February 3, 1994

Mr. Raymond Ng
Nuclear Management and Resources Council
1776 Eye Street, N.W.
Suite 300
Washington, D.C. 20006

Dear Mr. Ng:

SUBJECT: DRAFT COMMISSION PAPER, "ITAAC VERIFICATION AND CONSTRUCTION INSPECTION UNDER 10 CFR PART 52"

The Nuclear Regulatory Commission (NRC) is developing positions on how ITAAC requirements will be met and inspected during construction of nuclear power plants that have received a combined license under 10 CFR Part 52. In an effort to continue discussions of important COL issues with the industry, the enclosed draft Commission paper, "ITAAC Verification and Construction Inspection under Part 52," and its enclosure are being forwarded for your consideration.

The enclosed draft Commission paper represents some initial thoughts on ITAAC verification and construction inspection issues and does not have final approval from senior management. Although a COL may not be issued for several years, the NRC believes that it is important to continue discussions on COL policy issues. There are many issues related to issuing a COL and authorizing operation under a COL and we realize that the draft Commission paper may not discuss them all. Therefore, future meetings on this subject should not be limited to topics discussed in the paper but should include any topics that the industry believes are important.

Although it is important to begin discussing these issues, it is not our intention that these discussions adversely impact near term design certification activities. Should you have any questions, please contact Michael Case at (301) 504-1134.

Sincerely,

Original signed by

R.W. Borchardt, Director
Standardization Project Directorate
Associate Directorate for Advanced Reactors
and License Renewal
Office of Nuclear Reactor Regulation

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Enclosure:
Draft Commission Paper

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L-4-1, Part 52

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FOR: The Commissioners

FROM: James M. Taylor
Executive Director for Operations

SUBJECT: ITAAC VERIFICATION AND CONSTRUCTION INSPECTION UNDER 10 CFR PART 52

PURPOSE:

To give the Commission the staff's initial views on how ITAAC requirements will be met and inspected during construction of nuclear power plants in accordance with combined licenses (COLs) issued under 10 CFR Part 52.

SUMMARY:

The staff is developing policies regarding how the NRC will inspect plants licensed under Part 52 to verify that ITAAC are met, and thereby ensure that the plants are built consistent with their safety designs. This paper discusses the following topics: findings under Part 52; performing ITAACs; meeting ITAACs; interim inspection findings; sign-as-you-go; bridge concept verifications; aspects of evolutionary light-water reactor construction; use of a data base to help manage inspections; the impact of quality assurance on the inspection program; inspection program development activities; and proposals regarding public notice of construction inspection program matters.

BACKGROUND:

Subpart C of Part 52 describes a process for issuing COLs for nuclear power facilities. A COL refers to a single license authorizing construction of a nuclear power facility, and includes inspections, tests, analyses, and acceptance criteria (ITAAC) to provide reasonable assurance that the facility has been constructed and will operate consistent with the license and applicable regulations.

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The staff has prepared a number of Commission papers that discuss issues associated with the implementation of 10 CFR Part 52. Although related to the eventual issuance of a COL, most of these papers focused on the design review, issuance of a final design approval, and certification of standard designs. However, several papers discussed concepts and plans that the staff will implement during the period between COL issuance and plant operation.

In SECY 94-XXX, "10 CFR Part 52 Combined License (COL) Review Process and COL Form and Content," the staff discussed such topics as contents of a COL application, the COL form and content, COL ITAAC, the bridge concept of transition from high-level certified design information to detailed design and construction drawings, and the role of the quality assurance (QA) program in ITAAC. In addition, the staff has described its plans for incorporating a "sign-as-you-go" process and 10 CFR Part 52 requirements into the NRC's construction inspection program in SECY-92-134, "NRC Construction Inspection Program for Evolutionary and Advanced Reactors Under 10 CFR Part 52," and SECY-92-436, "Status of the Development of the NRC's New Construction Inspection Program." Also, the staff discussed its views on implementation of emergency planning requirements during the period that follows the issuance of the COL in SECY-94-YYY, "Emergency Planning (EP) Under Part 52."

NRC activities during the period following COL issuance will concentrate on the verification of ITAAC. For the evolutionary designs currently under design certification review, the applicants have developed, and the staff has reviewed, ITAAC that are substantially complete. Therefore, these ITAAC are a valid base from which additional details of NRC activities after COL issuance can be developed.

DISCUSSION:

Findings Under Part 52

As with Part 50 construction projects, the NRC will implement a comprehensive inspection program at future reactor construction sites to verify that the plants are built in conformance with the regulations and their approved safety designs. Although many of the inspection activities performed during construction of a plant licensed under Part 52 will remain the same as in previous construction projects, the regulatory objectives associated with performing safety verifications will differ somewhat from the Part 50 process. Under Part 50, NRC construction inspection activities were necessary, in part, to support a series of findings in §50.57 that culminated in the issuance of an operating license. Under Part 52, the only finding that remains after issuing the COL is contained in §52.103(g), which states: "Prior to operation of the facility, the Commission shall find that the acceptance criteria of the combined license have been met."

A majority of the NRC activity following COL issuance and preceding authorization for operation will focus on meeting this regulatory objective. The staff will base its recommendation to the Commission for this finding on two major elements: (1) the inspections, tests, and analyses (ITAs) prescribed in the license have been performed and the acceptance criteria (AC) met; and (2) other applicable conditions of the COL have been met. In addition, as with a

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Part 50 licensee seeking an operating license, the staff's recommendation will include an assessment of the licensee's readiness to load fuel and begin power operation.

