. For the AP600, the starting point for radwaste processing for shim bleed equipment drains and clean waste is the effluent holdup tank (see comment on Q460.9). Revise the schematics.

4	460.4(b)	The staff requested the applicant to demonstrate compliance with BTP ETSB 11-5 for WGPS failure analysis.	The applicant indicated that the release duration was 1 hour and the source term was based on 0.25%FF.	The release should be for 2 hours, the analysis should be based on 1% FF, and normal contributions should be added. The SSAR should provide a re-analysis in accordance with the subject BTP assumptions.
4	460.4(c)	The staff requested the applicant to address compliance with GDC 3, and to provide the number, locations, type of gas analyzers to show how the design meets with II.B.6 of Sections 11.3 of the SRP.	The applicant indicated that there were 2 oxygen analyzers for the hydrogen rich system; the nitrogen purge flow was at the outlet of the waste gas processing system; there was local and MCR annunciation; the setpoints were specified to facilitate sufficient time for operator action; and the system was not designed to withstand hydrogen explosion.	The following information was not provided and should be provided in the SSAR: (a) Locations (b) Alarm levels (c) non-sparking information (d) automatic action to preclude buildup of explosive mixture i.e., automatic cutoff of oxygen source and injection of nitrogen diluent at Hi-Hi alarm not specified (see II.B.6 of Section 11.3 of the SRP).
4	460.4(d)	The staff requested the applicant to demonstrate compliance with GDC 60 and RG 1.140 guidelines.	The applicant indicated that only the containment purge was filtered. There was no systematic discussion of compliance with RG 1.140 guidelines for the containment filter.	Clarify whether there is any high volume containment purge at > 4000 cfm and whether such a purge (in case, there is) also has filters. Provide a table in the SSAR to show how the containment filters meet <u>each</u> of the R.G. 1.140 guidelines.

5	460.5	<p>The staff requested the applicant to provide</p> <ul style="list-style-type: none">(a) estimates of annual shipment volume,(b) demonstration of compliance with BTP ETSB 11-3, Position III.1 regarding storage volume for accumulated filter sludges, and(c) storage volume and meeting Position III.2 for storage volume.	<p>The applicant indicated that</p> <ul style="list-style-type: none">(a) the total of expected shipment volume of wet and dry wastes 1729 CF,(b) there would be no filter sludges, and(c) there was adequate storage as follows:<ul style="list-style-type: none">(1) spent resins (HIC) - 12 months,(2) filter cartridges - 17 months, and(3) drums - 18 months.	<p>(a) The staff expects 1700 CF wet wastes and 3400 CF dry wastes. There is no sufficient data to accept significantly less solid radwaste generation.</p> <p>(b) & (c) are acceptable, although the staff does not agree with the statement that there is excessive storage capacity. Note: primary resins - 2 months storage in spent resin tanks is acceptable. The SSAR should be revised to give a higher waste generation.</p>
6	460.6	<p>The staff asked the applicant how the liquid, gaseous and solid radwaste systems meet the seismic criteria of RG 1.143; The staff also asked if the LWMS meets RG 1.143, Position C.1.1.3.</p>	<p>The applicant indicated that the LWMS equipment is in the Auxiliary Building and high bay area of the radwaste building. The Auxiliary Building is seismic Category I. The bay area is Category II; but more than meets RG 1.143 requirements; it is designed to meet maximum inventory. Guard bed and delay beds meet only the <u>intent</u>; equipment and supports are in accordance with commercial codes.</p>	<p>This response is under the review of the staff along with the response to Q230.11. What do you mean by meeting only the "intent?" What about supports? Disposition of this RAI is pending further review.</p>

7	460.7	The staff requested the applicant to provide information on the service water effluent monitor.	The applicant indicated that normally radioactive systems that provide leak pathways into the SWS include radiation monitors with a sensitivity as low as 10^{-8} $\mu\text{Ci/cc}$. Further dilution will result in concentrations below LLD.	Clarify which are the normally non-radioactive leakages that feed into the SWS and which are identified in Table 11.5-1 of the SSAR. Provide this information in the SSAR.
8	460.8	<p>The staff requested the applicant to provide clarification on</p> <ul style="list-style-type: none"> (a) a discrepancy on the shim bleed; (b) p/s leak 75 or 100 lb/day; (c) steam flow 8.4E5 or 8.4E4 lbs/hr; and (d) secondary concentrations (SC) 	<p>The applicant provided the following information:</p> <ul style="list-style-type: none"> (a) 658 gpm corrected table (b) 75 lb/day corrected (c) 8.4×10^5 lb/hr corrected (d) corrected 	<p>The response to Item d, i.e., calculated secondary concentrations (SC), needs further discussion. The staff's calculations show that I-131 SC will be 6.7×10^{-7} $\mu\text{Ci/gm}$ or 1.14×10^{-6} $\mu\text{Ci/gm}$ accordingly as SG blowdown is 8.4×10^4 lb/hr or 4.2×10^6 lb/hr. SG blowdown is processed by the blowdown demineralizer as per Section 10.4.8.3.2 of the SSAR. Tables 11.1-7 and 11.2-6 of the SSAR contradict this. Remove discrepancies regarding the SG blowdown, and correct the secondary concentrations for all radionuclides.</p>

