Docket No. 52-002

June 3, 1992

APPLICANT: Combustion Engineering, Inc. (ABB-CE)

PROJECT: CE System 80+

SUBJECT: SUMMARY OF MEETING HELD ON MAY 20, 1992

A public meeting was held between the Nuclear Regulatory Commission (NRC) staff and ABB-CE representatives at One White Flint North in Rockville, Maryland, on May 20, 1992, from 10:00 a.m. to 1:00 p.m. The purpose of the meeting was for ABB-CE to discuss the staff's comments on ABB-CE's pilot inspections, tests, analyses, and acceptance criteria (ITAAC) submittal. The staff discussed the written comments contained in Enclosure 1 with ABB-CE, and discussed the philosophy of ITAAC development and the role of ITAAC in 10 CFR Part 52. The staff and ABB-CE discussed the need for objective, measurable acceptance criteria, and emphasized that the relationship to the system design basis should be clearly established. The staff and ABB-CE identified interface systems as an area for future discussions. The proposed approach to ITAAC preparation that ABB-CE presented at the meeting is described in Enclosure 2. A list of attendees is provided in Enclosure 3.

ABB-CE is considering developing a cross reference of the CE standard safety analysis report-design certification (CESSAR-DC) (which is based on the standard review plan (SRP)) to the ITAAC (which is systems based). The cross reference would serve several purposes, including showing a systematic development process for the ITAAC, establishing a relationship between Tier 1 and Tier 2 information (which would aid future "50.59-like" changes to the SSAR), and facilitating the review process. The cross reference would be part of the CESSAR-DC.

The staff and ABB-CE discussed the future conduct of the ABB-CE ITAAC review. Based on experience with the lead design for ITAAC, the advanced boiling water reactor (ABWR) review, the staff recommended that ABB-CE proceed to a complete ITAAC submittal, rather than conduct further iterative reviews on the pilot ITAAC or hold meetings with the staff on the development of individual ITAAC. The staff also recommended that ABB-CE closely follow developments on the ABWR ITAAC in order to incorporate any lessons learned from the review.

Original Signed By:
Son Q. Ninh, Project Engineer
Standardization Project Directorate
Associate Directorate for Advanced Reactors
and License Renewal
Office of Nuclear Reactor Regulation

Enclosures:
As stated

cc w/enclosures:
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PROJECTS COMMENTS

Section 1.3.2, Design for Protection of SSCs against Dynamic Effects of Pipe Break and LBB, appears to be a section where the design has not been finalized, and DAC are being used. If so, then it may be useful to clearly identify the DACs. If this is not a DAC area, then it appears that the Tier 1 design description and the ITAAC are insufficient to provide the level of detail required to make a final safety determination. The level of detail does not appear to be that provided in FSARs, which is the minimum required by Part 52. An example is a sentence which states, "Protection requirements are met through the protection afforded by the walls, columns, floors, abutments, and foundations in many cases (emphasis added)." What does this mean? What is done in other cases?

There are numerous instances where the Tier 1 design description does not match the summary of the design committment in the ITAAC tables for that design area. In some cases, the "Certified Design Commitment" contains elements which are not found in the actual Tier 1 design description. For example, in Table 1.6.3-1, Item 1.a), Filter Efficiencies, there are references to 95% elemental and organic iodine efficiency and 99% particulate efficiency. These quantitative filter efficiencies are not set forth in Section 1.6.3, p.1; the legal consequence may be that the 95% and 99% figures are not binding. The converse situation also occurs, *viz*., the Tier 1 design description contains a specific committment which is not accurately captured in the Table. For example, the Tier 1 design description for the Safety Injection System (SIS) states that one independant electric bus will power two SI pumps and associated valves, and a second independant bus will power the other two pumps and valves. This is not reflected in the design committment summary on Table 1.6.5-1, Item 4. In sum, there must be a concerted effort to assure that every important design commitment/requirement is actually contained in the Tier 1 design description, and that it is worded in mandatory language.

There are numerous instances where there are design commitments which do not have corresponding ITAAC. Every Tier 1 design item must have an associated ITAAC.