The staff will base its recommendation to the Commission for this finding on the results of its inspection program during construction. Section 52.99, "Inspection During Construction," describes the purpose of this activity as follows: "After issuance of a combined license, the Commission shall ensure that the required inspections, tests, and analyses are performed and, prior to operation of the facility, shall find that the prescribed acceptance criteria are met."

Therefore, two primary goals of the NRC construction inspection program will be to inspect the licensee's process for performing ITAAC and to inspect the licensee's program for ensuring ITAAC requirements are met.

Performing ITAAC

In building a plant, a licensee will be responsible for performing all inspections, tests, and analyses (ITAs) embodied in the plant's COL to demonstrate that the plant is constructed in accordance with its approved design. As discussed above, the first objective of the NRC's construction inspection program (CIP) will be to verify that a licensee has implemented an effective process for performing the ITAs. To perform these verifications, inspectors will witness or review the conduct of appropriate ITAs throughout a plant's construction period and, in combination with objective evidence of completion of all ITAs, will be able to reasonably conclude that the ITAs have been performed. The staff expects that a COL holder will use its quality assurance process to ensure that all ITAs are satisfactorily performed, since performing ITAs is considered a safety-related activity. The NRC staff's inspections to verify the adequacy of ITA performance will validate the effectiveness of the licensee's quality functions by performing a combination of independent observations of construction activities and reviews of quality assurance activities and records. In view of the existing ITAAC and the construction methods likely to be employed in building new plants, implementation of this NRC verification concept will be complex.

The opportunity for NRC inspectors to physically verify the successful completion of some acceptance criteria (AC) may occur only once during plant construction, while the opportunity to verify others may exist indefinitely after installation. For instance, as part of the Advanced Boiling Water Reactor (ABWR) primary containment system as-built configuration inspection ITAAC, the corium protection fill depth of concrete will be verified to be greater than 1.5 meters. The opportunity to verify this AC will only occur once in the construction sequence -- while the concrete is being poured. Other AC, such as the ABWR ITAAC verification that "the listed displays and controls for the primary containment system exist in the main control room" can be evaluated any time after the displays and controls have been installed. Therefore, it will be desirable that appropriate inspector coverage occur during the more sequence-dependent ITAAC activities. Similarly, additional complexity will result from the fact that not all ITAAC verifications will be done on site. Some ITAAC involve type tests that could be performed by

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licensee vendors in factories, and these could be done before a combined license is issued. Also, as discussed in more detail later in this paper, the use of modular construction methods could dictate that some ITAAC be performed off site or in remote on site locations.

In order to verify that ITAs are being performed, the staff will need to tailor its inspection program to account for the situations discussed above. To do this, the staff will require a realistic and usable construction plan, including construction sequence and schedule, for ITAAC-related items from an applicant as early as when the COL application is submitted. The staff would use such a plan only as an aid to inspection planning; the staff would not use it as part of COL deliberations. Additionally, an applicant or licensee would need to inform the staff of revisions to the plan and schedule as changes occur throughout plant licensing and construction.

Meeting ITAAC

The second objective of the staff's inspection activity during construction will be to determine, prior to loading fuel, whether the acceptance criteria associated with the ITAs have been met. In SECY-94-XXX, the staff discussed several concepts that it will use to verify satisfactory ITAAC completion. These concepts included:

- the bridge concept
- sign-as-you-go (SAYGO)
- independent NRC inspection of ITAAC
- licensee determination that all ITAAC have been met

Before discussing these concepts in the context of plant construction activities, it is important to discuss some observations on the verification and sequencing of ITAAC during plant construction. The ITAAC are generally written as final verification of satisfactory plant construction, and they routinely refer to "as built" configurations or conditions. As a result, most ITAAC will be verified late in the construction period. On the basis of an initial review of existing ABWR ITAAC, the staff estimates that final verification that the bulk of the ITAAC are met will occur in the late phases of a plant's construction period (during the last year, assuming a four-year construction schedule), as illustrated in Figure 1.

By the time many ITAAC would be ready for verification, a great deal of construction activity will have taken place, most of which will have been inspectable only as it was performed. Hence, the NRC will need to conduct inspections throughout plant construction, and the results of these inspections will provide the bases for final ITAAC verification. To successfully determine that a plant's ITAAC have been met using these verification con-

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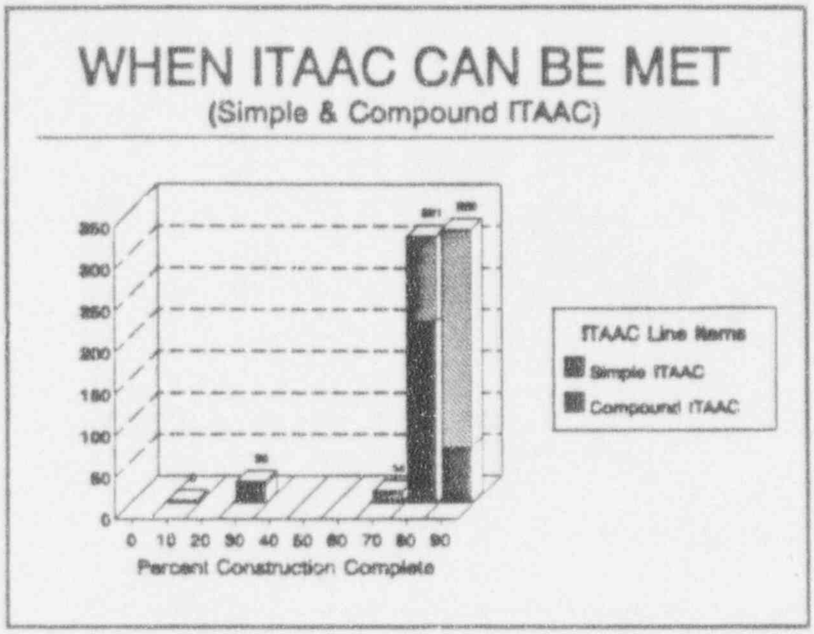

