POLICY ISSUE
(Information)

September 22, 1992 SECY-92-327

For: The Commissioners

From: James M. Taylor
Executive Director for Operations

Subject: REVIEWS OF INSPECTIONS, TESTS, ANALYSES, AND ACCEPTANCE CRITERIA (ITAAC) FOR THE GENERAL ELECTRIC (GE) ADVANCED BOILING WATER REACTOR (ABWR)

Purpose: To inform the Commission of the status of the development of ITAAC for the GE ABWR. This paper provides a summary of recent staff reviews and ongoing activities to address weaknesses in the current ITAAC submitted by GE, "Tier 1 Design Certification Material for GE ABWR Design."

Background: The requirement to provide ITAAC for a design certification application is contained in 10 CFR 52.47. In previous Commission papers, the staff discussed various aspects of ITAAC, including SECY-91-178, "Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) for Design Certifications and Combined Licenses," SECY-91-210, "Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) Requirements for Design Review and Issuance of a Final Design Approval (FDA)," and SECY-92-214, "Development of Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) for Design Certifications." In the staff requirements memorandum for SECY-91-178, the Commission directed the staff to keep it informed of the continuing interaction with industry on ITAAC.

Discussion: The staff and industry are developing ITAAC for certifying standard designs. In SECY-92-214, the staff discussed the status of the ITAAC for the GE ABWR, which is the lead plant for developing ITAAC for the evolutionary designs.

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In SECY-92-214, the staff noted that it had found significant inconsistencies between the standard safety analysis report (SSAR), Tier 1 design descriptions, and the ITAAC. The staff completed its initial reviews of all of the GE ITAAC and provided detailed initial comments to GE. Additionally, the staff organized two groups to more clearly define the issues regarding the adequacy of the ABWR ITAAC. In April 1992, a group of senior NRC managers with broad experience and extensive expertise in plant operations, inspections, and licensing was formed to examine the ITAAC. This group of senior managers, known as the Greybeard Committee, reviewed various aspects of the design certification process and specifically the ABWR ITAAC. Upon completing these reviews, the committee concluded that, overall, the design certification process could provide sufficient information for the staff to make a final safety determination on the GE ABWR design. However, based upon the material reviewed by the Greybeard Committee, the information that has been provided, thus far, by GE is not sufficient for the staff to make a final safety decision. Enclosures 1 through 4 describe the Greybeard Charter, items reviewed, and findings.

The staff also organized an ITAAC Working Group, consisting of inspection staff from each region and engineers from the Office of Nuclear Reactor Regulation. This group reviewed the ABWR system design descriptions, ITAAC, and SSAR sections for 10 ABWR systems from an inspection perspective. The group majority concluded that the level of detail contained in the Tier 1 document, if changes found by the group were made, would be sufficient for the staff to make a finding of reasonable assurance of safety for a facility. However, a minority within this inspection group found that the level of detail would not be sufficient to make a finding of reasonable assurance even if the noted changes were made. Enclosure 5 is the report of the ITAAC Working Group. The staff has sent all of its comments to GE, the Advisory Committee on Reactor Safeguards, Westinghouse, Combustion Engineering, and the Nuclear Management and Resources Council (NUMARC).

The results of these two additional review efforts reinforced the staff's earlier findings as noted in SECY-92-214. The review groups confirmed the staff's previous findings that the current ITAAC are not of adequate quality, and reiterated a concern that the current ITAAC do not contain sufficient depth and scope of material. The staff has provided its concerns on the appropriate level of detail to be included in the ABWR ITAAC, and its concerns on the inadequate quality of the ABWR ITAAC to GE. The two review group findings have also been provided to the vendor.

The Office of Nuclear Reactor Regulation (NRR) is reviewing its previously identified concerns with GE to determine the actions GE should take to improve the quality of and ensure that the ABWR ITAAC contain the appropriate level of information. Additionally, the staff is conducting a detailed review of the findings from the two review groups. This assessment will be factored into the staff's interaction with GE on final ITAAC development.

As discussed in SECY-92-214 and the reports of the reviews in the enclosures, GE and the staff will continue to develop the ABWR ITAAC in an interactive process. While GE has made progress in developing the ITAAC, significant work remains to be done, and significant improvement is needed in the quality of the ABWR ITAAC. In recognition of the deficiencies with the ABWR ITAAC, industry, with GE support, initiated a task group effort to conduct a system by system review. This group began its review during the week of September 7, 1992, and is expected to finish in mid October 1992. The staff participated in the kick-off meetings held in GE's offices in San Jose. The staff will monitor the progress of this group and participate in meetings on an "as requested" basis.

Additionally, the staff has organized a Task Group to review the revised ABWR ITAAC. The ITAAC Review Task Group will include engineers from NRR and the regional offices with technical review and inspection experience. This group will conduct a review of 100 percent of the revised ITAAC to verify the quality of each of the ITAAC. The ITAAC Review Task Group will start its review after a certified submittal is received from GE. The group will also communicate and coordinate with GE, NUMARC, and other industry groups to review the GE ABWR ITAAC. The staff will use the results from these efforts when it reviews the ITAAC for the CE System 80+, Westinghouse AP600, and GE SBWR designs.

GE submitted their complete set of ITAAC on June 1, 1992, as supplemented by a June 18, 1992, submittal. This submittal is more complete than previous submittals. However, this document is not of high quality. In a letter dated May 29, 1992, the staff requested that GE certify the quality of the Tier 1 material. GE indicated its intent to do so in a subsequent letter. In a letter dated August 12, 1992, the staff provided detailed comments on the June ITAAC submittals, and requested that GE provide this certification by September 30, 1992. At present, the staff expects that this certification will be submitted by GE in October or November 1992 after the GE task group has completed its review.

Significant work remains to be completed before the staff can use GE's Tier 1 design certification material to support the issuance of the ABWR final design approval (FDA). While GE is initiating an intensive ITAAC review and revision effort, no estimates of the amount of slippage in the FDA schedule have been made.

James M. Taylor
Executive Director
for Operations

Enclosures:
1. Greybeard Memo
   dated July 31, 1992
2. Greybeard Memo
   dated July 30, 1992
3. Greybeard Memo
   dated July 22, 1992
4. Greybeard Memo
   dated June 29, 1992
5. ITAAC Working Group Memo
   dated July 28, 1992

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

July 31, 1992

MEMORANDUM FOR: Thomas E. Murley, Director
Office of Nuclear Reactor Regulation

FROM: Greybeard Committee

SUBJECT: RESULTS OF THE "GREYBEARD" COMMITTEE REVIEW OF THE 10 CFR 52 LICENSING PROCESS FOR THE GE ABWR

Background

At your request, a committee of senior NRC managers was formed in April 1992 in order to review the 10 CFR 52 licensing process as it had been applied to the GE ABWR. The specific charter of the committee (known as the Greybeards) was:

1) To determine if the NRC staff could make a final safety decision for the GE ABWR based on the design information available in the Standard Safety Analysis Report (SSAR), the Tier 1 design description and the Inspection, Tests, Analyses, and Acceptance Criteria (ITAAC).

2) To determine if a sufficient and appropriate scope and level of detail was contained in the Tier 1 design certification process (Design Description and ITAAC).