It may be that by completing one ITAAC, you necessarily show compliance with more than one Tier 1 item. Nonetheless, there must be a specific reference from each Tier 1 item to the corresponding ITAAC that shows that the Tier 1 item has been complied with in the final design and construction.

There is a lack of detail in many ITAAC with respect to defining with specificity the inspections and tests to be performed, the timing of such tests, and the acceptance criteria.

Contact: T. Boyce, PDST, 504-1130

SPLB COMMENTS

CE SYSTEM 80+ ITAAC

1.3.2 DESIGN FOR THE PROTECTION OF STRUCTURES, COMPONENTS, EQUIPMENT, AND SYSTEMS AGAINST DYNAMIC EFFECTS OF PIPE BREAK AND LEAK-BEFORE-BREAK

Questions:

Is this considered a generic ITAAC?

Will this ITAAC be referenced in each building ITAAC?

Comments:

No break should violate offsite dose criteria in addition to the other criteria listed.

Include pipe restraints as another means to protect safety-related equipment from pipe failures.

High-energy pipe failures are discussed. Were the effects due to moderate energy pipe failures considered (wetting of equipment)?

1.6.3 ANNULUS VENTILATION SYSTEM

Comments:

Include important instrumentation on the drawing. In general, any instrumentation for parameters important enough to require automatic action if a limit is reached should be included on the system drawings.

Identify which parts are safety-related and which are not (if any).

Ensure systems can be inspected and tested.

Identify seismic Category.

1.9.1 SPENT FUEL STORAGE

Comments:

Identify seismic category, particularly for the inspection stand. If the stand is not seismic Category 1, it might fall into the pool unless it is properly secured.

Contact: W. Burton, SPLB, 504-2853

Provide load drop analysis (or list the criteria).

Discuss the pool itself and how the racks will be anchored in the pool to prevent the racks from falling over.

Discuss the need for a criticality monitor.

Where are the new fuel vault and the spent fuel pool located (what building)?

Ensure pool and racks can be inspected.

1.9.2.2 COMPONENT COOLING WATER SYSTEM

Comments:

Add important instrumentation to the drawing (temperature, surge tank level, flow, rad monitor, conductivity).

Identify all heat loads.

Identify worst-case heat condition.

Where is equipment located (what building)?

Ensure ability to inspect and test.

Include overflow line on drawing.

Identify which parts are safety-related and which are not (if any).

Question:

When the spool piece is used to provide SSWS water to surge tank, is it then possible to have an interconnection between the 2 systems?

1.9.6 COMPRESSED AIR SYSTEMS

Comments:

Include important instrumentation on drawing.

Ensure ability to inspect and test.

Identify capacity (50%, 100%) of each train.

Discuss how loss of air is detected and system operation on loss of air.

Identify which parts, if any, are safety-related.

1.9.22.9 STATION SERVICE WATER SYSTEM (SSWS) PUMP STRUCTURE

Question;

Is this a different writeup from the SSWS?

Comments:

Identify load handling provisions in pumphouse.

Identify how safety-related equipment in pumphouse will be protected from load handling accidents.

Ensure ability to inspect and test.

1.11.1 LIQUID WASTE MANAGEMENT SYSTEM

Comments:

Include fact that LWMS also provides capability to discharge liquid waste and to recycle liquid waste for additional processing.

Identify under what modes of operation the LWMS performs its function.

Identify seismic Category.

State that there are no interconnections between the independent subsystems for each category of waste.

Indicate what the "maximum expected liquid waste volume" is and how it is created (does this include volumes of liquid waste that may be developed due to the worst case accident?).

Indicate that the rad monitor upstream of the discharge will automatically terminate the release if pre-set limits are exceeded.

Indicate that system is designed to prevent releases beyond federal limits.

Ensure ability to inspect and test.

Provide drawing.

Identify all important instrumentation on drawing.

Identify which parts of system are safety-related and which are not.

1.11.2 GASEOUS WASTE MANAGEMENT SYSTEM

Comments:

Identify under what modes of operation the GWMS performs its function.

Indicate if HEPA filters and heating units are included in the system.

Include the capability of the system to release gaseous wastes.

Include seismic category.

Identify if system is designed to withstand hydrogen detonation.

Identify if system can accommodate all situations (including a failure of a waste gas decay tank).

