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CERTIFIED: William Lindblad 8/12/96
Date Issued: 7/29/96

ACRS-3023
PDR 10/3/96

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
SUBCOMMITTEE MEETING MINUTES:
WESTINGHOUSE STANDARD PLANT DESIGNS
JULY 19, 1996
ROCKVILLE, MARYLAND

The ACRS Subcommittee on Westinghouse Standard Plant Designs met on July 19, 1996, at 11545 Rockville Pike, Rockville, Maryland, in Room T-2 B3. The purpose of the meeting was to gather information concerning SECY-96-128, "Policy and Key Technical Issues Pertaining to the Westinghouse AP600 Standardized Passive Reactor Design." The entire meeting was open to public attendance. Mr. Noel Dudley was the cognizant ACRS staff engineer for this meeting. The meeting was convened at 8:30 a.m. and adjourned at 2:30 p.m.

ATTENDEES

ACRS

W. Lindblad, Chairman
I. Catton, Member
M. Fontana, Member
T. Kress, Member
D. Miller, Member

D. Powers, Member
R. Seale, Member
C. Wylie, Member
A. Cronenberg, ACRS Fellow

NRC STAFF

T. Kenyon, NRR
B. Grimes, NRR
M. Snodderly, NRR
J. Lee, NRR
T. Collins, NRR
H. Walker, NRR

R. Palla, NRR
T. Marsh, NRR
S. Jones, NRR
A. Levin, NRR
J. Kudrick, NRR

WESTINGHOUSE ELECTRIC CORPORATION

B. McIntyre, Westinghouse
T. Schulz, Westinghouse

J. Grover, Westinghouse
B. Lutz, Westinghouse

There were no written comments or requests for time to make oral statements received from members of the public. An attendance list of the NRC staff and public is available in the ACRS office files. Public participation during this meeting was limited to the presentations by the above named industry representatives.

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INTRODUCTION:

Mr. William Lindblad, Subcommittee Chairman, explained the purpose of the meeting. He noted that the Subcommittee had reviewed similar issues on May 31, 1996, and issued a report to the Chairman concerning AP600 technical issues on June 15, 1995. Mr. Lindblad identified the three staff policy issues to be presented as prevention and mitigation of severe accidents, post 72-hour actions, and external reactor vessel cooling. He called members attention to the memorandum from Dr. August Cronenberg, ACRS Fellow, that summarized the staff and Westinghouse positions on the policy issues.

Mr. Thomas Kenyon, NRR Senior Project Manager for the AP600 Review, provided a chronology of the ACRS review of the technical and policy issues related to the review of the AP600 design. He listed the three policy issues and identified the spent fuel pool cooling system design as an emerging technical issue.

USE OF NONSAFETY-RELATED SYSTEMS IN DESIGN REVIEWS:

NRC Staff Presentation: Mr. Michael Snodderly, NRR

The staff policy position is that nonsafety-related systems can be used to address the uncertainties associated with the passive removal mechanisms for design-basis analysis and for the balance between prevention and mitigation of severe accidents. There are many uncertainties associated with passive thermal-hydraulic designs, accident sequences, and natural aerosol removal mechanisms. Nonsafety-related systems must be available to mitigate the containment pressure and the airborne radionuclides following a severe accident.

The staff and the Subcommittee members discussed how policy issues differ from technical issues, how to determine the balance between prevention and mitigation of severe accidents, the use of spray systems, and the effectiveness of fan coolers. They also discussed the aerosol removal rate (λ), the source term calculation, the codes used to calculate aerosol removal, the timing of release fractions, and the reliance on natural radioactive isotope removal mechanisms to meet the requirements of 10 CFR Part 100.

Westinghouse Presentation: Messrs. James Grover and Bob Lutz, Westinghouse Electric Corporation (Westinghouse)

Westinghouse's position is that the AP600 can meet the regulatory dose limits without credit for nonsafety-related systems for design-basis accidents. Westinghouse supports the use of nonsafety-related systems to provide a balance between the prevention and mitigation of severe accidents.

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Westinghouse believes adequate aerosol deposition is provided by steam condensation and fan coolers, which negates the need for a spray system as suggested by the staff. The AP600 design minimizes challenges to containment integrity during severe accident events by design features, such as, passive containment cooling, hydrogen igniters, and flooding of the reactor vessel cavity. Containment bypass is minimized by automatic depressurization systems and by relocating the residual heat removal systems into the containment.