Figure 1

cepts, the staff will have to systematically plan its construction inspection activities. This will be particularly true for those ITAAC that require a series of inspections to support eventual NRC verification that an ITA's acceptance criterion has been successfully completed. As discussed in greater detail in the following paragraphs, NRC verifications for these ITAAC will rely on a combination of system-specific observations and generic conclusions, based on inspection information, regarding the adequacy of licensee construction and quality assurance activities.

Interim Findings

As mentioned earlier in this paper, some ITAAC verifications will be relatively simple, in that they will involve comparison of system performance measurements and observations against established criteria. ITAAC of this type will normally be accomplished within a well-defined period during construction and will have well-defined documentation of satisfactory completion. Examples of such simple ITAACs include: verification that alarms exist or can be retrieved in the main control room for a particular system, verification that water is pumped by a system at greater than a prescribed minimum flow rate, and verification that prescribed system valve interlocks function. A more comprehensive list of examples from the ABWR ITAAC is given in Enclosure 1. As shown in Figure 1, approximately 50 percent of the ABWR ITAAC are of this type. The staff believes that because (1) these ITAAC are simple, (2) will be completed over a short time span, and (3) will require comparatively little effort for verification, their successful completion will be noticed in the Federal Register in accordance with the requirements of 10 CFR 52.99 without reliance on interim findings.

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In contrast, other ITAACs will be accomplished over long periods of construction. These long-term ITAACs will involve criteria whose application would entail judgment and discretion on the part of the staff and licensee, a fact that the Commission recognized in the statement of consideration for Part 52. For these type of ITAAC, called compound ITAAC, the staff will likely use all of the verification concepts first discussed in SECY-94-XXX, and the NRC will perform many inspections over a long period of time to verify different attributes of such ITAAC. When the final construction activity is completed, the sum of the results of these inspections will support the conclusion that the ITAAC has been met. For example, one of the 13 ITAAC acceptance criteria for the ABWR control building (C/B) reads as follows: "The as-built C/B has a main control area envelope separated from the rest of the C/B by walls, floors, doors and penetrations which have a three-hour fire rating."

The staff estimates that construction activity associated with this ITAAC would start five months after COL issuance and would likely end four months before fuel loading, spanning 39 months. The staff's activities to verify that this ITAAC is met will not wait for field activity to start; rather, part of the staff's assurance that this ITAAC is met will involve verification that engineering details will properly implement the high-level design commitments pertaining to the control building. This could involve inspection activity which verifies that the prescribed thickness of the control building wall or floor will result in a three-hour fire rating, or could verify that the purchase specification for the control building has properly prescribed the attributes of a door that will possess a three-hour fire rating. When coupled with inspector verification of proper installation, there would be high confidence that the acceptance criteria of the ITA's are being met.

NRC verification that this control building ITAAC will be satisfied will also depend upon observations of licensee activities for similar attributes elsewhere in the plant. The staff will observe samples of the placement of concrete throughout the plant to demonstrate that other related ITAAC are met. Assuming that these concrete-pouring activities are also satisfactory in terms of the processes and materials used, as well as the effectiveness of the quality assurance oversight, the staff will further rely upon these observations to contribute to the staff's conclusions regarding the fire protection envelope in the control building.

In a broader sense, the staff will be able to rely on satisfactory inspection results from throughout the construction of a plant to help demonstrate satisfactory ITAAC completion for compound ITAACs. These types of inspection conclusions can be viewed as "interim acceptability findings" and will pertain to such generic construction activities as site preparation, structures, and equipment fabrication, placement, and operation. These generic interim acceptability findings will be necessary ingredients in the staff's ITAAC verification plan, since the staff does not intend to perform complete inspections of all construction activities. The staff intends to use these interim findings to support specific ITAAC conclusions, and it is envisioned that compound ITAAC verifications will be based on a combination of interim findings and system-specific inspection observations. In the example given, conclusions on the adequacy of the control building walls and floors will be reached about 15 months before reaching the conclusions for the remaining

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items covered by this ITAAC. Interim findings will document the inspection conclusions regarding control building walls and floors, while construction and inspection activity related to other parts of the ITAAC continue. The manner in which the staff plans to develop interim findings, and their role in the overall scheme of verifying ITAAC completion, is illustrated in the attached "Schematic Plan for Verification of ITAAC" (Enclosure 2).

