



Westinghouse Electric Company
Nuclear Power Plants
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Pittsburgh, Pennsylvania 15230-0355
USA

U.S. Nuclear Regulatory Commission
ATTENTION: Document Control Desk
Washington, D.C. 20555

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Your ref: Docket No. 52-006
Our ref: DCP_NRC_002759

January 29, 2010

Subject: Submittal of Proprietary and Non-Proprietary Technical Document Information,
Response to Request for Additional Information (RAI) on SRP Section 6.2.2

Westinghouse is submitting responses to the NRC request for additional information (RAI) on SRP Section 6.2.2. These RAI responses are submitted in support of the AP1000 Design Certification Amendment Application (Docket No. 52-006). The information included in the response is generic and is expected to apply to all COL applications referencing the AP1000 Design Certification and the AP1000 Design Certification Amendment Application.

The responses are provided herein for:

RAI-SRP6.2.2-SPCV-26
RAI-SRP6.2.2-SRSB-34

RAI-SRP6.2.2-SRSB-40
RAI-SRP6.2.2-SRSB-41

RAI-SRP6.2.2-CIB1-26
RAI-SRP6.2.2-CIB1-27

Pursuant to 10 CFR 50.30(b), proprietary and non-proprietary versions of the response to the request for additional information on SRP Section 6.2.2 are submitted as Enclosures 3 through 12. Also enclosed is one copy of the Application for Withholding, AW-10-2737 (non-proprietary) with Proprietary Information Notice, and one copy of the associated Affidavit (non-proprietary).

This submittal contains proprietary information of Westinghouse Electric Company, LLC. In conformance with the requirements of 10 CFR Section 2.390, as amended, of the Commission's regulations, we are enclosing with this submittal an Application for Withholding from Public Disclosure and an affidavit. The affidavit sets forth the basis on which the information identified as proprietary may be withheld from public disclosure by the Commission.

Correspondence with respect to the affidavit or Application for Withholding should reference AW-10-2737 and should be addressed to James A. Gresham, Manager, Regulatory Compliance and Plant Licensing, Westinghouse Electric Company, LLC, P. O. Box 355, Pittsburgh, Pennsylvania 15230-0355.

DO63
NRO

Questions or requests for additional information related to the content and preparation of this response should be directed to Westinghouse. Please send copies of such questions or requests to the prospective applicants for combined licenses referencing the AP1000 Design Certification. A representative for each applicant is included on the cc: list of this letter.

Very truly yours,



Robert Sisk, Manager
Licensing and Customer Interface
Regulatory Affairs and Standardization

/Enclosures

1. AW-10-2737 "Application for Withholding Proprietary Information from Disclosure," dated January 29, 2010
2. AW-10-2737, Affidavit, Proprietary Information Notice, Copyright Notice dated January 29, 2010
3. Response to Request for Additional Information on SRP Section 6.2.2, RAI-SRP6.2.2-SPCV-26 (Proprietary)
4. Response to Request for Additional Information on SRP Section 6.2.2, RAI-SRP6.2.2-SPCV-26 (Non-Proprietary)
5. Response to Request for Additional Information on SRP Section 6.2.2, RAI-SRP6.2.2-SRSB-34 (Proprietary)
6. Response to Request for Additional Information on SRP Section 6.2.2, RAI-SRP6.2.2-SRSB-34 (Non-Proprietary)
7. Response to Request for Additional Information on SRP Section 6.2.2, RAI-SRP6.2.2-SRSB-40 (Proprietary)
8. Response to Request for Additional Information on SRP Section 6.2.2, RAI-SRP6.2.2-SRSB-40 (Non-Proprietary)
9. Response to Request for Additional Information on SRP Section 6.2.2, RAI-SRP6.2.2-SRSB-41 (Proprietary)
10. Response to Request for Additional Information on SRP Section 6.2.2, RAI-SRP6.2.2-SRSB-41 (Non-Proprietary)
11. Response to Request for Additional Information on SRP Section 6.2.2, RAI-SRP6.2.2-CIB1-26 (Proprietary)
12. Response to Request for Additional Information on SRP Section 6.2.2, RAI-SRP6.2.2-CIB1-26 (Non-Proprietary)
13. Response to Request for Additional Information on SRP Section 6.2.2, RAI-SRP6.2.2-CIB1-27 (Proprietary)
14. Response to Request for Additional Information on SRP Section 6.2.2, RAI-SRP6.2.2-CIB1-27 (Non-Proprietary)

cc:	D. Jaffe	- U.S. NRC	14E
	E. McKenna	- U.S. NRC	14E
	P. Donnelly	- U.S. NRC	14E
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	A. Monroe	- SCANA	14E
	P. Jacobs	- Florida Power & Light	14E
	C. Pierce	- Southern Company	14E
	E. Schmiech	- Westinghouse	14E
	G. Zinke	- NuStart/Entergy	14E
	R. Grumbir	- NuStart	14E
	D. Lindgren	- Westinghouse	14E

ENCLOSURE 1

AW-10-2737

APPLICATION FOR WITHHOLDING
PROPRIETARY INFORMATION FROM DISCLOSURE



Westinghouse Electric Company
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P.O. Box 355
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USA

U.S. Nuclear Regulatory Commission
ATTENTION: Document Control Desk
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Your ref: Docket Number 52-006
Our ref: AW-10-2737

January 29, 2010

APPLICATION FOR WITHHOLDING PROPRIETARY
INFORMATION FROM PUBLIC DISCLOSURE

Subject: Submittal of Proprietary and Non-Proprietary Technical Document Information,
Response to Request for Additional Information (RAI) on SRP Section 6.2.2

The Application for Withholding is submitted by Westinghouse Electric Company, LLC (Westinghouse), pursuant to the provisions of Paragraph (b) (1) of Section 2.390 of the Commission's regulations. It contains commercial strategic information proprietary to Westinghouse and customarily held in confidence.

The proprietary material for which withholding is being requested is identified in the proprietary version of the subject RAI response. In conformance with 10 CFR Section 2.390, Affidavit AW-10-2737 accompanies this Application for Withholding, setting forth the basis on which the identified proprietary information may be withheld from public disclosure.