9	460.9	<p>The staff requested the applicant to provide the information on the liquid radwaste management system:</p> <ul style="list-style-type: none">(a) DFs for isotopes;(b) why minimum recycling is used in the design;(c) collection times;(d) process times;(e) input inconsistency;(f) RG 1.143 design features; and(g) discharge features	<p>The applicant provided the following information:</p> <ul style="list-style-type: none">(a) explained the DFs;(b) explained was it uses minimum recycling;(c) corrected;(d) corrected;(e) corrected(f) CST level controlled, design features given only for CST, not for all tanks(g) simultaneous discharge possible - only one discharge path	<p>The staff has the following concerns:</p> <p>(a) DFs - Using a value of 1000 for all isotopes for all streams appear more appropriate to the staff. For this, the arrangement will be a special ion demineralizer (100 for Cs and Rb), cation bed (10 for CS and Rb) and 2 mixed beds all in series. Credit for no more than 2 demineralizers in series for any isotope will be more appropriate. For more credit, industry experience will be required. For special ion removal also, industry experience should be cited.</p> <p>(c) and (d) The collection time should not be undervalued; this is non-conservative. Shim bleed, equipment drains, and clean wastes collection time should be 21.4 days; process time-0.148 days. Dirty wastes-collection time-8.6 days; process time-0.111 days.</p> <p>(f) compliance of C.1.2.1 through C.1.2.5 of R.G. 1.143 should be addressed for <u>all</u> applicable tanks. The GALE code has to be rerun with proper inputs for DFs and collection and process times.</p>
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10	460.10	<p>The staff requested the applicant to clarify</p> <ul style="list-style-type: none">(a) An inconsistency between Tables 11.2-6 and 11.3-1 of the SSAR regarding holdup times for Kr and Xe(b) degassing days and Table 11.3-3 releases(c) charcoal delay bed instrumentation	<p>The applicant provided the following information:</p> <ul style="list-style-type: none">(a) two 100% beds were normally used; Table 11.2-6 was revised for credit to one bed only(b) holdup times were corrected with credit for one bed-anticipated releases corrected(c) moisture level monitored; monitoring performance of individual components is achieved by grab sampling	<ul style="list-style-type: none">(a) A holdup time of 8.7 days for xenon and 11.7 hours for krypton appears reasonable. However, calculated WGS releases given in Table 11.3-3 of the SSAR are significantly <u>lower</u> than what would be expected. For example, Xe-133 would be 868 Ci/yr (with 17.4 days, it will be 275 Ci/yr). Using 2 beds and 1 scfm (EPRI URD value for passive reactors), one gets 8.7 days for xenon, which is appropriate. The GALE code should be rerun with correct input to get the correct WGS releases.(b) provisions for monitoring and a list of alarmed process parameters (similar to the one provided in EPRI's URD Table 12.3-1) were not given. These should be provided in the SSAR.
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11	460.11(a) and (b)	<p>The staff requested the applicant to</p> <p>(a) explain which method the applicant intended to employ: spent resin-encapsulation, solidification or dewatering. The staff asked whether the design deviated from the EPRI URD for passive reactors.</p> <p>(b) describe how the SWMS design features to demonstrate compliance with GDC 60, 63, and 64.</p>	<p>The applicant indicated that</p> <p>(a) The AP600 conforms with EPRI URD; that dewatering is the design basis with no encapsulation</p> <p>(b) all compliance explained. However, compliance with GDC 64 as it relates to gaseous effluent monitoring only explained.</p>	<p>(a) If encapsulation is not applicable, revise page 11.4-9 of the SSAR, left half, third paragraph, to delete the reference to encapsulation. State clearly in the SSAR that solidification is <u>not part of the AP600 SWMS</u>.</p> <p>(b) If the SWMS has provisions to divert any liquid radwaste that results from SWMS operation to the LWMS for processing and monitored discharge, it should be so stated in the SSAR. Only if the above provision is there, the SWMS will be in compliance with applicable GDC such as GDC 60, 63, and 64. This compliance should also be discussed in the SSAR.</p>
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1i	460.11(d)	The staff indicated that the projected annual solid radwaste volume may be inadequate, especially if some wet wastes are solidified.	The applicant indicated that the AP600 will use the EPRI URD design and operating techniques to minimize solid radwaste volume. No solidification is planned. The AP600 projected waste volume is based on dewatering. Alternative devices, such as vinyl ester styrene as a binding agent for solidification, may not increase waste volume.	Because the staff concludes that the storage volume provided in the AP600 design is sufficient to accommodate at least a 30 day generation of what the staff expects to be normal waste generation for a PWR and not because 1729 CF waste generated means storage volume is adequate for 1 year of the above expected waste generation, the staff finds this conditionally acceptable. The staff disagrees with Westinghouse's statement that solidification may not result in an increase in volume because it depends upon a solidifying agent. Does the AP600 use vinyl ester styrene as a binding agent? If solidification is not within the AP600 design basis, the SSAR should make it clear that only dewatering is within the scope of the AP600, the reference to vinyl ester styrene should be deleted, and the applicant should further state that 1729 CF or any other to be revised volume corresponds to a dewatering situation.
11	460.11(f)	The staff requested the applicant to provide a description of the onsite storage facility that will provide 6 month storage, along with a clarification regarding its conformance with Section 5.4 of the EPRI URD for passive reactor designs.	The applicant described four storage locations (a) 2 spent resin container fill stations; (b) onsite storage casks; (c) hi-activity filter processing cask; and (d) packaged waste storage room. The design conformed with the URD, except for remote reviewing.	Because the AP600 does not discuss how the intended facility will meet GL 81-38 guidelines and the need for such a facility is site dependent, staff will review such a site-specific facility against the guidelines of GL 81-38 when the COL applicant proposes such a facility, and gives additional information. Westinghouse should identify this as a COL action in the SSAR.