The Greybeard Committee met on May 5, May 29, July 9 and July 23 to review and discuss various aspects of the design certification process and the GE ABWR application. Specifically, the Greybeards reviewed the Standby Liquid Control System (SLCS) SSAR, Tier 1 design description and ITAAC; the piping system Design Acceptance Criteria (DAC) including the applicable SSAR sections, the associated ITAAC and the staff's Safety Evaluation Report (SER); the Electrical Distribution System SSAR, Tier 1 design description and ITAAC; and the generic ITAAC for equipment qualification (EQ). The Greybeard Committee reported the detailed findings resulting from these reviews in memos to you of June 29, July 22 and July 30.

Conclusions

Overall, the committee found that the design certification process could provide sufficient information for the staff to make a final safety determination on the GE ABWR design. However, based upon the material reviewed by the Greybeard Committee, the information that has been provided thus far by GE is not sufficient for the staff to make a final safety decision. When satisfactorily completed, the combination of the SSAR, the Tier 1 design description and the associated ITAAC/DAC can form an adequate basis for the staff to make an informed safety decision on the design.

ENCLOSURE 1

The committee noted a number of weaknesses or deficiencies in the implementation of the design certification process which must be corrected in order to form an adequate basis for making the "final safety" decision. The detailed items were provided in the previous memos. General areas of weakness or deficiency are discussed below.

1) The committee noted "QA" type problems with the SSAR and Tier 1 information. These problems included both errors in the documents as well as differences between the documents. These errors need to be corrected and assurance obtained from GE that the documents have been QA'd.

2) In general, the committee concluded that the ITAAC submitted by GE (DAC/ITAAC in the case of piping design) did not contain sufficient detail. The committee believes that prior to certification there must exist a clear understanding of commitments to all the activities that need to be accomplished to ensure that the as-built matches the design.

3) The ITAAC appear to have an over reliance on process inspections vice observable testing and field verification of the installation.

4) There appears to be unnecessary and confusing overlap between the three ITAAC columns. Each of the columns should only address the appropriate information (design commitment; inspections, tests and analysis; or acceptance criteria).

5) GE needs to better describe what will be covered by a generic ITAAC, how the generic ITAAC and the system specific ITAAC intersect and overlap, and how the various system specific ITAAC interrelate.

6) There is a need for a bridge document from Tier 1/ITAAC to pre-op and startup testing programs.

7) GE should identify applicable codes in the ITAAC/DAC and include the appropriate version in the SSAR.

Recommendation

The Greybeard Committee recommends that a review group of technical reviewers and regional/field experienced people be formed to perform a 100% review of the GE ABWR ITAACs in order to ensure that the problems identified by the committee are corrected in all of the ITAAC. The review group should ensure that all critical design certification information, including design verification requirements, are adequately addressed in the ITAAC. For other important information or requirements, a clear reference should be included in the Tier 2 or COL documentation such that a solid commitment exists prior to certification.

James H. Sniezek

James H. Sniezek
Deputy Executive Director
for Nuclear Reactor Regulation,
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cc:
Greybeard Committee members
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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555

July 30, 1992

MEMORANDUM FOR: Thomas E. Murley, Director
Office of Nuclear Reactor Regulation

FROM: Greybeard Committee

SUBJECT: SYNOPSIS OF ITEMS DISCUSSED DURING "GREYBEARD" MEETING ON JULY 23, 1992

On July 23, 1992, the members of the Greybeard Committee met with you and others from NRR to discuss the specific ITAAC for the ABWR electric system, and other issues related to the Part 52 licensing process.

Prior to this meeting, the Committee had received from the staff ABWR Station Electric and Equipment Qualification material, including: 1) Design Description and ITAAC, and 2) applicable SSAR sections. A comparison was made between these documents with the objective to determine if the design information available within the ITAAC is sufficient for the staff to make a final safety determination to support design certification and that ITACC performance will demonstrate that the as-built conforms to the certified design. The Committee reviewed these issues and a synopsis of the results is discussed below.

- Codes and standards, for example IEEE 279, should be referenced in the ITAAC. The applicable codes and standards should be identified in the ITAAC with the specific edition identified in the Tier 2 document. It was noted that the piping DAC/ITAAC (July 9 Committee review) was a good example of applicable codes and standards being identified in the DAC/ITAAC.

- Additionally, it was noted that the SSAR does not necessarily address specifically which codes/standards apply. The SSAR should reference the codes and standards that apply to the issues covered.

ENCLOSURE 2

- In general, for column 2 of the ITAAC, inspections are listed to be performed, these inspections are not always explicit as to what is expected. Is it assumed that inspections involve field verification that the as-built is in conformance with the design? "Inspection" needs to be defined.

- There was general agreement between the Committee and the staff that "inspection" as related to hardware will be a verification that the as-built agrees with the design. Inspections related to documentation or process will imply a QA review to confirm the process/documentation. It is imperative that the "what" and "how" of inspection and testing be clearly delineated in all cases.

- In general, there was an unacceptable lack of specific testing requirements in ITAAC, column 2. The Committee concluded that additional test requirements need to be incorporated into the ITAAC. For the ITAAC reviewed, the Committee highlighted to the staff numerous examples in this regard.

- Because of the difficulty, at this stage, in determining for some ITAAC whether a test or an analysis will be appropriate for the as-built plant, the Committee discussed the possibility of specifying in column 2 the option of either a test or an analysis, with the stipulation that the selected option results in the specified acceptance criteria being met. This option should only be allowed for those selected cases wherein the staff cannot conclude that testing is warranted.

- In general, terms such as "when required" and "where justified" should not be used in the ITAAC. Be specific or make the determination that the item does not need to be in the Tier 1 document. For example, in reference to Table 2.12.1, ITAAC 4 addresses redundant overcurrent devices and ends in a non-specific term. It was noted that this item is covered in detail in Table 2.12.10 and should be eliminated from the distribution system ITAAC. In reference to Table 2.12.1, ITAAC 6 addresses cable routing through hostile areas and uses a non-specific term. The hostile areas to be considered should be specifically addressed or this item should be removed from the ITAAC if it is not important.

- The "Design Description" and column 1 of the ITAAC need to be consistent. GE should be required to QA the ITAAC, Design Description, and SSAR to ensure consistency.

- The Committee noted that related topics may end up being covered in several ITAAC. An example of this is the reference to the 3 hour fire barrier which is included in both the penetration and fire protection ITAAC. Although these items need only be addressed in one ITAAC, a mechanism must exist to ensure that this type of item is covered somewhere. Cross-referencing between ITAAC may be required. The committee gave an example, Table 2.12.13, ITAAC 2, where this type of item (in this case, seismic qualification) was properly referenced to the appropriate ITAAC, Generic Equipment Qualification.

Note: Most of the specific comments listed below are directed toward ITAAC associated with Table 2.12.1. Some are generic to all electrical system ITAAC. For this reason not all specific comments made by the Committee are noted here. Of the ITAAC reviewed, several were better than the others; for example the EDG system ITAAC was more in line with the expectations of the Committee.

- In reference to Table 2.12.1, ITAAC 4.b is an example of an inspection which will not get to the field. This is actually a QA of the design. For this example, the review of the cable selection criteria (QA/QC) and the as-built verification need to be part of the ITAAC. Generically, for similar requirements, field verifications also need to be addressed.

- In reference to Table 2.12.1, ITAAC 1, the ITAAC should address whether the main output circuit breaker design incorporates dual or single trip coils. Incorporating dual trip coils is important from a reliability standpoint because the breaker must be open to allow for backfeeding from the main power transformer (normal preferred power) if a loss of the main generator should occur. Additionally, opening the breaker ensures that motoring of the main generator does not occur.

