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

December 17, 1996

APPLICANT: Westinghouse Electric Corporation

FACILITY: AP600

SUBJECT: SUMMARY OF NOVEMBER 13, 1996, MEETING TO DISCUSS THE AP600 INSPECTIONS TESTS, ANALYSES, AND ACCEPTANCE CRITERIA (ITAAC)

The Nuclear Regulatory Commission (NRC) staff and representatives of Westinghouse Electric Corporation held a meeting on November 13, 1996 in Rockville, Maryland, to discuss issues associated with the ITAAC for the AP600. Attachment 1 is a list of meeting attendees. Attachment 2 is a copy of handouts provided by Westinghouse.

The AP600 Certified Design Material, including the ITAAC was submitted by Westinghouse in a November 7, 1996 letter. The purpose of the meeting was for Westinghouse to describe to the staff the process used to select the Tier 1 material, and for Westinghouse to compare the submittal with the draft Standard Review Plan Section 14.3. Highlights of the discussion are summarized as follows:

Westinghouse maintained that their certified design material (CDM), which includes the ITAAC, is significantly different than the evolutionary plants' CDMs. The key differences, according to Westinghouse, are a fundamentally different safety approach, and the AP600 certified design is more complete in many areas. Based on these key differences Westinghouse applied a screening criteria to determine the equipment that would have ITAAC. The screening criteria used were: equipment that performs a safety function, equipment that performs a defense-in-depth function, non-safety related equipment that performs a function for which credit is taken in the design basis safety analysis, and equipment needed for in-vessel retention or hydrogen mitigation after postulated severe accidents.

The staff had several comments on Westinghouse's approach some of which were detailed in a November 26, 1996, letter to Westinghouse. The following issues were raised by the staff during the presentation and are some of the issues that will be addressed by the staff during their review:

1) The staff did not agree that the above screening criteria could be used to determine the systems that need to have ITAAC. The staff stated that all structures and systems need to have an ITAAC with the level of detail contained in the ITAAC commensurate with the system's safety significance.

2) The staff stated that there is no information in Westinghouse's submittal that cross references the important design information and parameters of the standard safety analysis report to their treatment in the CDM.

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3) The term "Basic Configuration" was used in the evolutionary designs and was not used for the AP600. Westinghouse maintains that with their approach the term "Basic Configuration" does not have to be used. The staff did not agree. The staff noted that for the evolutionary plants, the basic configuration ITAAC included an inspection of the "system functional arrangement." The inspection in this ITAAC verified detailed design, construction, and installation issues that could only be verified by inspecting the final installed facility. An example was given of why the staff considered the inspection of the system functional arrangement important because it could be used to identify a problem, and where Westinghouse's current ITAAC would not address the problem. The example used was that, for one current pressurized water reactor, the Auxiliary Feedwater pump could not supply sufficient water to the steam generators because the installed piping runs were too long and created too much head loss.

4) Westinghouse's approach to Human Factors ITAAC was also discussed. Westinghouse identified four elements that the staff had not evaluated at the complete product level which are: task analysis, integration of human reliability analysis with human factors engineering (HFE), human system interface design, and HFE program verification and validation. Westinghouse's position is that ITAAC are not needed for these areas and that they can assign responsibility for completion to the combined license applicant.

   a) The staff did not agree with this approach and stated that ITAAC are needed for each of the above elements.

   b) In addition, the staff stated that responsibility for ITAAC within the scope of the certified design could not be deferred to a COL applicant.

5) Westinghouse presented their ITAAC on the initial test program (ITP). The staff stated that the commitment was not the same as for the evolutionary plants, and that there was not an explanation as to how the ITAAC and the ITP relate to each other.

6) Westinghouse stated that, unlike evolutionary plants, the AP600 has no safety-related or defense-in-depth interface requirements. The staff questioned this assertion. Specifically, the staff wanted to know how Westinghouse treated the safety related connections to the plant which would be used for post-72 hour actions.

7) During the meeting, Westinghouse stated that certain features of the AP600 design were not captured in the ITAAC because Westinghouse believed that the acceptance criteria would be subjective. The staff stated that significant design features must be verified regardless of the subjectivity of the acceptance criteria.

8) The staff was also concerned that comments given to Westinghouse during the review of the pilot ITAAC were not incorporated into Westinghouse's submittal. These comments were provided to Westinghouse in letters dated June 27, 1996, July 31, 1996, and August 8, 1996. Although the letters transmitting the comments required no written response by Westinghouse it was not clear to the staff how the comments were resolved.

9) Westinghouse maintained for the AP600 there was no need for design acceptance criteria (DAC) for piping and for the instrumentation and control system. The staff did not agree with this approach. The staff noted that for the evolutionary plants the piping DAC took into account environmental effects of high energy line breaks inside and outside of containment. It did not appear that Westinghouse's approach addressed this issue.