12	460.14	The staff requested the applicant whether there were automatic control features for the CCW and SG blowdown system rad monitors.	The applicant indicated that for the CCW, the rad monitors provide manual isolation of the affected loop. The SG blowdown remote manual diversion valve directs blowdown stream to LWMS for processing. There is automatic isolation on high radiation by the blowdown control valve and an automatic isolation valve upstream of system's heat exchangers.	If, as Section 10.4.8.3.2 of the SSAR states, the SG blowdown stream is normally processed by the blowdown system demineralizers, what is the need to divert it to the liquid radwaste processing system? Clarify.
13	460.15	The staff requested the applicant to identify sampling provisions for the liquid and gaseous process and effluent streams and explain how they meet the provisions identified in Tables 1 and 2 of Section 11.5 of the SRP.	The applicant revised the SSAR and added tables. However, sample frequency, analysis type, and sensitivity were not provided.	Provide the sample frequency, sensitivity of analysis, etc. in the SSAR. Alternatively, the COL applicant may be called upon to provide such information.

**REQUEST FOR ADDITIONAL INFORMATION
ON THE WESTINGHOUSE AP600 DESIGN**

- 460.17 Discuss the applicability of IE Bulletin 80-05 to the AP600 design. The subject bulletin addresses the release of radioactive material or other adverse effects as a result of low-vacuum conditions that cause tank buckling. The low vacuum condition is created by cooling hot water in a low pressure tank. Design approaches that resolve this issue involve sizing the applicable tank vents adequately to prevent the collapse of the tank during drain down, or providing vacuum breakers to the tanks, as necessary. Section 11.2 of the SSAR should address how this concern will be resolved.
- 460.18 Because specific compliance with Appendix I of 10 CFR Part 50 for gaseous and liquid effluents (which includes offsite dose guidelines and cost-benefit analysis criterion), and the guidelines given in ANSI N13.1 "Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities," Regulatory Guide (RG) 1.21 "Measuring and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants," and RG 4.15, "Quality Assurance for Radiological Monitoring Programs (Normal Operation) - Effluent Streams and the Environment," is not within the scope of the AP600 design, the staff will review individual COL applications referencing the AP600 design to ensure their conformance with these documents. Section 1.8 of the SSAR summarizes the COL and site dependent interfaces, but these are not complete. Besides the above, the setpoints for terminating instantaneous discharges of liquid waste and processed waste gas [which will be given in site-specific offsite dose calculation manual (ODCM)] will be reviewed on a site-specific basis. Also, conformance with 10 CFR Parts 61 and 71 for processed solid wastes will be reviewed on a site-specific basis. The COL applicant may be required to prepare an operation and maintenance manual to demonstrate compliance with Section 50.34(f)(2)(xvii) of 10 CFR Part 50 as it relates to noble gas effluent monitoring and sampling and analyzing plant gaseous effluents for radioiodine and particulates during and following an accident (the above regulation incorporates the guidelines of TMI Action Item II.F.1, Attachments 1 and 2). Also, the staff will review the COL applicant's Process Control Program (PCP) for processing "wet" solid wastes. The staff will also review quality assurance (QA) provisions for liquid, gaseous and solid waste management systems against RG 1.143 guidelines.