Identify any unmonitored or untreated gaseous release pathways, if any.

Identify all monitored and treated release pathways.

Identify the location of the plant stack, its height, and verify that it is the highest point at the site.

Ensure ability to inspect and test.

Identify that system will keep releases within federal limits.

Identify which parts of system are safety-related and which are not.

DET COMMENTS

We have reviewed the draft tier 1 design description and associated ITAAC submitted by CE on April 30, 1992. The following are our preliminary comments:

Section 1.3.2

1. Provide clear definition for terms such as "unacceptable damage" (p.2).

2. The title of this section is misleading. No discussion was provided for the design of structures, components, and equipment. The discussion of this section also has little to do with LBB.

3. The discussion is focused on meeting the ASME Code. It is noted, however, that the Code generally addresses only 40 years of design life. Verification of 60 year design life should be addressed in accordance with SECY 89-013.

4. The design description should provide a discussion on LBB bounding analysis for specified piping systems. This bounding analysis should be used as the acceptance criteria in the corresponding table.

Section 1.9.2.2

5. There is no acceptence criteria in item 6 of Table 1.9.2.2. How will evaluation of construction records help to evaluate conformance of seismic Category I design requirements?

Section 1.9.22.9

6. There is no acceptence criteria in Table 1.9.22.9.

may be site specific

interface ITAAC acceptance requirement?

NRC

— Not clear —

Seismic Cat I requirement should ASME code?

— other structural requirement

Contact: P. T Kuo, DET, 504-3147

ELECTRICAL SYSTEMS B?NCH COMMENTS

SELB notes that no pilot ITAACs for the electrical power systems have been submitted to date. SELB has reviewed the pilot ITAACs for ESF fluid systems which have safety-related electric power requirements. These include the Annulus Ventilation System, the Safety Injection System, and the Component Cooling Water System.

We note that each system uses slightly different wording for the design descriptions and the ITAAC of the electrical portions of the systems. We believe that the design descriptions; the inspections, tests, and analyses; and the acceptance criteria for the Class 1E electric power systems can be almost identical for each ESF fluid system. Therefore, CE should be requested to justify the different treatments or to make them consistent.

Contact: D. Thatcher, SELB, 504-3260

REACTOR SYSTEMS BRANCH COMMENTS

At your request in a note dated May 4, 1992, the SRXB has reviewed the CE's pilot ITAAC submittal regarding the Safety Injection System (SIS) for System 80+. Our comments are as follows:

General

1. The design description should include top tier numerical criteria such as PCT, oxidation limits, DNBR limits, limiting DBA, as well as system performance criteria such as pressure-flow capacity of SIS pumps, actuation setpoints for SIS and SITs, and sizes of key lines.

Specific

2. The acceptance criteria for the SIS did not specify the test conditions in sufficient detail to ensure that they will correspond to those expected during system challenge. Each acceptance criterion should clearly indicate the system lineups and boundary condition necessary to meet the analysis assumptions incorporated into the Chapter 6 and 15 analyses. For those tests which cannot be conducted at such conditions, the acceptance criteria should provide specific evaluation methodology to correct observed performance to a representative DBA value. This comment is applicable to all systems.

3. In order to satisfactorily resolve the Unresolved Safety Issue (USI) A-17 regarding adverse systems interactions (ASIs), ABB/CE committed, in the response to the staff review question RAI 440.127, that acceptable ITAAC program addressing ASIs will be provided. However, the staff finds that no mention is made in the ITAAC for SIS for ASI prevention. ASIs can be divided into functionally coupled, spatially coupled, and induced human intervention coupled ASIs. As discussed in Generic Letter 89-18, USI A-17 is concerned with ASIs resulting from water

Contact: S. Sun, SRXB, 504-2868

intrusion, internal floods, seismic events and pipe ruptures. For example, high or moderate energy line breaks may result in the displacement of the pipe (pipe whip); the discharge of high pressure/temperature fluid (jet impingement); increased area temperature, pressure, humidity and local flooding. An acceptable ITAAC program should include provisions to validate pipe whip and jet impingement zones of influence, and design of pipe restraint by conducting plant walkdowns. Walkdowns should verify the compartment junctions and confirm any assumptions made regarding physical plant features with emphasis on ASI prevention. Other areas of ASI concerns include validation of functionability of indicators, alarms and equipment required for safe shutdown under flooding and adverse environments during transients, and zones of influence of seismic/non-seismic interactions to be consistent with the design calculations. Therefore, the staff requests that ABB/CE expands the proposed SIS ITAAC to include plant walkdowns for confirmation of consistency between constructions and analyses addressing ASIs. This comment is applicable to all systems.