- In reference to Table 2.12.1, ITAAC 4.a should address testing of the bus protection system. In this case the protection system refers to the hierarchy logic for preferential tripping of breakers to ensure that the higher level loads (switchgear and buses) are not lost. This should also be considered as a certified design commitment.

  The ITAAC should also address <u>how</u> a field verification is to be performed to ensure breakers that are installed meet the design requirements.

- In reference to Table 2.12.1, ITAAC 4.b should have a test specified which confirms independence.

- In reference to Table 2.12.1, for ITAAC 5.a, 5.b, and 5.c the acceptance criteria need to be covered more broadly.

- In reference to Table 2.12.1, ITAAC 6.d uses the term "separation" without specifying what is meant by separation; i.e., distance, barriers, etc.

- In reference to Table 2.12.10, ITAAC 1 refers to 3 hour fire barriers. This item is to be covered in the fire protection ITAAC and should specifically address testing to confirm/ certify the 3 hour specification.

In addition to the electric system specific review, the Committee had comments on several aspects of the overall DAC/ITAAC process.

- The NRC should develop a plan that describes the details of the staff approval and verification process leading to fuel load.

- A commitment associated with the Integrated Test Plan (ITP) should be identified in conjunction with the ITAAC. The concept should be to incorporate the requirements contained within the COL, SSAR, and DAC/ITAAC, allowing for cross-referencing, into the ITP. The cross-referencing process must have a high level of assurance that the final ITP is all inclusive.

- As stated in previous Committee meetings, traceability of requirements between the DAC/ITAAC, SSAR, and SER is considered a problem. The "Road Map" provided by GE for application of the generic ITAAC is considered to be inadequate.

  The Committee discussed the possibility of having a better format for the ITAAC. With the present format, information is difficult to trace between the applicable documents, thereby unnecessarily complicating reviews. In response to this, the staff noted that it may be too late in the ABWR licensing process to change formats; however, some worthwhile changes may be made within the present format. The staff will review this possibility.

  As discussed in the previous meeting, there is overlap between the three columns of: 1) commitments; 2) inspections, tests, (and) analysis; and 3) acceptance criteria. The staff is planning a review to ensure that the ITAAC are properly formatted.

- The Committee's review of GE ABWR application material (SSAR,DAC/ITAAC, etc.) did not reveal any discussion or commitments pertaining to equipment reliability requirements or certification. The Committee concluded that reliability expectations associated with significant safety related components (emergency diesel generators, key MOV's, etc.) should be addressed in appropriate ABWR licensing documents.

These issues are being provided for the purpose of capturing some of the thoughts expressed in the meeting and to allow for the development of actions to address the issues.

James H. Sniezek

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

JUL 22 1992

MEMORANDUM FOR: Thomas E. Murley, Director
Office of Nuclear Reactor Regulation

FROM: Greybeard Committee

SUBJECT: SYNOPSIS OF ITEMS DISCUSSED DURING "GREYBEARD" MEETING ON JULY 9, 1992

On July 9, 1992, the members of the Greybeard Committee met with you and others from NRR to discuss the specific DAC/ITAAC for the ABWR piping design, and other issues related to Part 52 licensing process.

Prior to this meeting, the Greybeards had received from the staff ABWR Standard Plant Piping Design DAC Material, including: 1) Design Description and ITAAC; 2) Draft Safety Evaluation Report; and 3) SSAR. A comparison was made between these documents with the objective to determine if the design information available within the DAC is sufficient for the staff to make a final safety determination to support design certification and that ITACC performance will demonstrate that the as-built conforms to the certified design. The Greybeards debated these issues and a synopsis of the results of the review is discussed below.

* Generally, the consensus was that the ITAAC was not specific enough. Although the overall process of DAC/ITAAC for piping (when completed) should provide sufficient bases for arriving at the required safety decision, a great deal of clarifying information is still needed and GE must provide the missing data. Changes were recommended to correct these concerns. Based on the panel's overall review of DAC/ITAAC, the staff should address what additional specificity can or should be covered in Tier 1, the COL, or Tier 2.

* The staff is awaiting information supplied by GE in order to complete the SER. The NRC staff should consider sending the draft SER to GE and request that GE provide the missing information. It is understood that the project would never be completed if the NRC did not move forward with the licensing review in parallel with GE filling in the "holes."

* Traceability of requirements between the DAC/ITAAC, SSAR, and SER was considered a problem. GE will be providing a "Road Map" to show the relationship between the three documents and their specific items. Along with this concern, there is a need for the staff to ensure that the SER "tracked" with the SSAR, ITAAC, etc.

ENCLOSURE 3

* The committee view is that if the NRC expects the COL holder to perform certain items it must be specified in non-general terms within the DAC/ITAAC or as a condition of the COL. In any event, such items should be clearly delineated so they are understood prior to certification.

* The point was made at the beginning of the discussion that DAC is the process and ITAAC, for this case (piping design), is the document containing the twelve items with three columns. Overall, section 3.3 of the submittal is the General Design Commitment.

* Generally, for the twelve ITAAC items, instead of using "applicable" specify the item requirements that apply.

* The issue of addressing "erosion/corrosion" was discussed in detail. Should this issue be addressed in the ITAAC or will it be covered in sufficient detail under the in-service inspection program? No consensus was arrived on this matter; however, it was agreed that the staff should re-examine this matter and decide on the appropriate treatment of this important issue.

* The question came up as to why the ASME code isn't specified in the ITAAC. It appeared to the committee that the version endorsed by 10 CFR 50.55a at the time of the COL application should apply.

* The issue of Leak-Before-Break (LBB) was discussed and the subject of LLB being addressed by the staff in the SER when GE is not proposing LLB in their Generic Piping Design. LBB should be removed from the application process unless the NRC has an acceptable LBB method to endorse.

* The use and the definition of the word "essential" was not consistent. "Essential" will be defined.

* The ITAAC should be more specific in regards to piping system description and address which ITAAC covers which code class or piping system. It was noted that a matrix is available which addresses this issue (piping system vs. code class). The suggestion was made that the matrix be referenced in section 3.3. This will result in the last sentence on page 3.3-1, section 3.3, being specifically addressed.

* General comment pertaining to all ITAAC and the SER: If the term "safe shutdown" is to be used, it should be defined. Best solution is probably to eliminate use of the term and specify "hot or cold shutdown" as appropriate.

* General comment pertaining to all ITAAC: There is overlap between the three columns of: 1) commitments; 2) inspections, tests, (and) analysis; and 3) acceptance criteria. In summary, the staff will perform a review to ensure that the ITAAC conform to: column 1 having commitments only; column 2 addressing methods (how); and column 3 addressing acceptance criteria only. For acceptance criteria (column 3), items such as input parameters and expected results should be included.

* The SER terminology referring to safety-related and important-to-safety should be clarified. It appears that the two are used interchangeably; the staff should stay with one, safety-related.

* Regarding the agency's final safety determination, the staff should ensure the ITAAC provide what is required for the design to be verified and tested. If something is not adequately covered by the ITAAC, it should be specified as a COL requirement.

* Specific to paragraph 2.3 of the SER and in general, a requirement should not be placed upon the NRC staff. If a requirement is necessary, it should be placed on the licensee.

* The staff should review section 9 of the SER to ensure that changes reflected in the DAC/ITAAC are incorporated in the SER.

* The staff should delete from paragraph 6.12 of the SER the reference of the COL holder seeking (after staff acceptance of the rules) use of ASME Code, Section III, Subsection NF, incorporating N-690.