The staff's plan to manage construction inspections so that interim findings can be systematically made is illustrated in the conceptual model of an inspection plan for the ABWR high-pressure core flooder (HPCF) system provided in Enclosure 3. The plan delineates activities and components that are integral to constructing a safety system, breaks them down in matrix format into possible inspections, and identifies the guiding inspection procedures. Each inspection procedure, in turn, will be based on, and will reference, appropriate regulatory guides and industry codes and standards, including those which are part of the design certification rule. To achieve the goal of being able to make substantial interim findings in accordance with this concept, the new Construction Inspection Program (CIP) will differ significantly from the current CIP because inspections will be planned around systems rather than around construction disciplines.

Therefore, for ITAAC that involve long periods of construction, acceptance criteria that require discretion on the part of the licensee and staff, and substantial efforts for verification, the staff proposes to use interim findings to summarize major conclusions related to those ITAAC. Although not required by 10 CFR 52.99, the staff will publish these interim findings and the ITAAC to which they pertain in the Federal Register at appropriate intervals before formally determining that these ITAAC are successfully completed. In addition, because so many methods could be employed to meet these ITAAC, the staff expects the COL licensee to submit its plan for meeting these ITAAC along with its COL application.

Sign-as-You-GO (SAYGO)

As discussed in SECY 92-134, the staff is considering incorporating a "sign-as-you-go," or SAYGO, system of "review points" in the new CIP. Under this concept, the staff will be able to verify that the inspection program has been successfully completed for specific SAYGO points during plant construction. The CIP is being structured to accommodate a SAYGO process, and the program will include the ability to establish the necessary links between SAYGO points and ITAAC. It should be noted that a SAYGO concept does not include the use of "hold points" at various stages of construction. As it develops the CIP, the staff plans to continue exploring methods by which a SAYGO process can be effectively implemented to have the greatest benefit in constructing a safe plant in a stable regulatory environment.

Regardless of the final form a SAYGO process may take, the staff expects that a licensee's ability to complete all ITAAC will require a great deal of advance planning and effective coordination between licensee organizations and the NRC. A licensee's determination that all ITAAC have been performed and their acceptance criteria met will play an important part in the Commission's fuel load authorization. As discussed above, the staff expects an applicant

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to submit for NRC review, along with its COL application, its plan for meeting ITAAC. The staff will use this plan to develop a systematic plan for conducting the required inspections and to identify plant-specific SAYGO points.

Bridge Concept Verifications

In SECY 94-XXX, "10 CFR Part 52 Combined License (COL) Review Process and COL Form and Content," the process used to shift from high-level certified design information to the detailed design and construction drawings used to build a plant was referred to as the "bridge concept." The change processes associated with a design certification rule will allow a licensee latitude in how it will implement, under a bridge concept, the methods used to design, build, and test a nuclear power facility.

In the early phases of a construction project, the NRC will verify the adequacy of a bridge concept's implementation by performing inspections and reviews of a licensee's design engineering process. It will be during this initial phase of inspection, which may begin soon after receipt of a COL application, that the staff would inspect the adequacy of design-specific first-of-a-kind engineering for the lead plant of each certified design. During the later phases, NRC inspectors will verify bridge concept adequacy primarily through performance-based inspections, which will determine the acceptability of inspected plant systems and components by comparing the extent to which the installation and testing of these items conform to their applicable standards, certified design information, and ITAAC. Because of the need to verify construction attributes in this manner, the technical information supporting NRC CIP inspection requirements will be more detailed than that described in the ITAAC. To accommodate the development of inspection guidance and ITAAC verification plans, the staff expects that an applicant will incorporate the necessary codes, standards, and regulatory guides used to build a nuclear power plant into a COL application as design and licensing information.

Aspects of Evolutionary LWR Construction

U.S. utilities have established a goal of constructing an evolutionary light-water reactor (LWR) in no more than 48 months from the initial placement of structural concrete to loading fuel into the reactor. To meet this schedule, the staff believes that the construction methods to be used will significantly differ from the methods used to build existing plants, in that highly efficient advanced construction techniques will likely be employed. Such advanced techniques may include extensive prefabrication of plant equipment and systems, and modular construction of large and small blocks of systems and structures. These modules would need to be engineered carefully, and fabricated to very tight standards, to ensure that they would fit together properly when installed in the plant. The staff believes that some ITAAC activities associated with these modules will be performed off site in factories or on site in pre-staging areas, before the modules are installed permanently. Significant NRC coordination with licensees will be required to verify satisfactory completion of these ITAAC activities, and the CIP will need to be sufficiently flexible to allow the staff to properly inspect a variety of fabrication methods. Additionally, the staff plans to develop new inspection guidance to govern inspections of the shipping, receipt, and storage of major components and prefabricated modules to verify that appropriate measures are taken to prevent equipment damage or degradation from handling and storage.

Use of a Data Base

As discussed above, the staff's verification that all ITAACs are met will be based on the results of many types of inspections performed over the several years required to build a nuclear power plant. These inspections will need to be performed on individual systems and structures, and will also need to assess the overall adequacy of construction disciplines throughout a plant. The total NRC inspection effort dedicated across all systems and structures in a plant will evaluate system performance tests, structural foundations supporting system components, electrical cable pulls and terminations, pipe welds, seismic supports, quality controls, and other aspects, as applicable. To accommodate the numerous inspection data which the staff expects will result from a plant-specific construction inspection program, extensive detailed recordkeeping will be required to document inspection findings in a systematic and retrievable manner.