4. For the safety analysis verification, ABB/CE merely indicated in ITAAC Items 5 and 6 that the results of safety analysis should meet the following acceptance criteria: (1) for LOCA, the acceptance criteria of 10CFR50.46(b) and (2) for non-LOCA transients, the acceptance criteria of Section 15 of NUREG-0800, Revision 3.5. The staff finds that the acceptance criteria so stated are too vague. Numerical criteria of PCT, oxidation and DNBR limits should be specified in acceptance criteria. The purpose of the safety analysis verification in the ITAAC is to verify that the operation of various systems and components are consistent with the assumptions used in the safety analysis as discussed in CESSAR-DC, Sections 6.3 and 15. Therefore, the important input parameters for the safety analysis should be identified as proposed and the specific values consistent with the assumptions used in the safety analysis should be included in the acceptance criteria for the ITAAC in order to confirm the consistency between the "as built" and the "as design." For example, the acceptance criteria for SIS pump performance should include the SI pump flow rates as a function of pressure with inclusion of the upper and lower bounds for acceptable SI pump flow. The upper bound is to limit the maximum flow allowable for the limiting large break LOCA, which results from the maximum SI flow, while the lower bound is to limit the minimum flow permitted for the limiting small break LOCA, which results from the

minimum SI flow. In addition, the safety analysis considered effects of the single failure events. The worst single failure event for the SIS performance was identified as a loss off-site power (LOOP). In the analysis for the System 80+ of design, it assumed that a time of 40 seconds (including the diesel generator loading time) for the full SI flow to reach the reactor vessel for a LOOP case. Therefore, this delay time should be included in the acceptance criteria for satisfactory verification of the safety analysis. For the same reasons discussed above, the values used in the safety analysis should be included in the ITAAC acceptance criteria for parameters such as unborated water in each SI line prior to a SI actuation, the IRWST volume, SIT volume, SIT inner diameter, SIT nozzle elevation above the DVI nozzles etc..

5. Items 2 and 3 should include the references which document the requirements of the safety classes, seismic and environment qualifications for each system, structure, and component discussed in CESSAR-DC and approved by the NRC for the System 80+ design. The documented references should be considered as a part of ITAAC.

6. Item 6 - The SIS is designed for post-LOCA long term cooling (LTC). For an extended period of LTC, the SIS may need maintenance. The shielding requirements for operators to conduct the SIS maintenance during the post-LOCA LTC should be developed and included in the ITAAC acceptance criteria.

7. Item 7 - The acceptance criteria for NPSH requirements should be more specific: Actual as-built pump NPSH requirements should be verified as well as available NPSH.

8. Item 8 - This item should include test program to demonstrate the operability of SIS operating at recirculation mode (low pump flow condition) for an extended period of time. It is necessary to develop the acceptance criteria for the admission time of SI pump operating at low flow based on the worst design basis events (such as a steam line break or small break LOCA with pressure remained near the SI pump shutoff head.)

9. Item 8 - It should provide a test program to determine the SI runout flow at the worst plant condition (i.e., the refueling mode with the reactor vessel head removed or untightened).

10. Control room indication - It should provide inspections to verify presence of control room indications and alarms for the SIS as designed.

11. SIT relief valves - A test program should be provided to verify the SIT relief capability.

12. Figure 1.6.5-1 - This figure should include all the MOVs and provide "open" or "close" status for each valve during normal operating condition. Symbols consistent with that in Figure 1.7.1 of CESSAR-DC should be used to indicate the alarms in the control room, and show the valve position indicators locally located, in the control room, on local panel and/or remote shutdown panel. The relief flow paths and the relief valves in the SIS should be included in Figure 1.6.5-1.