Accordingly, it is respectfully requested that the subject information which is proprietary to Westinghouse be withheld from public disclosure in accordance with 10 CFR Section 2.390 of the Commission's regulations.

Correspondence with respect to this Application for Withholding or the accompanying affidavit should reference AW-10-2737 and should be addressed to James A. Gresham, Manager, Regulatory Compliance and Plant Licensing, Westinghouse Electric Company, LLC, P.O. Box 355, Pittsburgh, Pennsylvania, 15230-0355.

Very truly yours,

A handwritten signature in black ink, appearing to read "James W. Winters".

James W. Winters, Manager
Standardization

cc: G. Bacuta - U.S. NRC

ENCLOSURE 2

Affidavit

AFFIDAVIT

COMMONWEALTH OF PENNSYLVANIA:

SS

COUNTY OF ALLEGHENY:

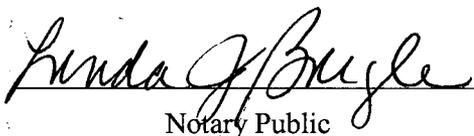
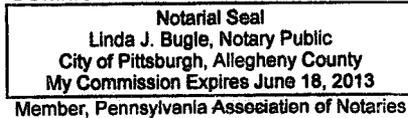
Before me, the undersigned authority, personally appeared James Winters, who, being by me duly sworn according to law, deposes and says that he is authorized to execute this Affidavit on behalf of Westinghouse Electric Company LLC (Westinghouse), and that the averments of fact set forth in this Affidavit are true and correct to the best of his knowledge, information, and belief:



James W. Winters, Manager
Standardization

Sworn to and subscribed
before me this 29th day
of January 2010.

COMMONWEALTH OF PENNSYLVANIA



Notary Public

- (1) I am Manager, Standardization, Westinghouse Electric Company, LLC (Westinghouse), and as such, I have been specifically delegated the function of reviewing the proprietary information sought to be withheld from public disclosure in connection with nuclear power plant licensing and rule making proceedings, and am authorized to apply for its withholding on behalf of Westinghouse.
- (2) I am making this Affidavit in conformance with the provisions of 10 CFR Section 2.390 of the Commission's regulations and in conjunction with the Westinghouse "Application for Withholding" accompanying this Affidavit.
- (3) I have personal knowledge of the criteria and procedures utilized by Westinghouse in designating information as a trade secret, privileged or as confidential commercial or financial information.
- (4) Pursuant to the provisions of paragraph (b)(4) of Section 2.390 of the Commission's regulations, the following is furnished for consideration by the Commission in determining whether the information sought to be withheld from public disclosure should be withheld.
 - (i) The information sought to be withheld from public disclosure is owned and has been held in confidence by Westinghouse.
 - (ii) The information is of a type customarily held in confidence by Westinghouse and not customarily disclosed to the public. Westinghouse has a rational basis for determining the types of information customarily held in confidence by it and, in that connection, utilizes a system to determine when and whether to hold certain types of information in confidence. The application of that system and the substance of that system constitutes Westinghouse policy and provides the rational basis required.

Under that system, information is held in confidence if it falls in one or more of several types, the release of which might result in the loss of an existing or potential competitive advantage, as follows:

 - (a) The information reveals the distinguishing aspects of a process (or component, structure, tool, method, etc.) where prevention of its use by any of Westinghouse's competitors without license from Westinghouse constitutes a competitive economic advantage over other companies.

- (b) It consists of supporting data, including test data, relative to a process (or component, structure, tool, method, etc.), the application of which data secures a competitive economic advantage, e.g., by optimization or improved marketability.
- (c) Its use by a competitor would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing a similar product.
- (d) It reveals cost or price information, production capacities, budget levels, or commercial strategies of Westinghouse, its customers or suppliers.
- (e) It reveals aspects of past, present, or future Westinghouse or customer funded development plans and programs of potential commercial value to Westinghouse.
- (f) It contains patentable ideas, for which patent protection may be desirable.

There are sound policy reasons behind the Westinghouse system which include the following:

- (a) The use of such information by Westinghouse gives Westinghouse a competitive advantage over its competitors. It is, therefore, withheld from disclosure to protect the Westinghouse competitive position.
- (b) It is information that is marketable in many ways. The extent to which such information is available to competitors diminishes the Westinghouse ability to sell products and services involving the use of the information.
- (c) Use by our competitor would put Westinghouse at a competitive disadvantage by reducing his expenditure of resources at our expense.
- (d) Each component of proprietary information pertinent to a particular competitive advantage is potentially as valuable as the total competitive advantage. If competitors acquire components of proprietary information, any one component

may be the key to the entire puzzle, thereby depriving Westinghouse of a competitive advantage.

- (e) Unrestricted disclosure would jeopardize the position of prominence of Westinghouse in the world market, and thereby give a market advantage to the competition of those countries.
 - (f) The Westinghouse capacity to invest corporate assets in research and development depends upon the success in obtaining and maintaining a competitive advantage.
- (iii) The information is being transmitted to the Commission in confidence and, under the provisions of 10 CFR Section 2.390, it is to be received in confidence by the Commission.
- (iv) The information sought to be protected is not available in public sources or available information has not been previously employed in the same original manner or method to the best of our knowledge and belief.
- (v) The proprietary information sought to be withheld in this submittal is that which is appropriately marked in RAI-SRP6.2.2-SPCV-26, RAI-SRP6.2.2-SRSB-34, RAI-SRP6.2.2-SRSB-40, RAI-SRP6.2.2-SRSB-41, RAI-SRP6.2.2-CIB1-26, RAI-SRP6.2.2-CIB1-27 in support of the AP1000 Design Certification Amendment Application, being transmitted by Westinghouse letter (DCP_NRC_002759) and Application for Withholding Proprietary Information from Public Disclosure, to the Document Control Desk. The proprietary information as submitted by Westinghouse for the AP1000 Design Certification Amendment application is expected to be applicable in all licensee submittals referencing the AP1000 Design Certification and the AP1000 Design Certification Amendment Application in response to certain NRC requirements for justification of compliance of the safety system to regulations.

This information is part of that which will enable Westinghouse to:

- (a) Manufacture and deliver products to utilities based on proprietary designs.