The results of inspections performed as plant construction progresses will be documented in a data base which will store inspection findings for the entire construction period. In addition to allowing users to sort inspection information in a variety of ways, the data base will also be used to plan and schedule required inspections. At the end of plant construction, the information contained within the data base will be used to support an NRC finding that all ITAAC have been met.

Quality Assurance

A licensee building a nuclear power plant will be responsible for determining the adequacy of all safety-related activities performed at the construction site. The staff expects licensees to ensure, through their quality assurance and quality control (QA/QC) processes, that these activities have been conducted in accordance with accepted industry standards and governing NRC regulations. The new construction inspection program will, therefore, devote particular attention to verifying the effectiveness of licensee, constructor, architect-engineer, and vendor QA/QC programs throughout the entire construction period. These inspections will consist of audits and record reviews, observations of in-process QA/QC activities, and independent nondestructive examination and comparison of results. The scope of the program will be broad enough to allow the NRC to make accurate conclusions regarding the effectiveness of a licensee's quality programs, so that sufficient confidence will exist that an individual QA/QC deficiency is limited in scope and would not preclude a finding that a related acceptance criterion in an ITAAC has been met.

NRC Organization

To be ready to inspect the construction of an evolutionary LWR, the NRC will need to establish its project team at the time a utility applies for a COL. Early establishment of the project team will allow the NRC to gain a detailed

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understanding of an applicant's design and plans for constructing a plant, which will be used in developing and implementing inspection plans. The NRC project team would consist of the organizations described below.

- o Resident Inspection Office: This office, headed by a GG-15 or higher level manager, would implement the inspection program at the construction site, and would be established at the start of construction. The office would consist of between 6 and 12 technical staff, plus administrative support, who would rotate on and off site according to the need for different types of expertise to verify satisfactory completion of various phases of plant construction.

- o An NRR Organization: This organization would oversee licensing aspects of plant construction and would issue interim inspection findings and notifications of successful ITAAC completion. The staff would consist of an SES-level director and an appropriate mix of project managers, project engineers, and support staff. This staff would also be responsible for implementing an appeals process, as described in SECY-94-XXX, to resolve controversies that may arise between the licensee and inspection staff during inspections.

Inspection Program Development

The staff is revising Inspection Manual Chapter (IMC) 2512, "Light Water Reactor Inspection Program - Construction Phase," to implement the inspection and ITAAC verification concepts described in this paper. This revised program will also incorporate elements of the current preconstruction, preoperational, and startup testing inspection programs, insofar as they verify aspects of plant construction activities. Under the new construction inspection program (CIP), NRC inspection activity for a given plant will begin before the start of construction, and will conclude when the NRC authorizes fuel load, after which the plant will be inspected under the preoperational, startup, and operating reactor inspection programs, as applicable. Each plant-specific CIP will identify what aspects of plant construction and licensee activities the NRC will inspect, what standards will be applied to NRC inspections, and when these inspections should be performed.

The staff is taking a phased approach to developing the new CIP on two parallel paths; namely, creating a computer data base management system (DBMS), and developing new inspection manual guidance. The staff is pursuing these developmental activities to ensure that the program governing construction inspections will be ready before a COL application is submitted, since the staff plans to use relevant CIP information to support the COL application review and issuance processes for evolutionary and advanced LWRs.

The initial version of the CIP DBMS, which will be used to plan and document inspections at the Bellefonte construction site, is nearing completion. The DBMS consists of a personal computer based system and data files containing coded inspection information from NRC inspection reports for Bellefonte since 1975. When the DBMS becomes operational, Region II personnel will be able to use it in reviewing inspection program completeness and in planning future inspections at the reactivated Bellefonte construction site. The staff's next step in data base development will be to modify the Bellefonte DBMS into a generic advanced reactor DBMS, which will incorporate the inspection requirements described in this paper to support ITAAC verifications. This generic advanced reactor version of the CIP DBMS will then be modified for each reactor design on the basis of design certification information.

The staff is developing the CIP inspection manual chapter to outline the structure and concepts to be used by inspectors to perform ITAAC verifications. In the future, this inspection manual chapter will be augmented by design-specific appendices, which will be based on available design information. The staff envisions that the final design-specific CIPs will consist of guidance on inspection conduct as well as a series of system-based hierarchical tables which will cross-reference components, inspection attributes, inspection procedures, technical references, and ITAAC.

The inspection guidance to be included in the new CIP will be derived from a variety of sources, including regulatory guides, industry codes and standards, the NRC's Standard Review Plan for nuclear power plants, and the current NRC inspection manual. Inspection guidance will reflect the sources that the staff expects a COL applicant will include or reference in a license application. On the basis of this information, the staff will develop inspection procedures and establish the standards, including those referenced in the certified design, by which a plant's conformance with COL conditions will be verified. To assist in this development effort, the staff is considering obtaining experienced contractor support to identify the appropriate technical standards on which to base inspections, to revise existing construction inspection procedures, and to identify any new procedures that may need to be developed.

Public Notice

As required by §52.99, the staff will publish, in the Federal Register, periodic notifications of successful ITAAC completion. However, to increase public and industry awareness of construction inspection matters beyond the minimum requirements specified in §52.99, the staff plans to prepare additional Federal Register notices.

The staff proposes that, after developing each design-specific inspection program, the program, including the available standards upon which inspections will be based, be published in the Federal Register to allow the general public and industry the opportunity to review and comment on the agency's planned approach to verify satisfactory completion of ITAAC. The staff believes that such notice would increase public awareness and enhance the credibility of our inspection plans, and thereby strengthen the predictability and stability of the regulatory process for advanced reactors.