10) The staff also noted that Westinghouse needs to verify that the ITAAC are consistent with the bases and limiting conditions for operation found in the technical specifications. The staff also noted that severe accident design features need to be verified in Tier 1. The example that was given during the meeting was equipment survivability, which is in addition to equipment qualification.

As a result of the meeting Westinghouse committed to the following action items:

I) Westinghouse will provide an explanation on how the ITAAC and the ITP relate to each other. (See item number 5 above).

II) Westinghouse will provide an explanation on how the safety related connections are addressed in the ITAAC. (See item number 6 above).

III) Westinghouse will provide a response to the comments provided in the June 27, 1996, July 31, 1996, and August 8, 1996, letters. The response will detail how comments were incorporated into the November 7, 1996, submittal and the reason for not incorporating some of the comments.

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Docket No. 52-003

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EJordan, T-4 D18
ACRS (11)
JMoore, O-15 B18
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EThrom, O-8 H7
JMonninger, O-8 H7
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MChiramal, O-8 H3
ECMarinos, O-8 H3
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NTrehan, O-7 E4
JLyons, O-8 D1
ALevin, O-8 E23
NSaltos, O-10 E4
GThomas, O-8 E23
GBagchi, O-7 H15
TBoyce, O-12 E4

WESTINGHOUSE AP600 ITAAC
MEETING ATTENDEES
NOVEMBER 13, 1996

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ROGER SCHREIBER	WESTINGHOUSE
EUGENE PIPLICA	WESTINGHOUSE
BRIAN MCINTYRE (PART TIME)	WESTINGHOUSE
CHARLES THOMPSON	DOE
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DALE THATCHER	NRR/DE/EELB
MARK PRAH	NRR/DE/EELB
MATTHEW CHIRAMAL	NRR/DRCH/HICB
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JERRY WILSON	NRR/DRPM/PDST
TOM BOYCE	NRR/DISP/PIPB
JOE SEBROSKY	NRR/DRPM/PDST

Attachment 1

Westinghouse Presentation to NRC Staff

November 13, 1996

Meeting Objectives

- Review key differences between AP600 and evolutionary plants
- Review content and organization of AP600 CDM
- Identify and explain differences from evolutionary plant submittals

AP600 Comparison with Evolutionary Plants

- Key Differences:
  - Fundamentally different safety approach
  - AP600 Certified Design more complete in many areas
- Results in significantly different CDM

Fundamental Differences in Safety Approach

- Safety ultimately assured by dedicated passive systems
  - Fewer, simpler systems
  - Clearer segregation of safety and non-safety
- Results in fewer, more concise ITAAC

Fundamental Differences in Safety Approach

- Specific non-safety systems identified as Defense-in-Depth (DID)
  - Prevent challenges to passive systems
  - Contribute to reduced core damage frequency

- Implications for ITAAC
  - Less detail for non-safety systems
  - Clarifies risk significance of non-safety systems

Fundamental Differences in Safety Approach

- Reduced reliance on operator
  - No actions required for three days
  - Limited actions thereafter

- Implications for ITAAC
  - Fewer instrument displays in ITAAC
  - Alarms not important to safety
  - Less emphasis on habitability outside MCR

Fundamental Differences in Safety Approach

- Severe accidents more benign
  - Depressurized primary system
    - Eliminates high pressure core melt phenomena
  - In vessel retention of core debris
    - Eliminates core relocation phenomena

- Results in fewer ITAAC for severe accident functions

AP600 Comparison with Evolutionary Plants

AP600 Design is More Complete in Many Areas

- Piping & LBB analysis
  - Preliminary analysis done for ASME/H.E. lines
  - Piping covered in individual systems
    - No generic piping ITAAC

- Design Reliability Assurance Program
  - D-RAP is complete (SSAR section 16.2)
  - No need for DRAP ITAAC

Basic Screening Criteria (SSAR 14.3)

- Equipment that performs a safety function
- Equipment that performs a defense-in-depth function
- Non-safety related equipment that performs a function for which credit is taken in the design basis safety analysis (e.g., turbine stop valves)
- Equipment needed for in-vessel retention or hydrogen mitigation after postulated severe accidents

Content and Organization of AP600 ITAAC

- "Yes" answers require an ITAAC

- Some systems had only one component in ITAAC
  - e.g., turbine stop valves
  - usually moved into other systems (SGS)

- Result: 29 System ITAAC
  - Each may address safety and non-safety functions
  - Safety functions addressed in more detail

- Five Non-System ITAAC

Introductory Paragraph

- Very brief statement of why system exists
- Relevant details in numbered design commitments
- Intention is to avoid information that is
  - Repetitive
  - Not relevant to screening criteria
  - Easily misconstrued

Typical System ITAAC

- Figures illustrate "functional arrangement"

  > ".....the major components, interconnections between major components, and connections to other systems that collectively provide the service for which the system is intended."

- Include main process lines needed to perform ITAAC functions
  - Does not include pump miniflow lines, etc.