- (b) Advance the AP1000 Design and reduce the licensing risk for the application of the AP1000 Design Certification
- (c) Determine compliance with regulations and standards
- (d) Establish design requirements and specifications for the system.

Further this information has substantial commercial value as follows:

- (a) Westinghouse plans to sell the use of similar information to its customers for purposes of plant construction and operation.
- (b) Westinghouse can sell support and defense of safety systems based on the technology in the reports.
- (c) The information requested to be withheld reveals the distinguishing aspects of an approach and schedule which was developed by Westinghouse.

Public disclosure of this proprietary information is likely to cause substantial harm to the competitive position of Westinghouse because it would enhance the ability of competitors to provide similar digital technology safety systems and licensing defense services for commercial power reactors without commensurate expenses. Also, public disclosure of the information would enable others to use the information to meet NRC requirements for licensing documentation without purchasing the right to use the information.

The development of the technology described in part by the information is the result of applying the results of many years of experience in an intensive Westinghouse effort and the expenditure of a considerable sum of money.

In order for competitors of Westinghouse to duplicate this information, similar technical programs would have to be performed and a significant manpower effort, having the requisite talent and experience, would have to be expended.

Further the deponent sayeth not.

PROPRIETARY INFORMATION NOTICE

Transmitted herewith are proprietary and/or non-proprietary versions of documents furnished to the NRC in connection with requests for generic and/or plant-specific review and approval.

In order to conform to the requirements of 10 CFR 2.390 of the Commission's regulations concerning the protection of proprietary information so submitted to the NRC, the information which is proprietary in the proprietary versions is contained within brackets, and where the proprietary information has been deleted in the non-proprietary versions, only the brackets remain (the information that was contained within the brackets in the proprietary versions having been deleted). The justification for claiming the information so designated as proprietary is indicated in both versions by means of lower case letters (a) through (f) located as a superscript immediately following the brackets enclosing each item of information being identified as proprietary or in the margin opposite such information. These lower case letters refer to the types of information Westinghouse customarily holds in confidence identified in Sections (4)(ii)(a) through (4)(ii)(f) of the affidavit accompanying this transmittal pursuant to 10 CFR 2.390(b)(1).

COPYRIGHT NOTICE

The reports transmitted herewith each bear a Westinghouse copyright notice. The NRC is permitted to make the number of copies of the information contained in these reports which are necessary for its internal use in connection with generic and plant-specific reviews and approvals as well as the issuance, denial, amendment, transfer, renewal, modification, suspension, revocation, or violation of a license, permit, order, or regulation subject to the requirements of 10 CFR 2.390 regarding restrictions on public disclosure to the extent such information has been identified as proprietary by Westinghouse, copyright protection notwithstanding. With respect to the non-proprietary versions of these reports, the NRC is permitted to make the number of copies beyond those necessary for its internal use which are necessary in order to have one copy available for public viewing in the appropriate docket files in the public document room in Washington, DC and in local public document rooms as may be required by NRC regulations if the number of copies submitted is insufficient for this purpose. Copies made by the NRC must include the copyright notice in all instances and the proprietary notice if the original was identified as proprietary.

ENCLOSURE 4

Response to Request for Additional Information on SRP Section 6.2.2

RAI-SRP6.2.2-SPCV-26 (Non-Proprietary)

WESTINGHOUSE NON-PROPRIETARY CLASS 3

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-SRP 6.2.2-SPCV-26
Revision: 0

Question:

Screen Head Loss

- a) The DCD states that the limiting head loss for the containment recirculation and IRWST screens is .25 psi at a maximum flow of 242 gpm, which is the flow rate from Case 10 of APP-PSX-GLR-001. The screen head loss modeled in Case 10 is zero, so please explain how Case 10 can be used to justify a screen head loss greater than zero.
- b) WCAP-16914 states that pressure drop is calculated from the resistances used in APP-PXS-GLR-001 as a function of velocity squared. It is not obvious how this was done for any of the tests, so please provide details of this calculation that relate the pressure drop to a specific APP-PXS-GLR-001 case resistance.
- c) WCAP-16914 Section 5.2 calculates the minimum IRWST flow using the core flow and ADS#4 water quality from sensitivity cases run in APP-PXS-GLR-001. Explain why this approach is more appropriate or conservative than using the flows reported for PSX A and B lines to represent the containment recirculation and IRWST flows.

Westinghouse Response:

- a) The following changes are offered to clarify the description of the design flow and allowable head losses of the AP1000 containment recirculation and IRWST screens.

Change the minimum screen flows to flows consistent with the long-term cooling analysis Case 3 from APP-PSX-GLR-001. This case is being used for the design of the screens because head loss across the screens was assumed in the analysis. Note that Case 10 is still bounding for the core DP because it maximizes the fiber that transports to the core; since so much of the fiber in the containment transports to the core (90%) there will not be enough to form a bed on the screens and therefore the screens will have no DP in this case. There are other situations where more debris can transport to the screen (and less to the core) and Case 3 is used to bound those cases.

For the containment recirculation (CR) screens, [

] ^{a,c}

WESTINGHOUSE NON-PROPRIETARY CLASS 3

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

The CR screen head loss modeled in Case 3 is 14 inches of water head loss at a flow of 77 lb/sec. In the analysis for Case 3 the actual CR screen flow is 56 lb/sec because the added resistance reduces the flow. The mass flow results in [

] ^{a,c}

For the IRWST screens, change the minimum flow to 310 gpm. [

] ^{a,c}

The screen head loss modeled in Case 3 is 14 inches of water head loss at a flow of 75 lb/sec. In the analysis for Case 3 the actual IRWST screen flow is 55 lb/sec because the added resistance reduces the flow. [

] ^{a,c}

For the maximum screen flows [

] ^{a,c}

This change will impact the DCD but that change is addressed in RAI-SRP6.2.2-SPCV-28. In addition, the reports for the screen debris tests and TR26 will be impacted. The main impact on the screen test WCAP will be on Section 5.2 and Table 5-2. The revised Table 5-2 is shown below. As shown in this table, the conditions tested bound the increased flow rates and as a result no additional testing is required.