Additionally, the staff proposes to periodically publish construction inspection results (e.g., interim findings) in the Federal Register. These notices would supplement those required by 10 CFR 52.99 for successful ITAAC completion.

CONCLUSION:

This paper has discussed details of many concepts pertaining to ITAAC verification and construction inspection which have previously been discussed with the Commission. However, the development of some issues would benefit from additional Commission comment, especially in relation to policy aspects of the issues. Specific topics requiring policy guidance include: the staff's proposal regarding public notice of construction inspection programs and inspection findings; the staff proposal for licensees to include their plant construction plans and schedules, and plans for meeting ITAAC, as part of their COL applications; and the staff proposal for an applicant to include in its COL application, as design and licensing information, its process for implementing the bridge concept, including the necessary codes, standards, and regulatory guides that will be used to govern design engineering and plant construction.

James M. Taylor
Executive Director
for Operations

Enclosures:
1. ABWR ITAAC Examples
2. Schematic Plan for Verification of ITAAC
3. Hardware Inspection Matrix Block Detail
for ABWR HPCF system

ABWR ITAAC Examples

Simple ITAAC		Compound ITAAC
2.4.2.3.e The High Pressure Core Flooder System flow is achieved within 16 seconds of receipt of a simulated initiation signal.		2.4.1.1 The as-built Residual Heat Removal System conform with the basic configuration shown in Figures 2.4.1a, 2.4.1b, 2.4.1c, and 2.4.1d.
2.6.1.6 The maximum throat diameter of the Reactor Water Cleanup suction line flow restrictor is 135mm.		2.6.3.3.b In the Suppression Pool Cleanup System, physical separation or electrical isolation exists between Class 1E divisions. Physical separation or electrical isolation exists between these Class 1E divisions and non-Class 1E equipment.
2.2.1.6 For the Rod Control and Information System, a control rod run-in signal occurs upon receipt of a simulated scram-follow signal.		2.12.1.22 Analyses for the as-built Electric Power Distribution System exist and conclude that the analyzed operating voltage supplied at the terminals of the Class 1E utilization equipment is within the utilization equipment's voltage tolerance limits, as determined by their nameplate ratings.
2.14.1.8 Displays and alarms exist or can be retrieved in the main control room as defined in Section 2.14.1 for the Primary Containment System.		2.4.4.9.b Based on the direction of the differential pressure across the valve, each check valve (for the Reactor Core Isolation System) opens, closes, or both opens and closes, depending upon the valve's safety functions.
2.15.5a.5.d The Control Room Habitability Area HVAC System outside air intakes are at least 50m apart.		2.15.10.1 The as-built Reactor Building conforms with the basic configuration shown in Figures 2.15.10a through 2.15.10o.
2.15.12 The top of the Control Building basemat is located 20.2m±0.3m below the finished grade elevation.		2.15.11.2 A structural analysis report exists which concludes that under seismic loads corresponding to the SSE ground acceleration the as-built Turbine Building does not damage safety-related functions.

Enclosure 1

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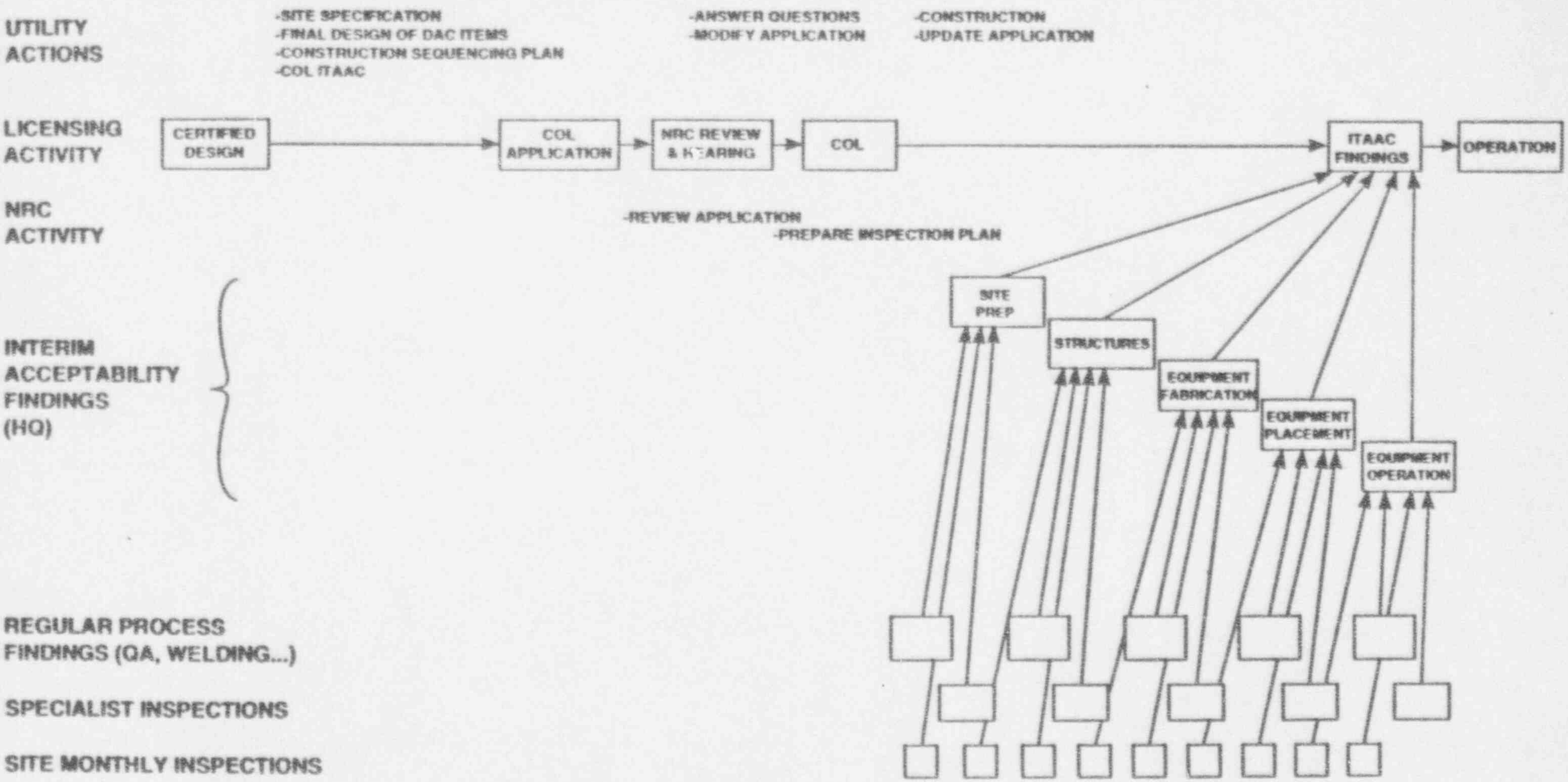
SCHEMATIC PLAN FOR VERIFICATION OF ITAAC



