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CERTIFIED: Robert Seale January 13, 1997
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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
SUBCOMMITTEE MEETING MINUTES
WESTINGHOUSE STANDARD PLANT DESIGNS
DECEMBER 4, 1996
ROCKVILLE, MARYLAND

The ACRS Subcommittee on Westinghouse Standard Plant Designs met on December 4, 1996, at 11545 Rockville Pike, Rockville, Maryland, in Room T-2B3. The purpose of the meeting was to review chapters 4, 5, 9, and 11 of the AP600 Standard Safety Analysis Report (SSAR). 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 3:15 p.m.

ATTENDEES

ACRS

R. Seale, Chairman
M. Fontana, Member
T. Kress, Member
D. Miller, Member
W. Shack, Member
J. Carroll, Consultant

NRC STAFF

T. Kenyon, NRR
W. Huffman, NRR
J. Holms, NRR
J. Wilson, NRR
G. Bagchi, NRR
J. Lyons, NRR

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WESTINGHOUSE ELECTRIC CORPORATION

B. McIntyre
W. Carlson
M. Mahlab
R. Blumstein
G. Israelson
M. Corletti
D. Hutchings
J. Winters
J. Grover

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 and will be made available upon request.

O&M, 7 ACRS

Minutes: Westinghouse Standard Plant Designs Subcommittee
December 4, 1996

INTRODUCTION

Dr. Robert Seale, Subcommittee Chairman, convened the meeting at 8:30 a.m. and stated that the Subcommittee would begin its review of certain Chapters of the AP600 SSAR related to the design of the reactor, reactor coolant system and connected systems, auxiliary systems, fire protection systems, and radioactive waste management systems. The Subcommittee will gather information related to the details and bases of the design.

NRC STAFF PRESENTATION - Mr. William Huffman, NRR

Mr. Huffman explained the status of the ongoing efforts by the staff and Westinghouse to develop a realistic and achievable schedule for completing the AP600 design review. He noted that the factors affecting the schedule included Westinghouse's submittal of deliverables and the availability of staff resources to support the review.

The staff issued a Draft Safety Evaluation Report (DSER) on November 30, 1994, which identified open items resulting from the staff review of the SSAR. Subsequently, the staff and Westinghouse have worked to resolve the open issues. Mr. Huffman noted that the staff was continuing its review of SSAR chapters 4, 5, 9, and 11, and anticipated resolution of the identified open items. He stated, however, that the staff has not completed its detailed review and that some items were still under discussion.

The Subcommittee members and the staff discussed the approach taken by Westinghouse in regards to the inspections, test, analyses, and acceptance criteria (ITAAC) process. Westinghouse's approach is different than that approved for the evolutionary plant designs and may result in extending the review process. They also discussed the regulatory treatment of non-safety systems (RTNSS) process as applied to the AP600 design.

WESTINGHOUSE PRESENTATION

Design Criteria for AP600 - Mr. Brian McIntyre, Westinghouse

Mr. Brian McIntyre, Westinghouse, presented the approach and criteria used in designing the AP600. He described the unique features of the AP600 design and compared it to the design of an operating Westinghouse reference plant. He explained how the probabilistic risk assessment (PRA) and the safety analysis were used as design tools.

The Subcommittee members and the Westinghouse representatives discussed the differences between the AP600 design and the design specifications in the Electric Power Research Institute's Utilities Requirements Document, the definition of a large release, and the design changes that resulted from PRA insights. They also discussed the seismic design and safety-related systems associated with spent fuel pool cooling.

Chapter 4: Reactor - Mr. Bill Carlson, Westinghouse

Mr. Carlson presented the AP600 core design and compared it to an operating reactor core design. He explained the core layout, fuel assembly and fuel rod designs, thermal hydraulic design, and reactivity control systems. Mr. Carlson noted that the design reduced the fluence to the reactor vessel and thereby reduced reactor vessel embrittlement.

The Subcommittee members and Mr. Carlson discussed the following issues:

- the AP600 reactor vessel debris filter design compared to the Clinch River debris filter design,
- expected burnup rate of AP600 ZIRLO clad fuel and the potential for fragmentation of high burnup oxides at relatively low energy levels, and
- the reason for developing a new departure from nucleate boiling correlation for low primary flow conditions.

In response to a Subcommittee question, Mr. James Winters, Westinghouse, explained that the flux seen at a weld on the AP600 reactor vessel over 60 years would be about 2% of the flux seen at the midline weld on an operating reactor vessel over 40 years.

Chapter 5: Reactor Coolant System and Connection Systems - Messrs. Moshe Mahlab and Michael Corletti, Westinghouse

Mr. Mahlab presented the design of reactor coolant system components and the associated design goals. He explained the design of the reactor vessel, reactor vessel internals, instrumentation and control rod drivelines, steam generators, and reactor coolant pump canned rotors. The Subcommittee members and Mr. Mahlab discussed the material used to manufacture components, flexibility of steam generators to respond to maneuvering transients, inservice inspections of the reactor coolant pump flywheel, cooling to reactor coolant pumps during accident conditions, and restricted use of specific lubricants on primary components.