Westinghouse and the Subcommittee members discussed the codes used to calculate λ , the source term used in the calculations, and the length of time over which λ was evaluated. They compared the λ s of proposed spray systems and proposed fan cooler systems. They also discussed how to determine the balance between prevention and mitigation, the uncertainty associated with the containment pressure during severe accident sequences, and steam generator tube rupture scenarios.

Dr. Catton requested a copy of the analysis for placement of hydrogen igniters in the containment in order to understand how stratification in the containment was considered.

EXTERNAL REACTOR VESSEL COOLING:

NRC Staff Presentation: Mr. Robert Palla, NRR

The staff policy position is that a balanced approach should be used to assure that ex-vessel release of core will not breach the containment. The staff believes that due to the extensive review of the ex-vessel cooling approach and the finite possibility of a failure of the reactor pressure vessel, Westinghouse should conduct limited analyses to demonstrate that the containment will accommodate the ex-vessel loads of core-concrete interactions, direct containment heating, and steam explosions.

The staff and the Subcommittee members discussed the critical heat flux at points on the lower vessel head, how molten fuel and internal reactor structural material interact with the vessel walls, and the possibility of exothermic chemical reactions. They discussed the meaning of limited analyses, the definition of adequacy of analyses, and the types of phenomena that should be evaluated.

Dr. Catton and Dr. Powers noted possible weaknesses in the Risk Oriented Accident Analysis Methodology (ROAAM) used to evaluate the external reactor vessel cooling approach. Dr. Catton requested a copy of the Rasplav facility report on in-vessel retention tests when it becomes available.

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Westinghouse Presentation: Mr. Bob Lutz, Westinghouse

Westinghouse supports the need to perform limited analyses of ex-vessel loads. Mr. Lutz described the types of deterministic evaluations and severe accident phenomena analyses that Westinghouse planned to conduct. The Westinghouse probabilistic risk analysis assumes containment failure when the reactor vessel fails.

Mr. Lutz and the Subcommittee members discussed different scenarios that would result in containment failure or bypass. The Subcommittee requested copies of the analysis of steam generator tube response during severe accident temperature and pressure conditions.

POST 72-HOUR ACTIONS:

NRC Staff Presentation: Mr. Timothy Collins, NRR

Westinghouse proposes to credit use of offsite support 72 hours after the initiation of a design-basis accident. The staff position is that a site should be capable of sustaining all design-basis events with on-site equipment and consumable for the long term. The staff position is based on the experience at Turkey Point, the possible problems of transporting offsite equipment to a site, and the burden on the local community.

Mr. Collins and the Subcommittee members discussed the definition of "long term," the applicable guidance in regulatory guides or the Standard Review Plan, and the significance of the seven day time period associated with the delivery of fuel oil.

Westinghouse Presentation: Mr. Terry Schulz, Westinghouse

The AP600 is designed to the Utility Response Document (URD) requirements, which were approved by the NRC staff. The URD allows the use of offsite equipment with some restrictions. Mr. Schulz explained the AP600 long term safe shutdown approach and support needs. He described the reliability and availability of offsite equipment and resources, and the extended safe shutdown coping capability. Mr. Schulz provided a list of post 72-hour equipment and consumable. He recommended that safe shutdown be provide by on-site safety-related equipment and consumable, use of readily available offsite equipment and consumable after three days, and extended safe shutdown capability after seven days. Mr. Schulz and the Subcommittee members discussed the barriers to storing equipment and consumable on-site, the expected time for transporting equipment to a site, and the regulatory basis for the seven day limit.

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SPENT FUEL POOL COOLING SYSTEM:

NRC Staff Presentation: Mr. Howard Walker, NRR

The AP600 spent fuel cooling system does not meet the Standard Review Plan acceptance criteria. The likelihood of a loss of the spent fuel cooling system is greater in the AP600 design than in other approved designs. The AP600 spent fuel cooling system design is less robust than other approved designs. Consequently, the staff proposes that additional on-site capability to remove decay heat from the spent fuel pool be added to the design.

The staff and the Subcommittee members discussed the reason for adding the technical issue to the status report, and the heat loads associated with advanced reactor high burnup fuel.

Westinghouse Presentation: Mr. Terry Schulz, Westinghouse

The NRC staff evaluated the URD spent fuel cooling requirements as acceptable. The AP600 is designed to the URD requirements for reliability and availability, and for site boundary dose limits. Mr. Schulz explained the AP600 spent fuel pool cooling approach and the extended spent fuel pool cooling capability, which included boiling of the spent fuel pool and passive water supplies. The calculation of offsite doses resulting from loss of normal spent fuel cooling or a fuel drop accident are less than the NRC site boundary dose limits.