* Specific to ITAAC #1:

  There were questions on the need for environmental effects to be addressed. The newer version, not provided to the Greybeards, addresses this issue; therefore, environmental effects review is now a Tier 1 item. However, a staff position is still needed.

* Specific to ITAAC #2:

  The staff should address how the COL holder is committed to vendor allowed limits on vendor supplied equipment.

  A GE provided matrix, discussed previously, should aid in making this ITAAC more specific in regards to the codes.

  A distinction should be made between requirements which are specific to: 1) pipe mounted components/equipment which are part of the pressure boundary and 2) components/equipment which are attached to the pipe outside of the pressure boundary.

* Specific to ITAAC #3:

  There was some discussion on the use of the word suitable. The use of methods approved by the NRC would be more specific. The point was made that specific methods are addressed in the SER.

* Specific to ITAAC #4:

  As discussed previously, reference to LBB should be removed; the staff should not pre-approve this item.

  A walkdown should be included as part of column 2.

* Specific to ITAAC #6:

  In reference to column 3, the subject of benchmarking should be placed in either column 1 or 2, as appropriate.

* Specific to ITAAC #7:

  The subject of fabrication inspections was discussed. The ITAAC should address requirements for licensee inspections in this area, as appropriate; this area should be Tier 1 or a condition of the COL.

  The ITAAC should address in process inspection of the implemented code program. The existence of code stamping meets only the requirement for the stamp; it does not ensure that the process is satisfactory.

* Specific to ITAAC #9:

  As in ITAAC 7, the subject of fabrication inspections should be addressed. Column 2 should address fabrication and welding processes.

* Specific to ITAAC #10:

  Remove references to resolution of deviations; this terminology should not be used in the rule as it tends to condone not meeting requirements. As a replacement for specifically addressing deviations in column 1, consider adding a commitment that a reconciliation process/method be available to address deviations should they be identified.

  In column 2, paragraph b., second to last line, should require verifications by both reviewing isometric drawings and by taking the as-built measurements.

* Specific to ITAAC #11:

  There was discussion on the terminology referring to hydrostatic testing. Agreement was made on the use of pressure testing in place of hydrostatic testing. Also, change internal pressures to design pressures.

These issues are being provided for the purpose of capturing some of the thoughts expressed in the meeting and to allow for the development of actions to address the issues.

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Regional Operations and Research

cc:
Greybeard Committee members
D. Crutchfield
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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555

June 29, 1992

MEMORANDUM FOR: Thomas E. Murley, Director
Office of Nuclear Reactor Regulation

FROM: Greybeard Committee

SUBJECT: SYNOPSIS OF ITEMS DISCUSSED DURING "GREYBEARD" MEETING ON MAY 29, 1992

On May 29, 1992, the members of the Greybeard Committee met with you and others from NRR to discuss DAC, ITAAC, the specific ITAAC submitted for the Standby Liquid Control System (SLCS), and other issues related to the Part 52 licensing process.

Prior to this meeting, the Greybeards had received from the staff the design bases and system description, the P&ID, and the system ITAAC for SLCS for the ABWR Standard Plant. These were compared against the GE SLCS test specifications, SER, UFSAR, and pre-op test procedure for Hope Creek. The objective was to determine if the design information available in the SSAR, the Tier I description, and the ITAAC for a sample system (SLCS) would be sufficient for the NRC staff to make a final safety decision. The approach was to assume the role of an inspector and evaluate the information needed to fully design, construct, inspect, and test the system. A list of the SLCS attributes that would need to be demonstrated, verified or tested for an inspector to consider SLCS complete and able to perform its functions was developed. The Greybeards then debated these attributes to discriminate which are necessary for a safety decision, and hence part of Tier I and ITAAC, and which could be considered Tier II, other design information, or other verification activities. A synopsis of the results of this review is discussed below.

The current plan for the Greybeards is to perform another review, the same as was done for SLCS, on a second system. Since SLCS is a relatively simple, straightforward, fluid system, we have chosen Onsite Emergency Power (plus its interface with Offsite Power) for contrast as the second system because it represents a more complex, interconnected, electrical system. In order to evaluate GE's DAC, we have chosen to review the DAC for piping. The review would be similar to SLCS above, except for the testability aspect. In order to evaluate the Generic ITAACs, the Environmental Qualification ITAAC was chosen for a similar review. Your staff has been asked to provide us with the similar information as was provided for SLCS to accomplish these reviews.

ENCLOSURE 4

The following represents a synopsis of some of the issues discussed at the meeting:

* Legal Issues - Much of the discussion at the meeting centered around the legal status, changes, enforcement, and burden of proof for Tier 1 and Tier 2 information. OGC (M. Malsch, J. Scinto) pointed out: (1) the words in the rule indicate that "if the licensee meets the acceptance criteria, the plant will operate," (2) if the information is in Tier 2, the staff is stuck with the verification, (3) "if the information is missing, then that means it was determined to not be necessary," 4) the concept is that the Tier 1 and Tier 2 information is sufficient, nothing else is necessary, (5) if Tier 1 criteria are not met, then license requirements are not met and changes mean rule changes, (6) if Tier 2 criteria are not met, then the normal enforcement process is used and changes are processed via 50.59. Because of some confusion over these type issues, OGC agreed to develop a white paper clarifying the legal issues. Other questions in this area included: What is the status of Tier 2 material and how will it be verified? How does a COL holder commit to a pre-operational test program that includes Tier 1 and ITAAC requirements?

* Responsibility - Several of the Committee members felt that it would create a big problem if the burden of proof rested with the NRC to show that criteria were not met versus the licensee having the burden of proving that the criteria were met.

* Overall Process - NRR needs to develop a process that describes the details of the approval and verification process leading to fuel load.

* Generic ITAAC - There needs to be a better understanding of what may be covered by a generic ITAAC, and how the generic ITAAC and the system specific ITAAC intersect and overlap.

* SLCS Specific ITAAC - Review and discussion of the GE provided SLCS ITAAC resulted in the general conclusion that there were several inadequacies in it, indicating poor quality assurance of the submittal. As reviewed, the SLCS ITAAC appeared to be inadequate for the staff to arrive at a positive safety conclusion. Specific deficiencies are contained in the enclosure.

* Other Topics - There is a need for a bridge document from Tier 1/ITAAC to pre-op and startup testing programs. There is also a need for a bridge document from Tier 1/ITAAC to the detailed system drawings. Can the ABWR heat up on pump heat alone in order to accomplish hot functional testing? What is the process for ensuring that Tech Specs are consistent with Tier 1/ITAAC and Tier 2?

These issues are being provided for the purpose of capturing some of the thoughts expressed in the meeting and to allow for the development of actions to address the issues.

James H. Sniezek

James H. Sniezek
Deputy Executive Director
for Nuclear Reactor Regulation,
Regional Operations and Research

Enclosure:
As stated

cc w/enclosure:
Greybeard Committee members

SLCS ITAAC DEFICIENCIES

1. The SSAR states that the system is sized for injection in 60 to 150 minutes while the Tier 1 description states 50 to 150 minutes.

2. The SSAR states that 800 ppm concentration in the vessel is needed while the Tier 1 description states that 850 ppm is needed.

3. There are no minimum and maximum boron injection rates in the Tier 1 description while they are stated in the SSAR (8 to 20 ppm/min). It is unclear as to whether these values coincide with other ITAAC parameters.

