



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

March 6, 1998

52-003

APPLICANT: Westinghouse Electric Company
FACILITY: AP600
SUBJECT: SUMMARY OF MEETING WITH WESTINGHOUSE TO DISCUSS SOURCE TERM
ISSUES ON THE AP600

The subject meeting was held in the Rockville, Maryland, office of the Nuclear Regulatory Commission (NRC) between representatives of Westinghouse and the NRC staff on December 18, 1998. The purpose of the meeting was to discuss the open issues remaining on the analyses of the radiological consequences of design basis accidents for the AP600 design. Attachment 1 is a list of meeting attendees. Attachment 2 is the handout provided during the meeting by Westinghouse.

The participants began the meeting with a discussion of the staff's questions on meteorology. The staff requested Westinghouse to revise the Standard Safety Analysis Report (SSAR) to reflect that it used ARCON96 in its meteorological evaluations. The x/q should be specified in the SSAR, with a brief discussion of the methodology used.

The staff indicated that there was close agreement on the λ values used by Westinghouse and the NRC. Westinghouse then requested feedback on the source term information it provided in April 1997 to support its proposed deviation from NUREG-1465 regarding values used for low volatiles and the GAP delay time. The staff stated that the review supporting the development of NUREG-1465 entailed a lot of interaction with the industry, and the staff requires significant new information to be persuaded to change its position from that described in NUREG-1465. The staff stated that it did not believe that any new information was presented in Westinghouse's April 1997 submittal to persuade it to allow deviation from the NUREG.

Westinghouse stated its opinion that using the NUREG-1465 values in their supporting calculations will not cause much (if any) actual design changes in shielding design, equipment qualification, or vital area access. Radiation zone maps would likely have to be changed. Although it agreed to use the values of NUREG-1465 in its source term analyses for offsite and main control room doses, Westinghouse proposed that it be allowed to use the already calculated dose values that were based on parameters different than NUREG-1465 to determine the shielding design, equipment qualification, and vital area access. Otherwise, Westinghouse felt that a large amount of documentation would have to be changed while having a minimal impact on the design. The staff stated that it was going to have to be careful about what it approved for the AP600 design because of the restrictions that design certification placed upon

The staff stated that it believed that Westinghouse should redo the supporting calculations using the NUREG-1465 values, and modify the AP600 design and radiation zone maps, as necessary.

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March 6, 1998

A draft of this meeting summary was provided to Westinghouse to allow them the opportunity to comment on the summary prior to issuance.

original signed by:

Thomas J. Kenyon, Project Manager
Standardization Project Directorate
Division of Reactor Program Management
Office of Nuclear Reactor Regulation

Docket No. 52-003

Attachments: As stated

cc w/atts: See next page

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Westinghouse Electric Corporation

Docket No. 52-003

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AP600 SOURCE TERM MEETING
MEETING ATTENDEES
DECEMBER 18, 1997

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ED RODWELL	EPRI
BRIAN MCINTYRE	WESTINGHOUSE
J.L. GROVER	WESTINGHOUSE
JAY LEE	NRR/DRPM/PERB
LETA BROWN	NRR/DRPM/PERB
RICH EMCH	NRR/DRPM/PERB
CHARLES MILLER	NRR/DRPM/PERB
CHARLES THOMPSON	DOE
MICHAEL SNODDERLY	NRR/DSSA/SCSB

AP600 LOCA Source Terms and Aerosol Removal

Presentation to NRC

December 18, 1997

**Westinghouse Electric Co.
James L. Grover**

Purpose of Meeting

Present the proposed Westinghouse approach for performing the radiological consequences analysis for the LOCA

Reach resolution between the staff and Westinghouse on the approach to be taken to close the existing open items in this area

Open Items

There are ~~three~~ significant open items remaining relative to the AP600 LOCA radiological consequences analysis

- Aerosol removal coefficients
- Source term - fraction of low-volatiles released to the containment atmosphere
- Source term - timing of onset of core damage