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AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

**Table 5-2 (in WCAP-16914)
AP1000CR vs IRWST Screen Debris Loadings**

The paragraphs following this table will be revised based on the discussion preceding this table. In addition a note will be added to this table stating that the IRWST minimum flow loading is based on reverse flow through one of the IRWST screens.

- b) The response to item a) addresses this question.
- c) With the changes made to the IRWST screen cross connections as well as to the squib valve operability while submerged, the only flow through the IRWST screens will be the steam condensate return from the containment.

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AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

Design Control Document (DCD) Revision:

None

PRA Revision:

None

Technical Report (TR) Revision:

1. WCAP-16914, screen debris test report will be revised based on the response to item a).
2. APP-GW-GLR-079 (TR-26), the AP1000 GSI-191 summary report will be revised based on the response to item a)

ENCLOSURE 6

Response to Request for Additional Information on SRP Section 6.2.2

RAI- RAI-SRP6.2.2-SRSB-34 (Non-Proprietary)

WESTINGHOUSE NON-PROPRIETARY CLASS 3

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-SRP6.2.2-SRSB-34
Revision: 0

Question:

RAI-SRP 6.2.2-SRSB-34: WCAP-17028-P, Rev. 3

A Performance Pro Cascade ¾ HP pump draws water out of the bottom of the mixing tank. There are a number of cycles that occur through the pump before maximum pressure across the core occurs. Does the debris change shape and become smaller as it flows through the pump? If so, explain how is this accounted for in determining length and size of the debris? The different compositions for the testing were created based on expectations of plant latent debris conditions. The pump impeller could change this expected debris composition to some other composition that may not represent the plant's latent debris composition. Provide justification that the pump does not change the conclusion of the testing composition and if it does, that the new composition is representative of the plant's latent debris composition.

Westinghouse Response:

Six types of fiber (Types A through F) were used for the fuel assembly (FA) head loss testing. As discussed in Section 6.2 of WCAP-17028-P, Rev. 3, all fiber types used in the FA tests are applicable to AP1000. [

]^{a,c} An evaluation of the pump in the test loop is not needed since all fiber types passed through the same pump and any effect that the pump could have on the fibers would have occurred to all fiber types used for the FA testing. [

]^{a,c}

Design Control Document (DCD) Revision:

None

PRA Revision:

None



WESTINGHOUSE NON-PROPRIETARY CLASS 3

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

Technical Report (TR) Revision:

WCAP-17028 will be revised to include the above discussion.

ENCLOSURE 8

Response to Request for Additional Information on SRP Section 6.2.2

RAI-SRP6.2.2-SRSB-40 (Non-Proprietary)

WESTINGHOUSE NON-PROPRIETARY CLASS 3

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-SRP 6.2.2-SRSB-40
Revision: 0

Question:

In the "Minimum Time To Transport Debris To Core" section (pp 18-20), Westinghouse demonstrates it takes more than 10 hours to flow the whole containment water mass through the core based on the long-term cooling sensitivity analysis results.

- a) It states that the flow rate at the time all the fiber / particle debris is transported is based on the sensitivity case 10 of the LTC analysis. However, Figure 2 shows this time to be about 9.6 hours which appears to be inconsistent with the 8.67 hours assumed in the LTC sensitivity case 10. Explain the inconsistency.
- b) In Figure 2, the flow rates through the break and the PXS appear to be obtained from linear interpolation between 2.3 hours and 9.6 hours. What is the basis for the straight line interpolation and is this assumption conservative or non-conservative?

Westinghouse Response:

- a) There is no discrepancy; the aim of the "Minimum Time To Transport Debris To Core" section was to demonstrate that the choice of 8.6 hours for the LTC sensitivity Case 10 was a conservative time for having the maximum core inlet resistance due to the presence of a debris bed. Since the time in Figure 2 (9.6 hours) is greater than that used in the LTC analysis (8.6 hours) the time used in the analysis is conservative resulting in a higher decay heat level.
- b) The original approach to determining when the peak core DP might occur following a LOCA due to debris accumulation was based on an assumption that it would not occur before all of the particles and fibers had been transported to the core. This approach employed conservative assumptions, such as assuming that it would require the flow of the whole containment volume through the RCS one time in order to transport the particles and fibers. Figure 2 and Figure 3 and the words associated with them discuss the results of this analysis.

Now that many concurrent debris addition tests have been conducted, the test results show that the DP occurs even later than this evaluation of debris transport. Thus, this section of TR 26 will be modified to use the test results as the basis for the time (8.67 hours) assumed in the LTC analysis cases. Figure 2 and Figure 3 will be deleted and a table will be included, as discussed in the following paragraph.

WESTINGHOUSE NON-PROPRIETARY CLASS 3

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

The aim of the section is to demonstrate that the time of 8.6 hours assumed in the LTC sensitivity case 10 is conservative. The test results obtained by the concurrent addition tests (CIBAP22 and CIBAP24 through CIBAP30) show that the peak DP will occur at a much longer time after the LOCA, as reported in the table below. The table shows, for each of the concurrent debris addition tests, the time when the peak DP occurred in terms of hours after the first debris addition, the quantity of chemicals added before the occurrence of the Peak DP and the corresponding time scaled to the Plant. In each of the above tests, the fibers and the particles were added in 7 hours, while the additions of chemicals was based on the production rate expected for the plant. The addition rate of the fibers and particles is considered consistent with respect to what the plant is expected to experience.

Because the tests were intended to explore the effect of the debris transport to the core over a period of 30 days after the LOCA, during the second part of the test the trend of chemicals production was accelerated (at this point all the fibers and particulate debris were already added). In all the tests, the peak DP occurred during this "accelerated" chemical addition part of the test and the last column of the table lists the time when the peak would occur in the plant after the LOCA on the basis of the quantity of chemicals added before the occurrence of the Peak DP. That quantity of chemicals in the test was compared to the post-accident chemical effects evaluation performed for the AP1000. The post-accident chemical effects are also summarized in TR26. Note as, even if the fibers and particles were added several hours faster, the earliest peak would remain well over the time of 8.6 hours used in the LTC analysis.