Functional Arrangement vs. Basic Configuration

- Evolutionary plants defined "Basic Configuration" as including:
  - Functional arrangment (which they never defined)

  PLUS:
  - Weld inspection
  - Seismic and environmental qualification
  - Qualification of MOVs

- AP600 CDM treats these items in specific systems

Equipment and Piping Tables

- Explicitly list tag numbers and important features
- Separate tables provided for:
  - Safety related equipment & instruments
  - High energy piping to be LBB qualified
  - Non-safety related equipment

ITAAC for Safety Related Equipment

- ASME requirements
- Seismic qualification
- Separation
- Environmental qualification
- Specific safety functions & performance requirements
- Safety related MCR displays & controls
- Active valve testing

ASME Requirements

- Code boundaries identified on figure
- ITAAC include:
  - NDE of welds
  - System hydrotest
  - Analysis of as-built piping & supports

Seismic Qualification

- Seismic classification given on equipment table

- ITAAC include:
  - Verification of equipment /piping location
    - Seismic equipment must be in seismic building (e.g., on Nuclear Island)
  - Equipment qualification testing and/or analysis
  - Seismic analysis of supports

Separation and Environmental Qualification

- Equipment table identifies 1E gear and harsh vs. mild environment

- Design commitment requires separation
  - Specific inspections and acceptance criteria are in the Nuclear Island Buildings ITAAC
  - Specific division assignments are not identified

- For harsh environments, commits to qualification testing and/or analysis

Specific Safety Functions/Performance Req'ts

- Flow rates, tank volumes, heat transfer capability, etc.
- System realignments to accomplish safety function
  - Containment isolation usually covered in containment system
- ITAAC do not identify all modes of system operation
  - Only functions relevant to screening criteria

Safety Related MCR Displays & Controls

- Design commitment requires the following
  - Class 1E PAMs displays can be retrieved in MCR
  - Controls for active equipment in MCR

- Covered elsewhere in ITAAC:
  - Interlocks & logic
  - Most non safety grade instrumentation and controls
  - Remote shutdown panel displays & controls

Active Valve Testing

- Most active, remote operated valves are stroke tested
  - Using MCR controls
  - Via signal from PMS
  - Squib valves are no-go tested
- Active check valves are exercised
- MOVs are type tested

ITAAC for Non-Safety Related Equipment

- ITAAC requires
  - Verificiation of basic function
    (e.g., RHR pump flow rate & Hx UA)
  - MCR display of basic performance parameter only
  - MCR controls for component providing the function
  - MCR controls for equipment actuated by DAS

- Not included
  - Pump NPSH, on line testing

Other ITAAC Sections

- I&C System ITAAC

- Other Sections
  - Human Factors
  - Nuclear Island Buildings
  - Intitial Test Program
  - Radiation Monitoring
  - Interface Requirements

I&C System ITAAC

- Emphasizes important functions/attributes
  - System performance
  - Bypass, premissives, blocks & interlocks
  - MCR controls & displays
  - Physical and electrical separation
  - Electromagnetic compatibility
  - Seismic qualification
  - Hardware/software development
  - Setpoint methodology
  - Diverse actuation
- Detailed implementation in tier 2

Human Factors Engineering

- Staff expects an ITAAC on each HFE program element not yet completed

- SSAR Chapter 18 identifies 4 incomplete elements:
  - Task Analysis
  - Integration of human reliability analysis with HFE
  - Human system interface design
  - HFE program V&V

Human Factors Engineering

- Westinghouse and industry feel that these elements should not be elevated to tier 1

- Approach:
  - In the SSAR, assign responsibility for completion to Combined License Applicant
  - Submit HFE ITAAC with
    - Performance based test/analyses
    - Measurable acceptance criteria

Nuclear Island Bulidings

- Emphasizes functions, not physical details

- Important functions:
  - Structural capability
  - Radiation shielding
  - Protection from internal/external flooding
  - Fire protection
  - HELB protection
  - Electrical/Physical separation

Initial Test Program

- Includes:
  - High level commitment to perform an ITP
  - Brief general description on the ITP
  - Commitment to complete ITAAC before fuel load
- Tier 2 contains complete description of ITP

Radiation Monitoring

- Includes
  - Safety-related monitors
  - Nonsafety-related process & effluent monitors

- Other aspects of radiation protection are elsewhere
  - Shielding & dose rates (building ITAAC)
  - Ventilation (HVAC systems ITAAC)

Interface Requirements

- AP600 Design Certification covers all safety-related and defense-in-depth functions
- AP600 ultimate heat sink is ambient air
- Unlike evolutionary plants, AP600 has no safety-related or defense-in-depth interface with portions of the plant outside Design Certification

Conclusions

- AP600 tier 1 covers the most important functions and features, at the appropriate level of detail

- Differences from previous submittals due to:
  - Fundamentally different safety approach
  - More complete design in several areas