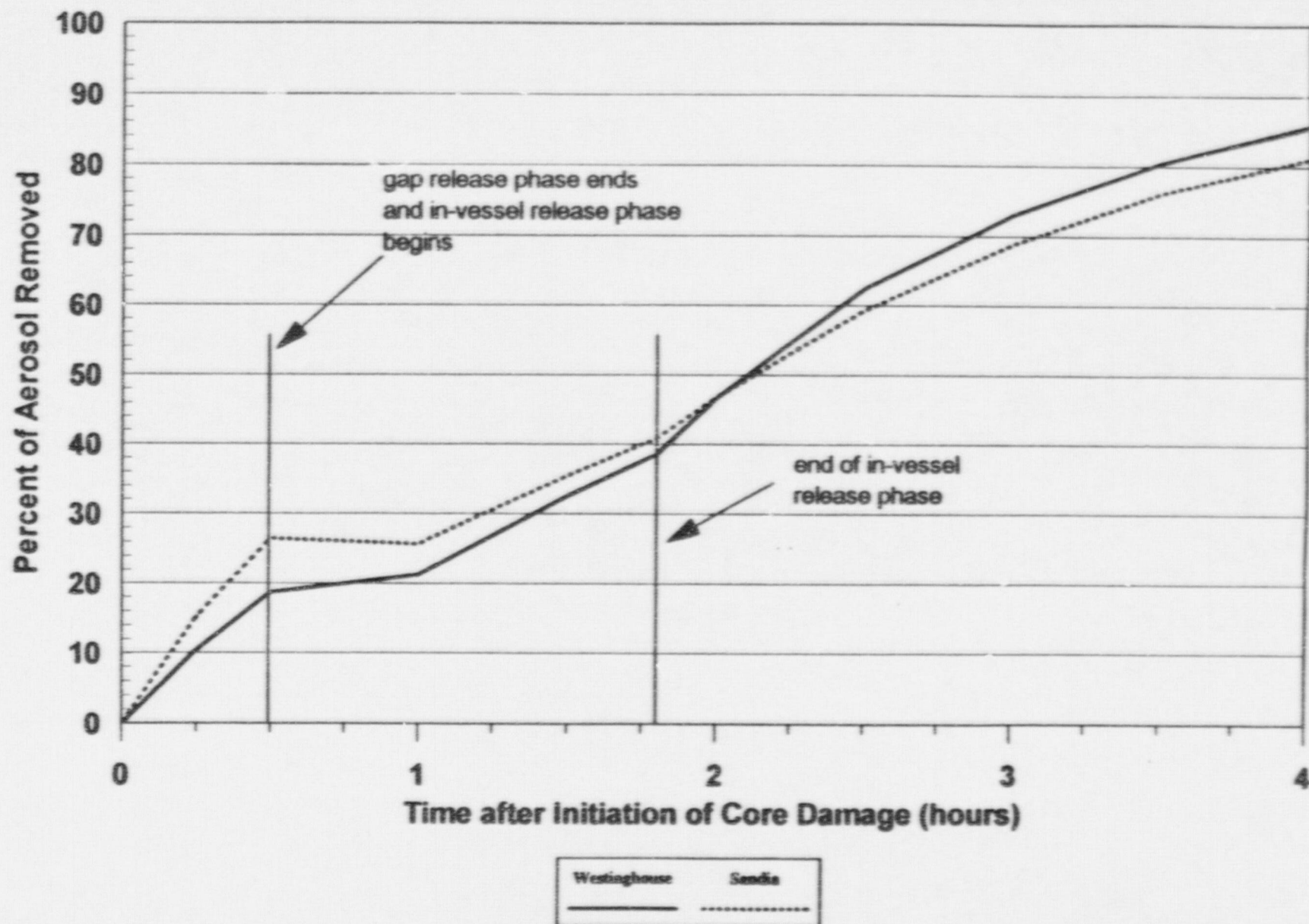
Aerosol Removal Coefficients

- The Westinghouse values reported in the SSAR range as follows:

- Gap Release Phase	0.50 - 0.58 hr ⁻¹
- In-vessel Release Phase	0.51 - 0.72 hr ⁻¹
- 2-hr interval after core release is complete	0.62 - 0.72 hr ⁻¹
- The recently calculated Sandia values are time-averaged as follows:

- Gap Release Phase	0.82 hr ⁻¹
- In-vessel Release Phase	0.74 hr ⁻¹
- 2-hr interval after core release is complete	0.53 hr ⁻¹
- The appropriateness of the Westinghouse removal coefficients is confirmed by the Sandia calculations. There are some differences but these are not significant to the calculation of removal of airborne activity from the containment atmosphere following a LOCA.

Aerosol Removal in the Post-LOCA Containment



Conclusions Regarding Aerosol Removal Coefficients

- The aerosol removal coefficients currently reported in Appendix 15B of the SSAR can continue to be used.
- The open item should be closed

Source Term Model

- Open item on low-volatile release fractions

	<u>Westinghouse</u>	<u>Staff</u>
- Sr & Ba	0.004	0.02
- Cerium group	0.0001	0.0005
- Lanthanide group	0.0001	0.0002

- Open item on timing of the initiation of the onset of core damage
 - The Westinghouse value is 50 minutes
 - The staff value is 10 minutes

Proposal on Source Term

- We believe that the departures from the model in NUREG-1465 are technically justified and should be accepted in the AP600 LOCA radiological consequences model.
- Despite the staff statements that our arguments have been reviewed and rejected, it seems that there has not been a full review. For a proper review to take place there would have to be discussions between staff and Westinghouse and there have been none.

Low-volatile Release Fractions

- In open item 470.42F it is implied that the Westinghouse arguments in support of the reduction in low-volatile release fractions are based only on the EPRI document "Passive ALWR Source Term" from February 1991. The document provided to the staff (April 1, 1996) in support of reduced volatile release fractions is from February 1995. This document was not reviewed in the formation of NUREG-1465.
- In open item 470.42F there is a statement that, "In its staff requirements memorandum of January 15, 1997, the Commission approved the staff position to use the low-volatile fission product release fractions outlined in NUREG-1465." The SRM does not address this issue.
- We believe that the arguments supporting the lower release fractions for the low-volatile nuclide groups are both credible and conservative.

Timing of Onset of Core Damage

- In open item 470.43F there is a discussion defending the use of the timing of core damage as identified in NUREG-1465. This is germane to plants similar in design to the currently operating plants but not to the AP600.
- Both in the preface to NUREG-1465 and in Section 2.2 of the document, the following statement is made:

"Source terms for future reactors may differ from those presented in this report which are based upon insights derived from current generation light-water reactors. An applicant may propose changes in source term parameters (timing, release magnitude, and chemical form) from those contained in this report, based upon and justified by design specific features."
- The NUREG-1465 invitation to propose changes in the source term model is assumed to be intended seriously. The AP600 has design features that delay the onset of core damage. The time delay has been documented and was provided to the staff in November of 1994.

- In Section 2.3 of NUREG-1465 there is specific identification of the potential for an increase in the timing of source term for "passive" plants. While this conjecture was made relative to lower core power densities, it is just as applicable to the AP600's core reflood capability.

Impact of the Two Source Term Features on the AP600 Application

Delay time

- Using a 10 minute delay instead of a 50 minute delay results in only a small increase in offsite and control room doses (on the order of a couple percent).
- Converting to a 10 minute delay from the current 50 minutes would result in changes to the source terms for shielding, equipment qualification, vital area access doses, and radiation zone maps. This would constitute a substantial impact on existing documents.

Low-volatile release fractions

- Using the release fractions from NUREG-1465 would result in an increase in the 2 hour site boundary dose of about 20%.
- Using the release fractions from NUREG-1465 would result in no significant impact on the other post-LOCA considerations (i.e., shielding, equipment qualification, vital area access, and radiation zone maps).