RECOMMENDED ADDITIONS TO CE SYSTEMS 80+
PILOT TIER 1 DESIGN DESCRIPTIONS AND ITAAC

The initial plant test program (ITP) consists of a series of tests categorized as construction, preoperational, or initial startup tests. The construction acceptance tests determine installation and functional operability of equipment. Preoperational tests are those tests normally conducted prior to fuel loading to demonstrate the capability of plant systems to meet performance requirements. Initial startup tests begin with fuel loading and demonstrate the capability of the integrated plant to meet performance requirements.

The primary objectives of a suitable program are (1) to provide additional assurance that the facility has been adequately designed and, to the extent practical, to validate the analytical models and to verify the correctness or conservatism of assumptions used for predicting plant response to anticipated transients and postulated accidents and (2) to provide assurance that construction and installation of equipment in the facility have been accomplished in accordance with design.

The initial test program is conducted by a startup group in accordance with a site specific startup administrative manual (procedures). CE will provide the applicant referencing the System 80+ design with scoping documents (i.e. preoperational test specifications) containing testing objectives and acceptance criteria applicable to its scope of design responsibility. The tests demonstrate that the installed equipment and systems perform within limits of these specifications. In general, testing during all phases of the initial test program is conducted using detailed, step by step written procedures to control the conduct of each test. For all preoperational tests detailed procedures that include applicable acceptance criteria shall be made available to the NRC approximately 60 days prior to their intended use. To allow for verification that the detailed test procedures were developed in accordance with established methods and appropriate acceptance criteria, the plant and system preoperational test specifications will also be made available to the NRC. Additionally, approval for commencement of fuel loading is granted by the NRC after it has been verified that all prerequisite testing has been satisfactorily completed.

Inspection, Test, Analyses, and Acceptance Criteria

The following table provides a definition of the inspection, test, analyses, and acceptance criteria, which will be performed for CE System 80+ in order to demonstrate compliance with the preoperational test program commitments for the certified design.

Contact: T. Polich, DLPQ, 504-1038

CERTIFIED DESIGN COMMITMENT	INSPECTION, TEST, ANALYSES	ACCEPTANCE CRITERIA
The preoperational test program will be conducted in accordance with the following: a. Site Specific Startup Administrative Manual	An inspection of the site specific startup administrative manual will be performed.	It will be confirmed that the startup administrative manual includes: the requirements that govern the activities of the startup group and their interfaces with other organizations; the specific format and content of preoperational test procedures as well as the review and approval process for both initial procedures and subsequent revisions or changes; the process for review and approval of test results and for resolution of failures to meet acceptance criteria and of other operational problems or design deficiencies noted; the requirements for progressing from one phase to the next as well as those for moving beyond selected hold points or milestones within a given phase; the controls in place that will assure the as-tested status of each system is known and track modifications, including retest requirements, deemed necessary for systems undergoing or already having completed specified testing; and the qualifications and responsibilities of the different positions within the startup group.

CERTIFIED DESIGN COMMITMENT	INSPECTION, TEST, ANALYSES	ACCEPTANCE CRITERIA
b. CE Preoperational Test Specifications	An inspection of the CE preoperational test specifications will be performed.	It will be confirmed that the CE preoperational test specifications includes the following: the testing objectives; the conditions at which tests are to be conducted; testing methodologies to be utilized; specific data to be collected; acceptable data reduction techniques; and acceptance criteria.
c. Preoperational Test Procedures	An inspection of the site specific preoperational test procedures will be performed.	It will be confirmed that the site specific preoperational test procedures includes the following: the testing prerequisites; the initial conditions; the appropriate methods to direct and control test performance (including the sequencing of testing); the acceptance criteria by which the test is to be evaluated; the format by which data or observations are to be recorded; and the participation of principal design organizations in the establishment of test performance requirements and acceptance criteria.

RISK APPLICATIONS BRANCH COMMENTS

As requested, the Risk Applications Branch (PRAB) reviewed CE's Pilot ITAAC submittal. The focus of our review was to comment on how CE utilized PRA insights either to (1) identify systems or components requiring ITAAC, or (2) identify system/component requirements necessary to ensure that PRA assumptions for the certified design will be verified during construction of the plant. Based on our review, it is not clear if any effort to incorporate PRA insights in ITAAC has yet been made. There is no mention of a PRA-based structured approach that CE followed to identify adequate individual ITAAC elements, i.e., elements which address the whole spectrum of risk-important systems, structures and components (SSCs) as well as important assumptions, uncertainties, and interactions among SSCs.