Table 1: Summary of Peak DP in Concurrent Debris Addition Fuel Assembly Head Loss Tests

	a,c
--	-----

WESTINGHOUSE NON-PROPRIETARY CLASS 3

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

A new discussion will accompany this table in TR26 to explain that the experimental results show that the peak DP occurs at a Plant post-LOCA time greater than the 8.6 hours assumed in the WCOBRA/TRAC LTC sensitivity Case 10. And therefore the 8.6 hours assumed for Case 10 is bounding.

Design Control Document (DCD) Revision:

None

PRA Revision:

None

Technical Report (TR) Revision:

APP-GW-GLR-079 (TR 26) will be revised to include a summary of AP1000 approach to GSI-191, as discussed above.

APP-PXS-GLR-001, long-term cooling thermal hydraulic sensitivity analysis: minor word changes will be made to the next revision.

ENCLOSURE 10

Response to Request for Additional Information on SRP Section 6.2.2

RAI-SRP6.2.2-SRSB-41 (Non-Proprietary)

WESTINGHOUSE NON-PROPRIETARY CLASS 3

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-SRP6.2.2-SRSB-41
Revision: 0

Question:

RAI-SRP 6.2.2-SRSB-41: APP-GW-GLR-079 (TR 26):

In the "Debris Split (Break vs PXS)" section on page 16, Westinghouse presents an example to illustrate the determination of the flow split with a DVI LOCA in the loop compartment.

a) It is indicated in Table 3 that DVI-A is the broken DVI line, which is inconsistent with the LTC sensitivity analysis in APP-PXS-GLR-001, where DVI-A and DVI-B are designated as the intact and broken DVI lines, respectively. Explain this difference and inconsistency.

b) It is stated that [

Table 3, it is not apparent that at []^{a,c} of the total cumulative DVI flow goes through the break. Explain how the statement that []^{a,c} is derived from Table 3.

c) Table 3 was presented for the DVI break. Since the DECL break is the design bases break for debris in the reactor, provide a flow split table for this break or justify why it is not needed.

Westinghouse Response:

a. This is an error in the labeling of Table 3 in TR26. The broken DVI line is indeed DVI-B. However this table will be replaced by a flow split table for a DECL LOCA. Please refer to response for part 'c'.

b. The original intent of the discussion was not clearly stated. The phrase, []^{a,c} was not correct and will be deleted.

c. The DEDVI LOCA flow split table (Table 3 in TR26) will be replaced with a table based on a DECL LOCA. A copy of the table is included here for reference. A discussion of this new table will be added to TR26.

WESTINGHOUSE NON-PROPRIETARY CLASS 3

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

Table: DECLG Break Flow Split Calculation

[

a,c

]

[

] ^{a,c} This calculation demonstrates that assuming that 90% of the debris enters the reactor vessel through the broken cold leg (unscreened) is conservative for determining the quantity of debris available to form a debris bed in the fuel assemblies.

The preceding paragraph discusses the conclusions of the new table. However a revised introduction will be added to TR26 before the table. That introduction will explain that the objective of creating this DECL LOCA flow split table was to maximize the flow into the reactor vessel through the broken cold leg. A WCOBRA/TRAC LTC analysis was performed for this scenario in a window mode at the beginning of recirculation. The start of recirculation was obtained from a WGOthic calculation (which calculated

WESTINGHOUSE NON-PROPRIETARY CLASS 3

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

14,355 seconds into the transient) and conservatively assumed to be 14,000 seconds for WCOBRA/TRAC.

As discussed in the response to RAI-SRP6.2.2-SRSB-32, the WCOBRA/TRAC inputs were conservatively selected in order to maximize the flow into the vessel from the break. The assumptions are not conservative for core cooling. The flows from this WCOBRA/TRAC case are 445 lbm/sec through the broken cold leg and 86 lbm/sec through the PXS.

[

] ^{a,c}

The objective of the table is to depict this 90% flow split for purposes of assuming that 90% of the fiber enters the core. This assumption of fiber quantity is then used in conjunction with other conservative assumptions for screen head loss testing and fuel assembly head loss testing.

Design Control Document (DCD) Revision:

None

PRA Revision:

None

Technical Report (TR) Revision:

APP-GW-GLR-079 (TR26) will be revised in accordance with above discussion.

ENCLOSURE 12

Response to Request for Additional Information on SRP Section 6.2.2

RAI-SRP6.2.2-CIB1-26 (Non-Proprietary)

WESTINGHOUSE NON-PROPRIETARY CLASS 3

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-SRP6.2.2-CIB1-26
Revision: 0

Question:

[]^{a,c}

Showing that this approach is conservative appears to depend on the validity of the method for measuring the amount of chemical precipitates in the water samples. Please discuss this test procedure in more detail, including the following:

- a) How was the test procedure validated?
- b) How does the test ensure that solids other than chemical precipitates were not present in the samples?
- c) How does the test ensure that no aluminum is carried out of the solution during boiling?
- d) How does the test account for dissolved aluminum in the sample? [

- e) []^{a,c}, it seems the concentration of chemical precipitates in a sample of the circulating water would depend on the time and location of the sample. How is this addressed in the water sampling protocol for this termination criterion?
- f) How was the "±0.06 gm tolerance" for the equipment determined? (page 7-40)

Westinghouse Response:

a) The test procedure was validated by preparing an AIOOH solution with a known concentration and performing a boiling test on the known concentration. The goal was to show that the measured amount of solids will equal the total mass of solids used to prepare the solution. Prior to conducting the boiling test on the solution, a boiling test was first conducted on a clean water sample used to prepare the solution. The data from the test is shown below:

[]^{a,c}

WESTINGHOUSE NON-PROPRIETARY CLASS 3

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

Thus, as could be seen from the data, []^{a,c} of residual solids were measured in the water used to prepare the solution of known concentration. This mass will be accounted for in later calculations used for the solution.