Enclosure 2

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HARDWARE INSPECTION MATRIX BLOCK DETAIL

HIGH PRESSURE CORE FLOODER SYSTEM - ITAAC 2.4.2							
INSPECTION AREAS	Procedures Review	Inprocess Inspection	Final Inspection	Independent Testing	Testing & QA	Records Review	ITAAC Number
COMPONENT PADS; Location and Orientation for pumps, motors, pipe supports, etc	System Design requirements for flood protection, seismic mountings; HPCF Pipe Support Dwgs; Review ITAACs for applicable structures. IP 46051	none	Component Pads satisfy the minimum height requirements for component flood protection. Component Pads provide adequate seismic support for the design bases earthquake. IP 46053	none	none	As-built records for HPCF room construction including pipe support location and component pad placement. IP 46055	2.4.2.1
CONCRETE EXPANSION ANCHORS (CEA); Installation and Testing	CEA Installation and testing procedures, Design requirements for mounting HPCF system seismic supports, Engineering Instructions for placement of CEAs for HPCF system. IP 46071	Observe placement of 5 to 10% of CEAs for the HPCF system, of that sample observe testing of 10%. IP 46071	If initial sample indicates a high or inconsistent failure rate increase the inspection rate correspondingly IP 46071	none	none	Review completed installation records for mixture of CEAs observed and not observed. IP 46071	2.4.2.1

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HIGH PRESSURE CORE FLOODER SYSTEM - ITAAC 2.4.2							
INSPECTION AREAS	Procedures Review	Inprocess Inspection	Final Inspection	Independent Testing	Testing & QA	Records Review	ITAAC Number
PIPE, VALVE, INSTRUMENT SUPPORTS AND SNUBBERS; Location, Orientation, Mounting	Review procurement records, review engineering instructions for installation of supports and snubbers, review system drawings showing support and snubber locations, review work packages associated with installation IP 48051, 35061	Observe in process installation of 5 to 10% of snubbers, pipe supports, instrument supports for the HPCF system. Verify piping supports meet ASME Subsection NF. IP 48053, 35061	If initial sample indicates a high or inconsistent failure rate, increase the sample size appropriately. IP 48053	none	none	Review installation records for mix of observed and non-observed snubber and support activities. IP 48055	2.4.2.1

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HIGH PRESSURE CORE FLOODER SYSTEM - ITAAC 2.4.2							
INSPECTION AREAS	Procedures Review	Inprocess Inspection	Final Inspection	Independent Testing	Testing & QA	Records Review	ITAAC Number
PIPE; Material, Installation, Boundary, Alignment, Welding.	Review procurement records for pipe, review engineering provided installation instructions (drawings, work packages, field notes, etc.), review the high energy pipe break mitigation design feature documentation for HPCF, review welding procedures for class 1 and class 2 piping. Review procedures for NDE of class 1 and 2 pipe welding. Review the ASME Code Certified Stress Report. IP 49051, 55050, 35065	Observe control of pipe material during receipt, storage, handling, and installation; observe placement and welding of 5 to 10% of pipe to verify proper alignment, cleanliness, and welding controls. Observe attachment of pipe supports and snubbers. Observe NDE of 10 to 15% of all piping welds. Observe installation of high energy pipe break protection mea?sures. IP 49063, 48053, 55050, 570XX, 35061	Verify pipe and valve supports and snubbers, piping, valves, pumps, motors and instruments were installed to design requirements by doing a 100% walkdown of the system after completion of all system work. Verify during the system walkdown that adequate physical and electrical separation exists between the two trains of the HPCF system and the HPCF system and the RCIC system as described in the system design. IP 49063, 48053, 50073, 51053, 52053, 51063	Conduct independent NDE of 5 to 10% of the welds for the HPCF system including valve welds. If the initial sample of independent NDE results have a high or inconsistent failure history increase the sample size as appropriate. IP 570XX	Review and observe the ASME Section III hydro-static test of the installed HPCF system. IP TBD	Review receipt inspection records, weld material records (weld rods, filler material, etc), QA records for pipe. Review NDE records for a mix of observed and non-observed welds. Review the completed hydro-static test of the HPCF system. Review the as-built stress report Verify documentation of the as-built reconciliation analysis. IP 49065, 35061	2.4.2 1, 2, and 5; 3.3.1, 2, and 3 (for HPCF system only)