The importance of incorporating PRA insights into ITAACs stems from the objective of the ITAAC process itself, which is to provide reasonable assurance that the plant will be built and operated in accordance with the design certification. This requires the ability to judge the adequacy of the individual ITAAC elements by using a structured approach (such as PRA) that links them to important design elements, their functional requirements, and ultimately the plant risk levels. The ITAAC elements should be detailed enough to provide adequate assurance that final safety decisions on the design can be made. Since these final safety decisions vary according to the significance of SSCs to the safety of the plant, insights from PRA-based "importance analysis" should be used to determine the importance of the various ITAAC elements to assuring that the as-built plant complies with the certified design.

CE is currently updating the System 80+ PRA and plans to include a section on insights about the design strengths and relative weaknesses and also provide guidance on how to use the PRA to support pre and post certification activities. This PRA-based information should be considered in developing individual ITAAC elements. It also should be used to check the completeness of the ITAAC process to ensure that no risk-significant design feature is left out and to prioritize individual ITAAC elements according to their risk importance.

I recommend that the approach that will be used to integrate PRA insights into the ITAAC process be the subject of discussion between the ITAAC and PRA teams. The application of this approach to the ITAAC process should be included in the ITAAC submittal and prove with reasonable confidence that appropriate ITAAC elements were developed for all risk-important design features. For any questions or additional information regarding these comments please contact Nick Saltos of my staff at 504-1072.

Contact: N. Saltos, PRAB, 504-1072

Enclosure 2

PROPOSED APPROACH TO ITAAC PREPARATION

1. ABB C-E PREPARE AN OUTLINE (TABLE OF CONTENTS) OF TIER 1 DOCUMENT AND SUBMIT TO NRC

2. NRC AND ABB C-E NEGOTIATE AND AGREE TO CONTENTS OF THE TIER 1 TABLE OF CONTENTS

3. BOTH ABB C-E AND NRC ASSIGN SPECIFIC ITAACs TO RESPONSIBLE TECHNICAL AREAS

4. TECHNICAL REPRESENTATIVE FOR EACH AREA MEET AND NEGOTIATE AN OUTLINE OF THE ACCEPTANCE CRITERIA FOR EACH ITAAC

5. THE DRAFT OUTLINES FOR THE ACCEPTANCE CRITERIA WILL BE CIRCULATED WITHIN NRC AND ABB C-E TO OBTAIN MANAGEMENT CONCURRENCE

6. DIFFERENCES WOULD THEN BE NEGOTIATED AND JOINTLY AGREED TO OUTLINES WOULD BE ISSUED

7. BASED ON THE ACCEPTANCE CRITERIA OUTLINES, ABB C-E WILL WRITE THE DESIGN DESCRIPTIONS AND ITAACs

8. ABB C-E SUBMIT TIER 1 DESIGN DESCRIPTIONS AND ITAACs TO NRC FOR COMMENT

Enclosure 3

MEETING ATTENDEES

MAY 20, 1992

NAME	ORGANIZATION
T. Boyce	NRR/ADAR/PDST
T. Wambach	NRR/ADAR/PDST
W. Burton	NRR/DST/SPLB
S. B. Sun	NRR/DST/SRXB
S. O. Ninh	NRR/ADAR/PDST
Sam Lee	NRR/DET/ESGB
P. T. Kuo	NRR/DET/ESGB
David Tang	NRR/DET/ESGB
L. Kopp	NRR/SRXB/DST
C. Hinson	NRR/DREP/RPB
N. T. Saltos	NRR/DREP/PRAB
A. El-Bassioni	NRR/DREP/PRAB
M. Chiramal	NRR/DST/SICB
H. Windsor	ABB-CE
J. R. Ree	ABB-CE
James E. Robertson	ABB-CE
J. Longo, Jr.	ABB-CE
C. B. Brinkman	ABB-CE
G. D. Hess	ABB-CE
M. D. Ceraldi	DE&S