Thus, in total []^{a,c} of water need to be accounted for in the calculation. The mass of water contained in $\text{Al}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$ is accounted for first. Using the periodic table, the mass of each element is listed below (Silberberg, 2000):

WESTINGHOUSE NON-PROPRIETARY CLASS 3

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

Hydrogen (H)	1.008 g/mol
Nitrogen (N)	14.01 g/mol
Oxygen (O)	16.00 g/mol
Sodium (Na)	22.89 g/mol
Aluminum (Al)	26.98 g/mol

The corresponding molecular masses are:

[Empty rectangular box for molecular masses]

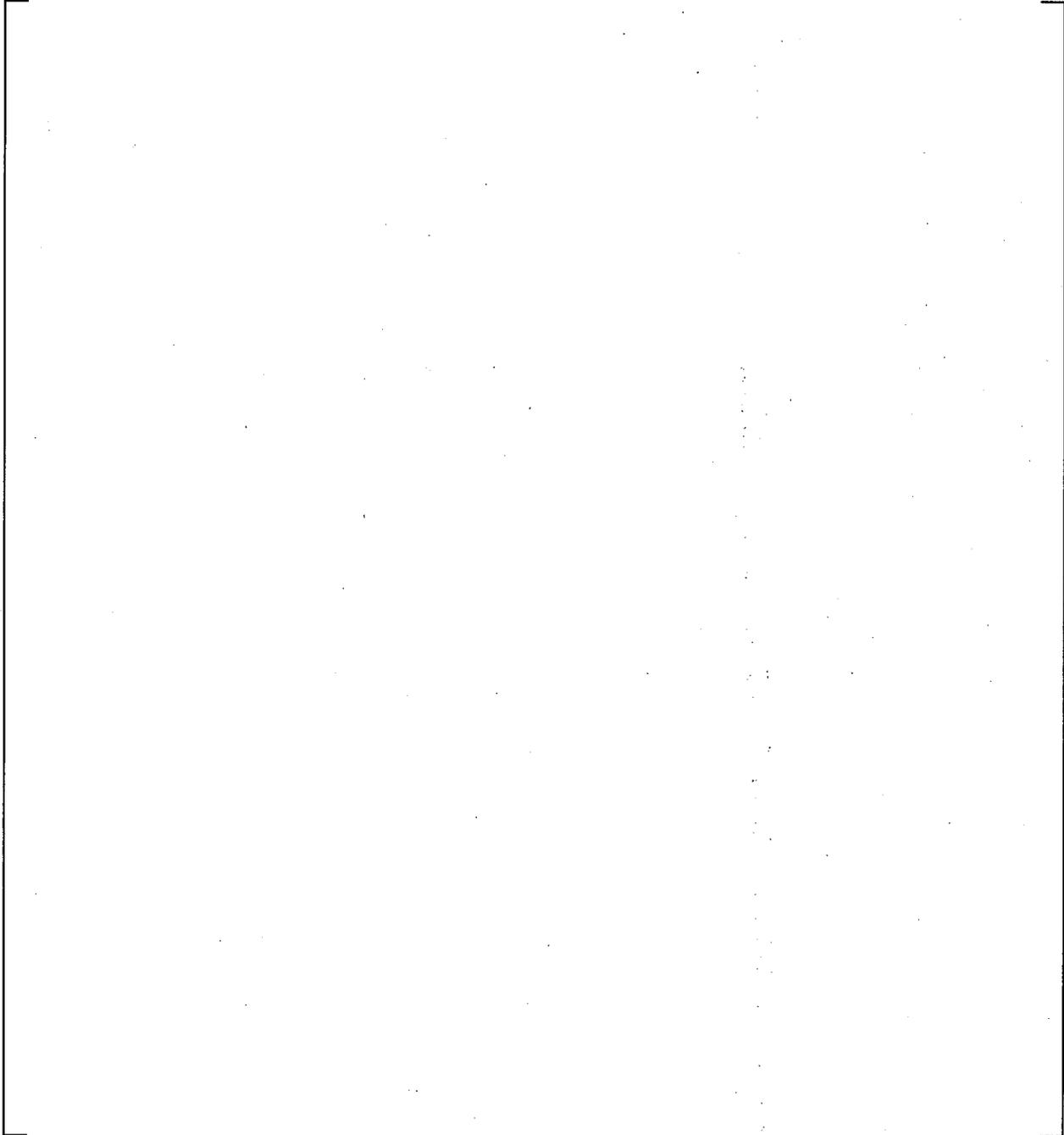
a,c

WESTINGHOUSE NON-PROPRIETARY CLASS 3

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

a,c



WESTINGHOUSE NON-PROPRIETARY CLASS 3

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)



b) [

]a,c

c) [

]a,c

WESTINGHOUSE NON-PROPRIETARY CLASS 3

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

d) [

]a,c

e) The time and location were taken into account when extracting samples from the flume during each test. The location of each sample extraction is shown below in the two figures.
[

]a,c

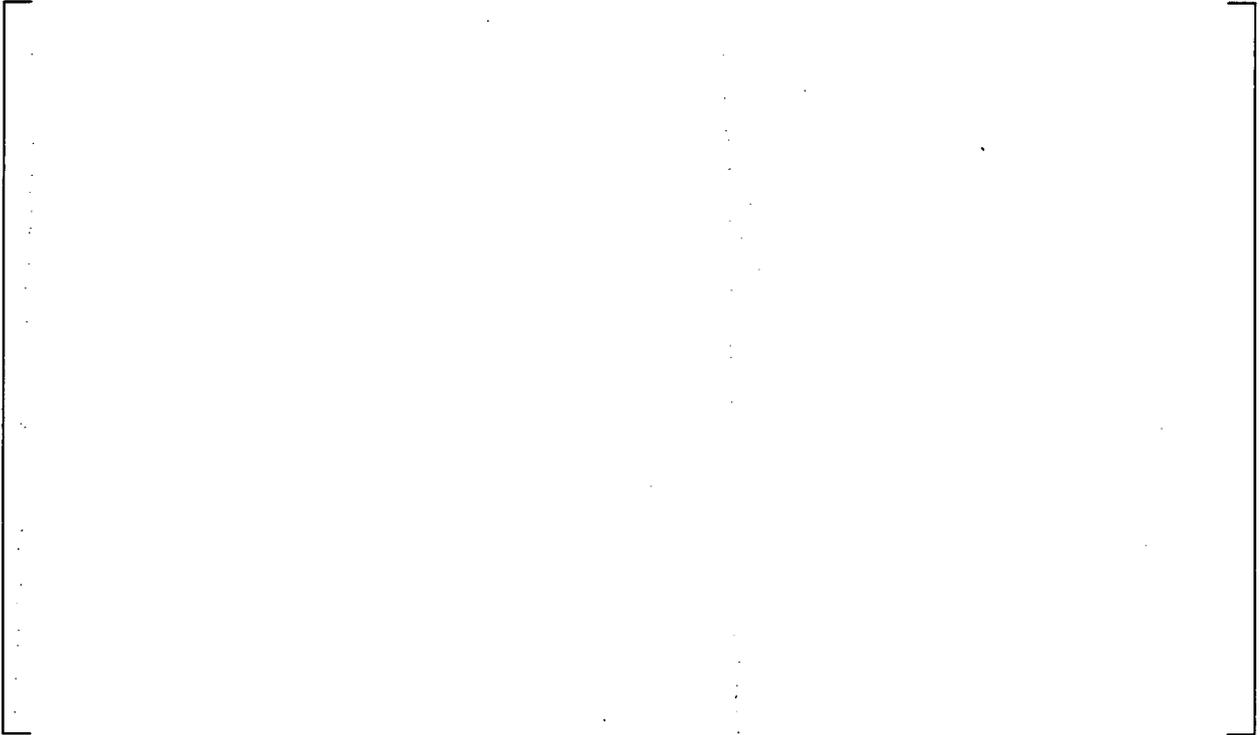
The time of sample collection was also considered by providing a significant amount of time after each debris addition prior to a sample being collected. [