4. The locked open valve with remote indication noted in SSAR section 9.3.5.4 isn't shown in the system P&ID.

5. While the SSAR states that the system is automatically initiated or can be manually initiated, the ITAAC doesn't test the manual initiation.

6. The Tier 1 description indicates that the system is independent of normal reactivity control, but this aspect isn't tested in the ITAAC.

7. Figure 9.3-2 of the SSAR indicates a minimum tank volume of 5760 gallons while Tier 1 and the ITAAC indicate a minimum of 6100 gallons.

8. The "functionality" of the tank heaters needs to be tested in the ITAAC. Currently, only the fact that the heaters can be powered by standby AC is tested.

9. A better system diagram is needed in the ITAAC and the words in ITAAC relating to inspection to the diagram need to be changed. The inspection would probably be to the functions as depicted in the diagram.

10. The ITAAC test pressure needs to be changed from 1250 to 1560 psig.

11. The ITAAC needs to delineate "natural boron" vice "poison". The acceptance criteria of 850 ppm is unclear relative to the 25% dilution factor.

12. The pumps should be tested as individual 50 gpm units in addition to the 100 gpm combined test.

13. It was noted that the SLCS preop tests (SSAR 14.2.12) noted in SSAR 9.3.5.4 are currently insufficient. They need to be more detailed and have some top level performance criteria.

14. The interlock that causes RWCU isolation upon actuation of SLCS isn't in the ITAAC.

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

July 28, 1992

MEMORANDUM FOR: Thomas E. Murley, Director
Office of Nuclear Reactor Regulation

THRU: Dennis M. Crutchfield, Associate Director
for Advanced Reactors and License Renewal
Office of Nuclear Reactor Regulation

FROM: A. Bill Beach, Director
Division of Reactor Projects
Region IV

SUBJECT: ITAAC WORKING GROUP

During the week of July 13, 1992, an ITAAC Working Group, consisting of members from each of the Regions and the Office of Nuclear Reactor Regulation (NRR), met in Region IV to review the GE ABWR TIER 1, Stage 3 document dated May 30, 1992. The working group members and their charter are provided in Enclosure 1. The purpose of the review was to provide an independent look at the ITAAC process from an inspection perspective and to draw conclusions regarding its soundness and feasibility.

The group reviewed the Design Descriptions, ITAACs, and the SSAR sections for the following systems: 1) Nuclear Boiler, 2) High Pressure Core Flooder, 3) Reactor Recirculation, 4) Recirculation Flow Control, 5) Reactor Building Cooling Water, 6) Emergency Diesel Generator, 7) AC Electrical Distribution, 8) AC Power Supply, 9) Primary Containment, and 10) Control Building. Specific comments on each of systems are provided in Enclosure 2. General comments and conclusions are as follows.

The group concluded that the Part 52 process developed by the staff is both sound and workable. The process has several substantial benefits. It will keep the staff focused on safety, hardware, and engineering, and will provide for regulatory coherence in the licensing process. The process will also provide a framework for plant standardization, yet will be flexible enough to provide for problems which develop during construction. It is apparent that significant staff effort has been involved in making the process both sound and feasible.

CONTACT:
A. Bill Beach, RIV
817-860-8223

ENCLOSURE 5

Although the group believes that the process is workable, it had several concerns regarding it and the GE TIER 1 document. The group recognizes that any new process is iterative; however, it is concerned that there are still substantial issues which need to be resolved before the staff can finalize what is required in the TIER 1 document.

As a result, the group had difficulty reaching a conclusion with respect to the level of detail required in the TIER 1 document for the staff to make a finding of reasonable assurance that a plant has been built and will operate safely in accordance with the design certification. The majority of the group concluded, based on their reading of Part 52, that the level of detail contained in the TIER 1 document, with these changes incorporated such as those suggested by the group for the specific systems reviewed (described in Enclosure 2), would be sufficient for the staff to make the reasonable assurance finding. However, there was a minority view within the group, that even with the recommended changes, the level of detail would not be sufficient to make such a finding.

The group also noted some significant deficiencies in the quality of the GE TIER 1 document. Specifically, the ITAACs identified by GE relied heavily on after the fact review of documentation of installation and testing of equipment rather than specifying in-process testing and in-plant verification. The group identified several discrepancies (identified in the specific system comments) between the information contained in the SSAR, the Design Description, and the ITAAC. The group also noted inconsistencies in the level of detail in the various ITAACs reviewed, with some containing more detail than necessary and some less. The group noted that comprehensive testing for trips, permissives, interlocks, controls, alarms, and computer points were not always apparent. In addition, design values were often specified without allowable tolerances. This was particularly evident for those instances in which wall and floor thicknesses were specified to the inch and specific volumes were provided. The group was concerned that the lack of tolerances could create a burden during construction.

The group concluded that the use of generic ITAAC for specific areas such as equipment qualification is a good approach.. However, the group suggests that the generic ITAAC be referenced in the system ITAAC when applicable. This will assure a set of complete ITAAC for each system.

During the review, the group questioned how non-safety-related equipment would be treated in the Design Certification Process. In addition, the group believed that there were several issues regarding implementation of the Part 52 process which require resolution. These include the treatment of startup and power ascension test programs and plant technical specifications.

The group appreciated the opportunity to participate in review process and would encourage early regional involvement in the review of the ITAACs for other plant designs.

A. Bill Beach, Director
Division of Reactor Projects
Region IV

Enclosures:
As stated

Distribution:
Central Files
JSniezek, EDO
FJMiraglia, NRR
WTRussell, NRR
FPGillespie, NRR
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RKnopp, RIII
JLMilhoan, RIV
WJones, RIV
JBMartin, RV
DKirsch, RV
MSlosson, NRR
JSharkey, NRR
ADAR R/F

*see previous concurrence

OFC	RIV	PDST:ADAR*	ADAR:NRR		
NAME	ABBeach:bt	THBoyce	DMCrutchfield		
DATE	07/28/92	07/24/92	07/28/92		

DOCUMENT NAME: BILL

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
611 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TEXAS 76011-8064

ENCLOSURE 1

JUL 13 1992

MEMORANDUM FOR: Dennis M. Crutchfield, Director
Division of Advanced Reactors & Special Projects (DAR)
Office of Nuclear Reactor Regulation

FROM: A. Bill Beach, Director
Division of Reactor Projects, Region IV

SUBJECT: ITAAC REVIEW GROUP

This memorandum defines the general scope of the review you requested to obtain additional insights into the ITAAC process.

The purpose of the review is to determine if, in fact, the staff can make a reasonable assurance finding from the design information presented in the Tier 1 ITAAC. This review will be performed by the following individuals:

Region 1 - Jimi Yerokun
Region 2 - Caudle Julian
Region 3 - Richard Knopp
Region 4 - William Jones
Region 5 - Dennis Kirsch
NRR:LPEB - Jeffry Sharkey
NRR:PMSB - Marylee Slosson

This team of individuals will meet in Rockville for one day, July 9. It is planned that the team will be briefed by selected members of your staff on the ITAAC process. Also, on that afternoon, the team will receive their assignments and actually select the systems to be reviewed in the Region IV office the entire week of July 13, using the following information:

1) The Tier 1 ITAAC submitted by GE for it's ABWR design
2) The Tier 2 information for those systems selected by the team
3) The River Bend FSAR, SER, and Technical Specifications

It is anticipated that the team will review six to eight different systems and provide you it's conclusions in a report, a draft to be provided to you prior to the Greybeard Committee Meeting now scheduled for July 23 and 24.