Westinghouse and the Subcommittee members discussed the sources and volume of the passive water supplies, the length of time to pool boiling, the chemical control of the spent fuel pool, and the iodine partitioning factor. Mr. Lindblad requested information as to the length of time the URD allows for loss of offsite power.

TECHNICAL ISSUES: Mr. Thomas Kenyon, NRR

Mr. Kenyon provide a brief status of the following six technical issues:

- design-basis radiological consequences,
- MAAP4 benchmarking and regulatory treatment of nonsafety systems (RTNSS)/thermal-hydraulic uncertainty,
- safe shutdown end-state used in technical specification,
- passive autocatalytic recombiners,
- initial test program, and
- security design.

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Mr. Grover, Westinghouse, stated that the NRC total effective dose equivalent (TEDE) limit for offsite doses of 25 REM is inconsistent with the NRC defined basis. He stated that the limit should be 35 REM.

The staff, Westinghouse, and the Subcommittee members discussed the qualification program for chemical poisoning of passive autocatalytic recombiners and the schedule for future ACRS reviews.

SUBCOMMITTEE DISCUSSION:

Dr. Kress requested a future presentation by the staff and Westinghouse regarding the derivations of the aerosol removal rate λ . Dr. Miller requested clarification of which discussion subjects were policy issues and which were technical issues.

Drs. Catton and Fontana suggested future presentations on the severe accident issues of containment stratification, location of hydrogen igniters, and the potential for a hydrogen burn. Drs. Catton, Fontana, and Seale agreed that the Subcommittee should hear more information on the effects of a partially filled cavity on containment failure probability.

Drs. Fontana and Miller requested future presentations on the safe shutdown end state. Dr. Powers stated that radiological consequences of loss of spent fuel pool cooling needed to be discussed including chemical interactions.

FOLLOWUP ACTIONS:

The Subcommittee requested that the staff provide a copy of the Rasplov facility report on in-vessel retention tests to the ACRS when the report became available.

Westinghouse agreed to provide the following information or documents:

- Utility Requirements Document specification or assumption of the time a plant is disconnected from the electrical grid. [note: completed at ACRS meeting on August 8, 1996]
- Analysis of steam generator tube response during severe accident temperature and pressure conditions.
- Analysis for placement of hydrogen igniters in the containment. [note: completed at ACRS meeting August 8, 1996]

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SUBCOMMITTEE RECOMMENDATIONS:

The Subcommittee requested that the staff and Westinghouse provide presentations on the three policy issues and the spent fuel pool cooling technical issues, and a synopsis of the technical issues contained in SECY-96-128 at the August 8-9, 1996 ACRS meeting.

BACKGROUND MATERIAL PROVIDED TO THE SUBCOMMITTEE:

1. SECY-96-128, "Policy and Key Technical Issues Pertaining to the Westinghouse AP600 Standardized Passive Reactor Design," dated June 12, 1996
2. Letter dated June 15, 1995, from Thomas S. Kress, Chairman, ACRS, to James M. Taylor, Executive Director for Operations, Subject: Proposed Commission Paper On Technical Issues Pertaining To The Westinghouse AP600 Standardized Passive Reactor Design
3. Letter dated August 8, 1995, from James M. Taylor, Executive Director for Operations, to T. S. Kress, Chairman, ACRS, Subject: Response To ACRS Comments On Commission Paper On Technical Issues Pertaining To The Westinghouse AP600 Design
4. Memorandum dated July 2, 1996, from August Cronenberg, Senior ACRS Fellow, to ACRS Members and Staff, Subject: NRC Staff and Westinghouse Positions on AP600 Design Review Issues

PRESENTATION SLIDES AND HANDOUTS PROVIDED DURING THE MEETING

The presentation slides and handouts used during the meeting are available in the ACRS office files or as attachments to the transcript.

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NOTE: Additional details of this meeting can be obtained from a transcript of this meeting available in the NRC Public Document Room, 2120 L Street, N.W., Washington, D.C. 20006, (202) 634-3274, or can be purchased from Neal R. Gross and Company Incorporated, Court Reporters and Transcribers, 1323 Rhode Island Avenue, N.W., Washington, D.C. 20005, (202) 234-4433.