]a,c

WESTINGHOUSE NON-PROPRIETARY CLASS 3

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)



WESTINGHOUSE NON-PROPRIETARY CLASS 3

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)



a.c

WESTINGHOUSE NON-PROPRIETARY CLASS 3

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

f) The uncertainty was partially addressed in the report and the discussion is expanded in this document. The following wording was extracted from the report. "The large uncertainty was considered based on the sensitivity of the equipment, which was observed to measure the data with a ± 0.06 gm tolerance. [

] ^{a,c}."

The uncertainty of ± 0.06 grams was determined based on the extensive use of the scale by the experimenter. [

] ^{a,c}

Design Control Document (DCD) Revision:

None

PRA Revision:

None

Technical Report (TR) Revision:

None

WESTINGHOUSE NON-PROPRIETARY CLASS 3

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

Reference:

Silberberg, M.S. (2000). "Chemistry: The Molecular Nature of Matter and Change." Second Edition. McGraw Hill. Boston, MA.



WESTINGHOUSE NON-PROPRIETARY CLASS 3

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

Attachment:

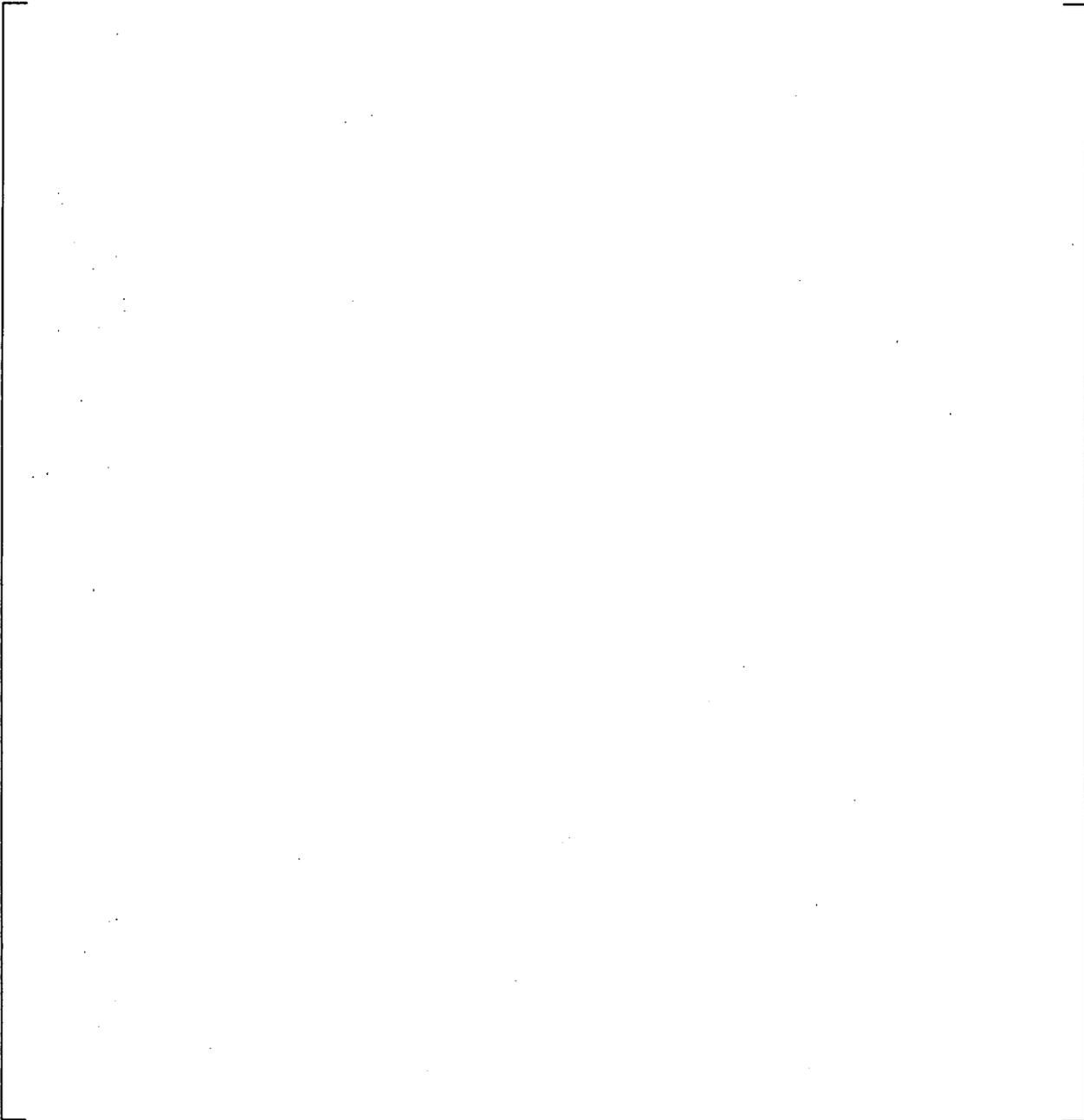
Dissolved aluminum data.