A. Bill Beach, Director
Division of Reactor Projects

cc:
F. Miraglia

ENCLOSURE 2

GENERAL COMMENTS: (Nuclear Reactor System, High Pressure Core Flooder System, Reactor Recirculation System, Recirculation Flow System, Reactor Building Cooling Water System)

1. Without valve/pump designations in the system ITAAC simplified diagrams, it is not clear which valves the system description is referencing, and which components are to be tested. For example, the term "isolation valves" has different meanings in the ITAAC (it can mean containment isolation or safety/non-safety isolation valves).

2. It appears that the SSAR approach or philosophy for conducting failure analysis is to fail entire trains rather than individual components. Is this an acceptable approach and is it comprehensive? For example, the Reactor Building Cooling Water (RCW) system utilizes air-operated valves. What is the effect of a loss of instrument air on the RCW system?

3. Comprehensive testing for trips, permissives, interlocks, controls, alarms, and computer points for components or functions provided in the design description should be included in the system ITAAC. For example, the RCW design description includes a radiation measuring element and alarm for detecting leakage from the Residual Heat Removal (RHR) system into the RCW system; however, the RCW system ITAAC does not require testing of the radiation alarm feature.

4. The inspections, tests, and analyses listed in the ITAAC columns to confirm that the certified design commitment has been satisfied require documentation reviews rather than actual tests, inspections for field verification, or analyses as appropriate.

5. The level of detail within the TIER 1 document does not always identify all the key system operating parameters which bound the analysis and system performance. The level of detail varies between system ITAACs, and sometimes, even with the same ITAAC.

6. Cross referencing between ITAAC sections is lacking. For example, the Reactor Recirculation System (RRS) motor housing is part of the Reactor Pressure Vessel (RPV) and reference is made to ITAAC Section 2.1.1, Reactor Pressure Vessel System for a description of the RRS motor housing. The RPV ITAAC #5 does not specify RRS bolting/flanging material requirements.

7. English and metric units are mixed and not consistently used when described in the SSAR, design description, and the system ITAAC.

NUCLEAR BOILER SYSTEM

- The design description contains only the most basic of descriptions, and is not sufficient. Lacking a complete description of the design criteria, it is not possible to provide a nuclear boiler system ITAAC which verifies the design bases. The system ITAAC does not require certain testing normally verified in a pre-operational testing program. Testing of the main steam isolation valve (MSIV) drain valves and bypass valves, testing of the vacuum breaker for Safety Relief Valve (SRV) discharge piping, and testing of the SRVs, MSIVs, or bypass valves for leakage were not required.

- The system ITAAC refers to inspections of documents to assure conformance with ASME Code requirements. The ITAAC does not provide for verification of manufacturer, installer, or supplier Quality Assurance (QA) programs or processes to verify the accuracy and sufficiency of the Code documents. The TIER 1 design description also does not discuss nor the system ITAAC require verification of welding processes or personnel qualification.

- The drawings in the TIER 1 document are only the most simplified one-line diagrams. The system ITAAC requires inspections for conformance of the systems to these one-line diagrams, not to any detailed P&ID or other specific isometric diagram.

- No verification of SRV accumulator capacity to conform to the requirements for cycle capability is required by the Nuclear Boiler System ITAAC.

- The TIER 1 document contains no information or requirements for system/component supports and the ITAAC is silent on the inspection of these important system component supports throughout heatup and cooldown cycles (this may be included in the piping Design Acceptance Criteria).

- The system ITAAC does not contain requirements for the verification of SRV lift/reset pressures or for the verification of local/remote switch-operated lift capability.

HIGH PRESSURE CORE FLOODER

- The simplified drawing (Figure 2.4.2) does not identify the isolation boundary for the Make Up Water (Condensate) (MUWC) system. The figure indicates that the outboard Motor Operated Valve (MOV) injection isolation valve is located outside the containment; however, the SSAR (Section 6.3.2.2.1) indicates the MOV is located inside the containment. The Condensate Storage Tank (CST) suction line shows three manual isolation valves from the CST, in parallel, to one suction line. This design is not consistent with the expected design of a single manual isolation valve.

- Full flow testing to the reactor pressure vessel is not specified from the Suppression Pool (S/P) or CST. Therefore, no verification of the High Pressure Core Flooder (HPCF) spray pattern or other flow anomalies is verified.

- System ITAACs in the TIER 1 document usually require functional testing of all actuating test parameters prior to acceptance of the system ITAAC. Tests of the manual override features in the High Pressure Core Flooder (HPCF) are not verified in the HPCF ITAAC.

- Specific alarms, controls, and interlocks were not specified. Specific parameters which will cause an alarm or isolation function are not always specified; for example, HPCF ITAAC #5, which will isolate valves on a sensed high pressure. The valves to be isolated, the piping to be protected, and the pressure value at which the isolation would occur were not identified (see General Comment #3).

- Valve stroke times for the Motor Operated Valve (MOV) injection isolation valve and the CST to S/P valve were not specified in this system ITAAC.

- All possible flow lineups were not verified in the HPCF ITAAC. HPCF ITAAC #6 addresses adequacy of the miniflow line. However, this line is also used by the Low Pressure Core Flooder (LPCF). The test does not verify that adequate miniflow is maintained with flow through the line from other sources including LPCF. HPCF ITAAC #10 addresses Net Positive Suction Head (NPSH). However, the lineup from the CST is not verified to be adequate with respect to NPSH to the point of realignment to the S/P with all other systems taking suction from the CST concurrently.

- The level of detail within the TIER 1 document does not identify all the key system operating parameters which bound the analysis and system performance (see General Comment #5).

HIGH PRESSURE CORE FLOODER (Cont.)

- The present design does not provide for full flow recirculation testing from the CST to the CST. This could result in the need to process excessive radwaste from the S/P if a CST to S/P test configuration is used. The SSAR only identifies full flow testing from the S/P to the S/P. It is expected that the Technical Specification (TS) will require some type of testing from the CST; therefore, full flow testing from the CST to CST would be required prior to plant operation.

REACTOR RECIRCULATION SYSTEM

- ITAAC Figure 2.1.3 is missing.

- Each Reactor Internal Pump (RIP) has an anti-rotational flow device to minimize flow reversal, but the Reactor Recirculation System (RRS) ITAAC does not require testing the anti-flow device. A free wheeling pump would cause bypassing core flow from remaining operating reactor recirculation pumps.

- RRS ITAAC #2 does not require testing/demonstration of the coastdown curves on loss of the RIPs to confirm the thermal margin. It should require a test that demonstrates that the thermal margin can be met by coastdown flow cooling.

- Comprehensive flow testing cannot be conducted without fuel in the vessel. The system ITAAC should address how flow testing will be demonstrated prior to loading fuel.

- The RRS ITAAC does not require testing any of the following subsystems/components:

  Adjustable speed drive
  Recirculation pump trip
  Core flow measurement
  Recirculation motor inflatable shaft seal

- The RRS motor housing is part of the Reactor Pressure Vessel (RPV) and reference is given to ITAAC Section 2.1.1, Reactor Pressure Vessel System, for its description. RPV ITAAC #5 does not specify RRS bolting/flanging material requirements (in general, cross referencing between ITAAC chapters is lacking) (see General Comment #6).

RECIRCULATION FLOW CONTROL SYSTEM

- Figure 2.2.8-1 is missing.