Mr. Corletti presented the design of the reactor coolant system and compared selected AP600 operating parameters with parameters of an operating plant. He described the design of the pressure control system, overpressure protection system, automatic depressurization system, reactor vessel head vent system, and residual heat removal system. Mr. Corletti explained what design enhancements had been developed for loss-of-coolant-accidents, mid-loop operations, and shutdown conditions. The Subcommittee and Mr. Corletti discuss the 100% load rejection capability of the AP600, temperature monitoring of the pressurizer surge line, and testing of the automatic depressurization system valves and vacuum breakers.

The Subcommittee questioned the relationship between a turbine generator underfrequency trip, reduced primary coolant flow, and the possibility of

departure from nucleate boiling. Mr. Winters explained that the AP600 design does not include an underfrequency trip. The low flow trip is actuated by the speed of the reactor coolant pump motor at an equivalent electrical frequency of about 54 Hz. Mr. Winters concluded that the AP600 would be able to operate with electrical grid upsets down to 55 Hz without tripping.

Chapter 9: Auxiliary Systems - Messrs. Donald Hutchings, James Winters, and Robert Blumstein, Westinghouse

Mr. Hutchings presented the design of the auxiliary water systems, air systems, the chemical and volume control system, and the heating, ventilation, and air conditioning (HVAC) systems. He described the design of the service water, component cooling water, and central chilled water systems. He explained the design of the instrument air, service air, and high-pressure air subsystems, and the functions of the chemical and volume control system. The Subcommittee members and Mr. Hutchings discussed the source of diesel generator cooling, possible equipment damage caused by the loss of component cooling water, reliability of chillers, primary and secondary water chemistry control programs, and initial testing of the instrument air system.

In response to a Subcommittee question, Mr. Winters explained that a ventilation duct high radiation alarm would realign the ventilation system and provide both the main control room and the technical support center with filtered air. On a high-high radiation alarm or loss of all power, the ventilation system would realign and provide only the main control room with clear air.

Mr. Winters presented the fire protection program. He described the design objectives and the enhanced features of the program. He explained the layout of the fire zones, the operation of the fire suppression systems, and the design of the floor drain system, which prevents flooding caused by fire water. The Subcommittee members and Mr. Winters discussed the relationship between the water supply for the fire protection system and the containment passive cooling system, and the automatic realignment of the ventilation systems to prevent the spread of smoke.

Mr. Blumstein presented the design of the reactor building and the fuel storage and handling building. He explained the receipt, handling, and storage process for new fuel, and the storage, handling, and shipping process for spent fuel. He described the layout of the spent fuel building and the reactor building refueling floor. The Subcommittee members and Mr. Blumstein discussed fuel handling operations and the storage and inspection of the reactor vessel head.

Chapter 11: Radioactive Waste Management - Messrs. James Grover and Gordon Israelson, Westinghouse

Mr. Grover presented the design basis source term, the technical specifications for primary coolant activity, and the realistic source term. He explained that the AP600 offsite release concentrations calculated using both the design basis and realistic source terms for liquid and gaseous releases were well below 10 CFR

Part 20 limits. The Subcommittee members and Mr. Grover discussed the design basis scenario for the assumed worst case iodine spike.

Mr. Israelson presented the design of the liquid, gaseous, and solid radwaste systems. He described the radiation monitoring system and the associated safety-related automatic system actuation. The Subcommittee members and Mr. Israelson discussed the disposal and processing of chemical waste tank contents, system response to a steam generator tube leak or rupture, gaseous radwaste system decay beds, radiation monitoring instrumentation, and the digital control systems, which produce automatic system actuation signals.

SUBCOMMITTEE DISCUSSION

Mr. Carroll stated that the ITAAC should evolve into a better product and that people should not be discouraged from being innovative. He noted that for future reviewers the discussion of safety related HVAC systems in SSAR Section 9.4 should be referenced in section 6.4.

Dr. Seale stated that the AP600 design demonstrated how Appendix R fire protection requirements are easier to comply with when a designer starts with a clean slate.

FOLLOWUP ACTIONS

The Subcommittee identified the following items to be considered at future Subcommittee meetings:

- details of the digital control systems associated with the radiation monitoring system,
- conformance of the AP600 design with the staff policy position, which is under review by the Commission, concerning spent fuel pool cooling systems, and
- the proposed definition of safe shutdown conditions as the reactor coolant system below 420°F and at or below normal operating pressure.

SUBCOMMITTEE RECOMMENDATIONS

The Subcommittee agreed to schedule future meetings to review additional chapters of the SSAR.

BACKGROUND MATERIAL PROVIDED TO THE SUBCOMMITTEE

1. "AP600 Standard Safety Analysis Report, Simplified Passive Advanced Light Water Reactor Pilot Program," issued on June 26, 1992, updated though revision 8 issued on July 1, 1996.

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 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.