WESTINGHOUSE NON-PROPRIETARY CLASS 3

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

a,c



ENCLOSURE 14

Response to Request for Additional Information on SRP Section 6.2.2

RAI-SRP6.2.2-CIB1-27 (Non-Proprietary)

WESTINGHOUSE NON-PROPRIETARY CLASS 3

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-SRP6.2.2-CIB1-27
Revision: 0

Question:

Please provide the following information about the concentration of AIOOH in water samples for WCAP-16914:

- a) The calculated concentration of AIOOH for each sample. (Comparable to Table 8-1 in WCAP-17028.)
- b) Results for any samples processed that were not reported in WCAP-16914
- c) A description of how you determined the tolerances reported for the final AIOOH ppm concentrations from tests WE213-4W and WE213-5W.
- d) Confirm of the calculated values for the Final Sample column of Table 7-6, as the staff was unable to reproduce these results
- e) An explanation of the following apparent discrepancies in the information about test WE213-2W in WCAP-16914:

[]^{a,c}

Westinghouse Response:

- a) The final concentrations of AIOOH for each test (total mass of AIOOH added per each test in ppm) are included below just like in Table 8-1 of WCAP-17028. The data presented below is an expansion of Table 7-2 of WCAP-16914. [

] ^{a,c}

WESTINGHOUSE NON-PROPRIETARY CLASS 3

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)



a,c

d) Please refer to response c) for an answer to the posted questions, since it was addressed as part of response c).

e) The total chemical debris intended for test WE213-2W was []^{a,c}, thus the value listed in Table 6-1 is a typographical error and should be corrected. Based on the new value of []^{a,c}, the percentage of AlOOH added during the test was []^{a,c} and this value should also be updated.

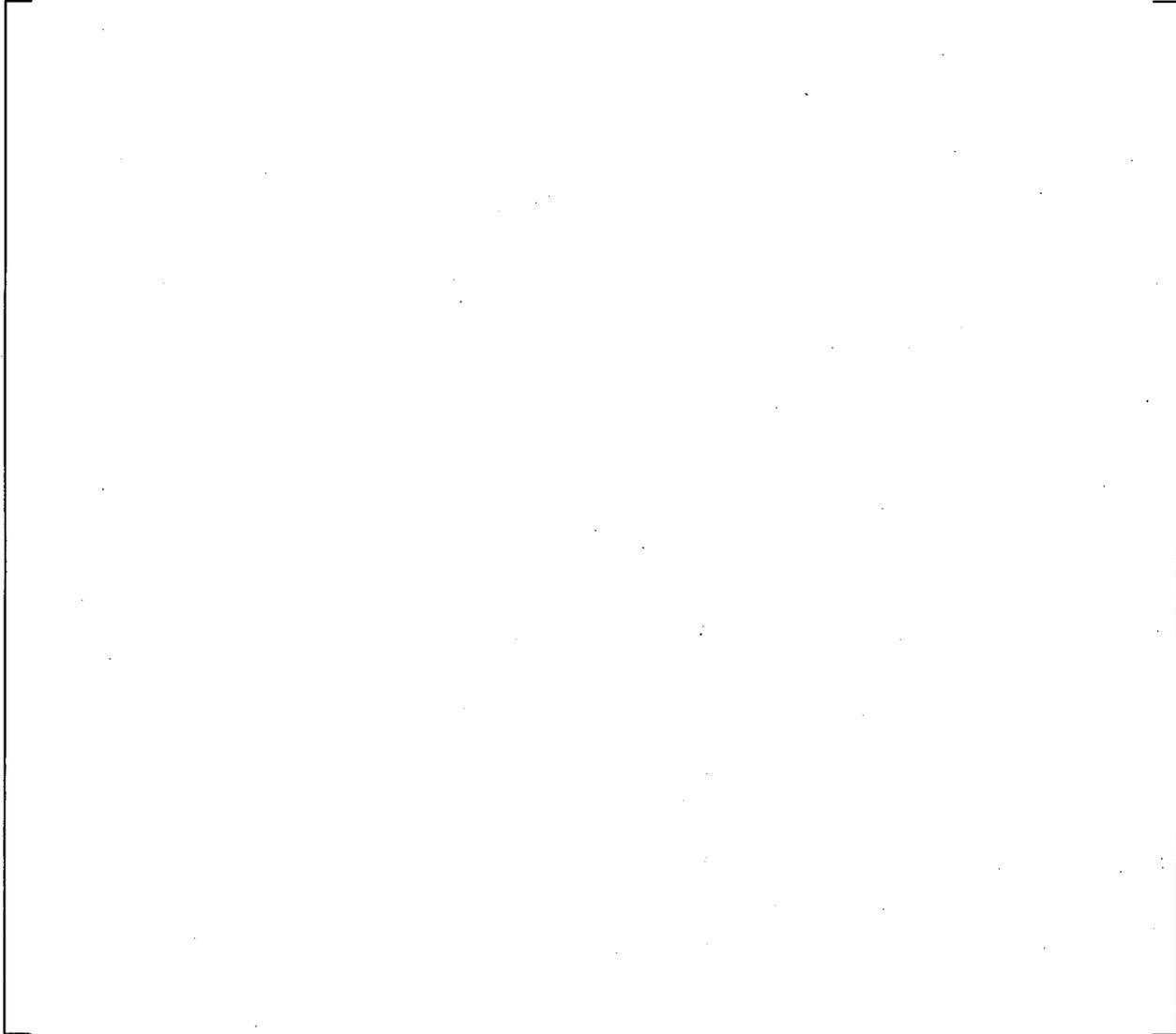
In terms of the ppm that was calculated by the Staff, the calculation is correct. However, the measured ppm's reported in WCAP-16914 are slightly misleading and a correction to the report should be made to make the results clearer. []^{a,c}

WESTINGHOUSE NON-PROPRIETARY CLASS 3

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

a.c



WESTINGHOUSE NON-PROPRIETARY CLASS 3

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

Design Control Document (DCD) Revision:

None

PRA Revision:

None

Technical Report (TR) Revision:

WCAP-16914 will be revised based on the responses to items a) and e).