- Recirculation Flow Control System (RFCS) ITAAC #6, Column 2 (inspections, test, analyses) indicates low dome pressure rather than high dome pressure. The certified design commitment and the design description correctly specify a high dome pressure Reactor Internal Pump (RIP) trip. This ITAAC also specifies that a select group of RIPs trip off in the event of certain conditions, while the design description specifies that a group of four RIPs will trip off under the same conditions.

- RFS ITAAC #3 applies to post-fuel load status. It should be deleted as an ITAAC for this system.

- RFS ITAAC #2 and #3 should specify the percent of rated speed or rated reactor power, as appropriate.

- The system ITAAC identifies the use of triplicated process controllers and/or devices, but does not describe either the triplication function or testing of the triplication feature.

- The system ITAAC does not test the automatic mode called "Master Auto" mode Automatic Load Following (ALF) operation.

- The system ITAAC states that when in ALF mode, there "is a set down function that automatically reduces flow when core flux is above 105 percent." Typically, this occurs at 102 percent. (Reference SSAR Chapter 6.2, Paragraph 6.2-5).

- SSAR Section 5.4.1.4 states that "a runback to 30 percent speed on a bank of five RIPs occurs on a loss of a reactor feed pump." This runback feature is not required to be tested by the RFCS ITAAC. Trip from current reactor protection conditions, or a runback to 30 percent speed with a subsequent trip is also not tested. Although this is a post-fuel load test, how will GE ensure that this feature is tested?

- The features specified in SSAR Section 9.2.11.3.2 for a loss of one Reactor Building Cooling Water (RCW) division are not tested. Loss of one RCW division will result in loss of RCW cooling to every other RIP (five total) and will cause those five RIPs to runback to minimum speed. The RIP Motor-Generator (M-G) set in the same electrical division, which is cooled by the same RCW division which failed and also powers two RIPs, would stop by M-G set cooling water protection.

REACTOR BUILDING COOLING WATER SYSTEM

- The ITAAC system description references Figures 2.11.3 and Figures 2.11.3a-c. It is not clear if Figure 2.11.3 is a separate drawing or if it means Figures 2.11.3a-c.

- Reactor Building Cooling Water System (RCW) ITAAC #4, isolation valve testing, does not include the non-LOCA automatic isolation of the non-safety-related portions of the system on a low RCW surge tank level condition, although it is discussed in the RCW ITAAC design description.

- The level of detail varies between different system ITAACs. In the case of the RCW ITAAC, it varies within the same ITAAC. For example, the RCW ITAAC #3 for flow testing should be at least as detailed as the RCW ITAAC #4, isolation valve testing. The isolation valve ITAAC tests the valves under various plant conditions, while the flow testing ITAAC has a global requirement for hydraulic testing of the system. Specifically, heat exchanger flow testing/performance testing is not required. The normal system configuration is one pump/two heat exchangers per train. Under LOCA conditions, the system automatically shifts to two pumps/three heat exchangers. The RCW ITAAC does not require flow testing under these conditions (see General Comment #5).

- The Failure Analysis as described in the SSAR appears to be inadequate in that it does not provide a comprehensive discussion of component failures. For example, it does not address loss of instrument air system or failure of individual components (see General Comment #2).

- Table 9.2.4c does not state what the assumed reactor service water temperature/ultimate heat sink temperature is under LOCA conditions. There is also a difference in scope between SSAR and ITAAC for the system design requirement following a LOCA (active/passive vs. active).

- Table 9.2-4d does not agree with design requirements in the TIER 1 document. Discharge flow rate in the SSAR table for pumps in the A/B trains is 5720 gpm versus $\geq$ 5700 in the TIER 1 requirements; pump total head for pumps in the A/B train in the SSAR is 82 psig versus $\geq$ 80 psig in the TIER 1 requirements.

GENERAL COMMENTS: (Electrical ITAAC)

- The system ITAAC does not address undervoltage protection. Current plants have both an undervoltage trip and a loss of voltage trip. The system ITAAC states that on loss of voltage to the safety-related buses E, F, and G, the diesels will start so there is loss of voltage protection. But for an undervoltage condition that does not dip this low, there should be either: 1) a time delayed undervoltage trip that would cause separation and diesel start or; 2) assurance that all equipment is capable of operation with undervoltage down to the loss of voltage trip point (which does not appear in the ITAAC).

- SSAR 8.3.1.7 (8) states that undervoltage protection exists at 90 percent of nominal with a five minute time delay. This should be addressed in the system ITAAC and appropriately functionally tested.

- SSAR 8.3.1.2.4 addresses Environmental Qualification (EQ) for electrical equipment and references SSAR 8.3.4.3 for interfaces. The system ITAAC for electrical should have clear reference to the generic EQ ITAAC.

- There were several system ITAAC/SSAR discrepancies noted during the review of the electrical ITAACs:

  - ITAAC describes three Unit Auxiliary Transformers (UATs) to power both safety class and non-safety class loads in Section 2.12.2. SSAR 8.1.2.1 states there are four UATs; two safety class and two non-safety class.

  - In discussing General Design Criterion 17, SSAR paragraph 8.2.2.1.(2) appears to conflict with the ITAAC description of the system in that: 1) the SSAR references two UAT feeds rather than the three specified in the ITAAC, and 2) the SSAR implies that the Reserve Auxiliary Transformer (RAT) supplies are not safety class, but the ITAAC indicates that the RAT supplies are safety class. ITAAC figure 2.12.1a shows the RAT as the normal power supply for Division III load group C.

ELECTRICAL POWER DISTRIBUTION

- It appears important for the main generator breaker to open when called on. Thus, ITAAC 2.12.1 should have an additional item #1.c to test that the main generator breaker will open when called on and that the Unit Auxiliary Transformers (UATs) will continue to receive load from the offsite power supply via the switchyard and Main Plant Transformer (MPT).

- Electrical Power Distribution ITAAC #2.b does not repeat the design description from page 3 that the UAT impedance is selected to limit the fault current to less than the maximum interrupting capacity of the circuit breakers. Also, should the UATs design descriptions specify voltage and frequency similar to the RAT design description on page 3?

- Electrical Power Distribution ITAAC #3.b has a similar lack of design description on impedance for the RAT as described on page 3. The specification of +/- 2 percent at .9 power factor is not discussed in ITAAC #3.b.

- Electrical Power Distribution ITAAC #4.b requires inspection of the cable selection criteria. However, inspecting of the installed cable, at least on a sampling basis, compared to the selection criteria also should be required and the load placed on the cable to confirm proper sizing.

- Electrical Power Distribution ITAAC #4.d requires redundant overcurrent protection for containment penetrations "when required." That differs from the design description on page 4 that indicates redundance will be provided when the calculated fault current exceeds the rating of the penetration.

- Electrical Power Distribution ITAAC #6 in the first column on page 12 has some words missing.

- There should be a ITAAC Step 6.f to confirm, at least on a sampling basis, the cable routing. The design concept of redundancy is based on accurate cable routings.

AC POWER SUPPLY

- AC Power Supply ITAAC #2, #3, or #4 should not include battery capacity for powering the Constant Voltage Constant Frequency (CVCF). This should be specified and tested by a capacity test. This is addressed, to some extent in SSAR 6.3.2.1 page 8.3-19.

- AC Power Supply ITAAC #2 is specific, Division IV is powered from Division 1 Motor Central Center, but Step 2 implied it might be any division. SSAR 8.3.1.1.4.2.1 says Division 1.

- There should be some description of frequency and voltage stability in normal and upset conditions for the CVCF units, and there should be a test to confirm they meet the design description and to test the auto transfer feature.