Therefore, the staff believes that all the following items should be identified as COL Action Items in Sections 11.2 through 11.5 of the SSAR:

Section 11.2 (Liquid Waste Management System)

The COL applicant should provide:

- a. A statement of specific compliance with Appendix I numerical objectives for offsite individual doses via liquid effluents and cost-benefit analysis for population doses via liquid effluents.
- b. The basis for set point calculation in the plant-specific ODCM for terminating liquid waste discharge:

$$\sum_i \frac{C_i}{C_{i \text{ liquid effluent limit for isotope in any unrestricted area}}} \leq 10$$

For the $C_{i \text{ eff}}$ limit, see 10 CFR Part 20, Sections 20.1001-20.2402, Appendix B, Table 2, Column 2.

- c. A statement of compliance with the QA provisions of RG 1.143.

Section 11.3 (Gaseous Waste Management System)

The COL applicant should provide:

- a. A statement of specific compliance with Appendix I numerical objectives for offsite individual doses via gaseous effluents and cost-benefit analysis for population doses via gaseous effluents.
- b. The basis for set point calculation in the plant-specific ODCM for terminating instantaneous GWPS discharge: This should be based on instantaneous dose rates in unrestricted areas due to radioactive materials released via gaseous effluents. The following are the limits: noble gases 500 mrem/yr total body; 3000 mrem/yr skin; others 1500 mrem/yr to any organ. Note: Instantaneous rate here means the above annual dose rates prorated for 1 hour.
- c. A statement of compliance with the QA provisions of RG 1.143

Section 11.4 (Solid Waste Management System)

The COL applicant should provide:

- a. A demonstration that the wet waste processing will result in products that comply with 10 CFR 61.56
- b. The establishment and implementation of a PCP for processing wet solid wastes, i.e., solidifying (if applicable) using an approved solidification agent and the dewatering processing of spent resins.

- c. A discussion of on-site storage of low-level waste and demonstration that such a facility will meet GL 81-38 guidelines (only if applicable).
- d. A demonstration that all radioactive waste shipping packages will meet 10 CFR Part 71.
- e. A statement of compliance with the QA provisions of RG 1.143.

Section 11.5 (Process and Effluent Monitoring and Sampling Systems)

The COL applicant should provide:

- a. Sampling details and demonstration of compliance with RGs 1.21 and 4.15, and ANSI N13.1 guidelines.
- b. An operation and maintenance manual to demonstrate compliance with 10 CFR Part 50, Section 50.34(f)(2)(xvii) with regard to monitoring and sampling of gaseous effluents during and following an accident.

- 460.19 The responses to these questions state that there will be no revision to the SSAR to incorporate the contents of the responses. All responses should be incorporated in appropriate SSAR sections.
- 460.20 There is no systematic discussion of how the liquid, gaseous and solid waste management systems meet each one of the guidelines of RG 1.143. Provide an item-by-item demonstration of compliance with RG 1.143 for all of the radwaste management systems.
- 460.21 Compliance of liquid and gaseous effluent concentrations in unrestricted areas with 10 CFR Part 20 limits is not based on 1% FF or annual average. Tables 11.2-8 and 11.3-4 of the SSAR should be revised based on 1% FF and annual average effluent concentrations of radionuclides in unrestricted areas.
- 460.22 The waste gas processing system failure analysis is not based on applicable BTP assumptions. The system should be reanalyzed in accordance with the assumptions of BTP ETSB 11-5.
- 460.23 Provide an item-by-item demonstration of compliance with the guidelines of RG 1.140 for the containment filtration system.
- 460.24 The dilution flow for the liquid waste discharge appears to be very low. Reevaluate the dilution flow for diluting liquid radwaste discharge concentrations and revise, as appropriate. Justify your response.
- 460.25 The GALE code should be rerun with the revised inputs for liquid waste processing and waste gas processing. The GALE output should be checked for secondary concentrations of iodines and other isotopes.
- 460.26 Table 11.1-8 of the SSAR should have an entry for N-16 primary coolant activity. Revise the table accordingly.