- AC Power Supply ITAAC #12 has words missing in line 6.

- The TIER 1 document references "vital" and "non-vital" and "essential" and "non-essential" Instrumentation and Control (I&C) power supplies. There should be a definition of these terms in the text, at least in the design description and maybe in the ITAAC.

- AC Power Supply ITAAC #12 states there will be a test of the manual transfer switch. The test should also include the interlock.

- Neither the ITAAC nor the design description has a definition or listing of what vital AC and I&C equipment are on what supply. Without that information, it is difficult to understand the system design.

- AC Power Supply ITAAC #13 indicates power supply adequacy will be confirmed by looking at the name plate. This should be done by test to confirm the adequacy of the supply.

EMERGENCY DIESEL GENERATOR SYSTEM

- The ITAAC does not address the auxiliary system of the Diesel Generator (D/G) Systems such as the starting air system; cooling water system; lubrication air system; and the combustion air system.

- Acceptance Criterion 1 does not address verifying the "physical separation" of the three D/G trains. Independence and separation of the trains are important aspects of the system.

- Acceptance criterion 3b states that each D/G unit shall produce rated power output for a period greater than or equal to 24 hours (momentary transients excepted). It is not clear what the extent of this "momentary transients exception" is.

- Acceptance criterion 5 indicates that each D/G unit sequences its loads after each automatic start. This is not true for the case of an automatic start from a LOCA signal without a loss of power. The criterion should specify which automatic start causes load sequencing.

- The "Certified Design Commitment" section of ITAAC #5 does not address the LOCA automatic start signals of the D/G.

- Acceptance Criterion #5 does not properly indicate that following a D/G automatic start from a LOCA plus LOPP signal, load sequencing does not begin until the D/G has attained rated voltage and frequency. Load sequencing must not start before rated voltage and frequency are attained by the D/G. The Criterion does not clearly state the time restrictions for bus voltage coming back up to rated prior to the next load sequence on.

- Acceptance Criterion #7 indicates that if a simulated LOCA and LOPP signal is applied while the D/G is in test, the D/G will revert back to automatic mode. However, according to the design description and the SSAR (8.3.1.1.7 (5), either of the signals would do it. It does not require both signals to be present.

- The various signals in the Categories listed in Criterion #8 should be listed. It is important to know and verify which D/G protective signal is bypassed in an accident situation when the D/G is required. Also, the feature of the D/G being removed from service when in the "lockout" or "maintenance" mode is not tested.

- The ITAAC does not demonstrate that if an LOCA should occur after a LOPP has occurred, running loads are not stripped of the bus and the D/G are not overloaded with other Engineered Safety Features (ESF) equipment starting up. This feature is described in the SSAR (8.3.1.1.7 (4))

EMERGENCY DIESEL GENERATOR SYSTEM (Cont.)

- The ITAAC does not demonstrate that the Residual Heat Removal system (RHR) and High Pressure Core Flooder (HPCF) injection valves are not stripped of the bus when a LOCA and LOPP signal initiates a D/G. SSAR (8.3.1.1.8.2 (4)) discusses this feature.

- The ITAAC does not address the automatic start of the D/G from an undervoltage of 90 percent or lower sustained for a period of five minutes. SSAR (8.3.1.1.7 (8)) discusses this feature.

- The extent of the reliability testing of the D/G onsite and prior to being onsite is not clearly discussed or referenced in the ITAAC.

- The design description indicates that a D/G will automatically start in the event of a sustained drop in bus voltage below 70 percent. It is not clear what "sustained" is limited to (page 2, 1st paragraph).

- Not all D/G testing is possible during normal plant conditions as indicated in the design description (page 2, 3rd paragraph).

PRIMARY CONTAINMENT SYSTEM

- Level of detail is not consistent with other system ITAACs. More detail is provided for construction features. For example:

  - Design description provides specific volumes and wall, slab thicknesses with no margin.

  - ITAAC is heavily focused on measuring volumes instead of maintaining appropriate CTMT pressures and temperature.

- Performance of structural integrity test should be included as a separate ITAAC. Acceptance criteria should specify ASME Division 2.

- Maintenance of negative pressure differential between drywell and wetwell does not appear to be tested in the ITAAC. In addition, design description (page 3, paragraph 5) appears to be in conflict with SSAR Section 6.2.11 and design description does not define variables.

- Design description (page 3, paragraph 3) states that CTMT structure and penetration isolation system limit fission product leakage below allowable limits. Part 100 should be specified for clarity.

- ITAAC #1 - Drawing 2.14.1a is not in TIER 1 Stage 3 document.

- ITAAC #2 - Volumes are verified by review of drawings. What about walkdown and measurements.

- ITAAC #4 - Verification of specified elevation is used in ITAAC. The elevation is the acceptance criteria and would appear to be more appropriate in that column. Also, it is not clear from the design description or SSAR why an elevation is used in this case instead of meters from a certain point.

- ITAAC #5 - Verification of code stamp (if applicable) is included. It is not clear when it is applicable.

  Acceptance criteria states confirm thorough review of documentation testing in compliance with codes and regulatory requirements. Why aren't the tests themselves the ITAAC.

- ITAAC #7 - Welds are included as part of this ITAAC. It is not clear why this is here and not part of welding ITAAC.

- ITAAC #8 - Acceptance criteria should at least specify limiting code applicable such as ASME Code Section III, Division 2.

- ITAAC #9 - ITAAC is confusing as written. It states to conduct tests in conjunction with test reports. Also acceptance criteria is specified in ITAAC.

PRIMARY CONTAINMENT SYSTEM (Cont.)

- ITAACs #9, #10, & #11 - Acceptance criteria specifies limits recorded in the TS. However, reference to TS is not necessary or appropriate.
- ITAACs #10 & #11 - Successful performance of the tests themselves should be the ITAAC, not the review of documentation.
- ITAAC #12 - Delete "serving the security system" from the ITAAC. It does not provide significant detail necessary.
- ITAAC includes records review, but does not include field walkdown.
- As a general comment, English and metric units are intermixed between SSAR, design description, and the ITAAC.

CONTROL BUILDING

- Level of detail is far greater than rest of ITAACs reviewed and should be decreased. For example:
  - Six drawings are included. One comprehensive drawing should be enough.
  - ITAAC #2 is basically word-for-word what is in design description. Detail could be reduced.
- Design description states the control building is two stories above ground and four stories below. SSAR states three stories above and three below.

	SSAR	DESIGN DESCRIPTION
• Overall height above basemat	38.7m	30.5m
Overall planar dimension (0-180°)	22m	24.0m

- ITAAC #1 - Plant walkthrough includes as-needed dimensional measurements. As-needed is not defined.
- ITAAC #2 - Acceptance criteria states roofs are designed to prevent pooling of water. This should verify construction to design, not just design.
- ITAAC #3 - ITAAC covers radiation shielding. It is not clear why this is not covered by Section 3.7 radiation protection.
- ITAAC #4 - Dimensional checks performed as-needed. As-needed is not defined.

  Acceptance criteria states that roof and walls are designed greater than .5m. This should verify as-built, not as-designed.

  Acceptance criteria specifies HVAC damper design instead of construction. HVAC damper differential pressure is defined. Should this ITAAC be included with HVAC system instead of here.
- ITAAC #6 - States that design will be based on site-specific parameters. The enveloping site parameters for the design are already specified in Section 2 of the TIER 1 design certification material.