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HIGH PRESSURE CORE FLOODER SYSTEM - ITAAC 2.4.2							
INSPECTION AREAS	Procedures Review	Inprocess Inspection	Final Inspection	Independent Testing	Testing & QA	Records Review	ITAAC Number
VALVEs - MOTOR OPERATED, CHECK, MANUAL; Installation, Orientation, Welding, Power Supplies, Testing	Review procurement specifications for valves, motor operators; review engineering instructions for location & installation requirements; review electrical drawings to determine proper power supplies for MOVs, position indication, control power; review ITAACs for electrical distribution systems; review post installation testing requirements; review environmental qualification requirements. IP 50071, 51051, 35061	Observe procurement controls, observe installation of 2 of 5 MOVs (pump suction (CST /suppression pool),minimum flow, test return, and injection valves) in each train of HPCF system. Observations should include weld preps, welding, limitorque installation, MOV motor terminations, power supply verification and MOV testing. Observe installation of testable check valve. IP 50073, 51053, 51063, 35061	Verify pipe and valve supports and snubbers, piping, valves, pumps, motors and instruments were installed to design requirements by doing a 100% walkdown of the system after completion of all system work. Verify during the system walkdown that adequate physical and electrical separation exists between the two trains of the HPCF system and the HPCF system and the RCIC system as described in the system design. IP 49063, 48053, 50073, 51053, 52053, 51063	Conduct independent NDE of 5 to 10% of the welds for the HPCF system including pipe welds. If the initial sample of independent NDE results have a high or inconsistent failure history increase the sample size as appropriate. IP 570XX	Review and observe 5 to 10% of the MOV testing. If failure history is high or inconsistent increase the sample size as appropriate. Observe open and closed testing of MOVs; Verify that the RPV injection valve opens in $\leq$ to 16 seconds upon receipt of an actuation signal; MOV automatic controls and functions will be reviewed during logic testing. IP TBD	Review records associated with Hi-Pot and megger of power and control cables for HPCF system MOVs; Review receipt inspection records for valves; Review weld material records (weld rod, filler material, etc); Review NDE records for a mix of observed and non-observed welds; Review MOV test results for observed and non-observed MOV tests. IP 50075, 51055, 51065, 35061	2.4.2. 1, 2, 4a, 4b, 8

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HIGH PRESSURE CORE FLOODER SYSTEM - ITAAC 2.4.2							
INSPECTION AREAS	Procedures Review	Inprocess Inspection	Final Inspection	Independent Testing	Testing & QA	Records Review	ITAAC Number
PUMPS; Installation, Alignment, Operation, Testing	Review procurement records for main pumps; Review manufacturers pump performance curves; Review engineering provided installation guidance; Review as-built analysis of adequate NPSH; Review pump vibration requirements and testing procedures IP 50071, 35061	Observe storage of the pumps before use; Verify reasonable alignment with suction and discharge piping; Observe alignment of pumps and motors. IP 50073, 35061	Verify pipe and valve supports and snubbers, piping, valves, pumps, motors and instruments were installed to design requirements by doing a 100% walkdown of the system after completion of all system work. Verify during the system walkdown that adequate physical and electrical separation exists between the two trains of the HPCF system and the HPCF system and the RCIC system as described in the system design. IP 49063, 48053, 50073, 51053, 52053, 51063	none	Observe system functional or logic testing to ensure that: 1) each pump produces a total system flow of not less than a straight line between 182 m^3/hr at a dp of 82.8 kg/cm^3 and 727 m^3/hr at a dp of 7 kg/cm^3; 2) HPCF system flow is achieved within 16 seconds of simulated initiation signal; 3) NPSH available exceeds NPSH required. IP TBD	Review receipt inspection records for pumps; Review pump test records used to develop as installed pump performance curves; Review completed functional test records; Review pump vibration records. IP 50075, 35061	2.4.2. 1, 3d, 3e, 3f

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HIGH PRESSURE CORE FLOODER SYSTEM - ITAAC 2.4.2							
INSPECTION AREAS	Procedures Review	Inprocess Inspection	Final Inspection	Independent Testing	Testing & QA	Records Review	ITAAC Number
PUMP MOTORS; Installation, Power Supplies, Electrical Connections, Alignment, Operation, Testing	Review procurement records for pump motors; Review engineering provided installation guidance; Review environmental qualifications of pump motors; Review instructions for cable terminations; Review electrical distribution system drawings to determine appropriate power supplies for motors; Review Hi-pot, megger, and vibration testing requirements and procedures for pump motors. IP 51051, 35061	Observe storage of the pump motors before use; Observe alignment of pumps and motors; Observe termination of electrical power supplies; Observe rotation check; IP 51053, 51063, 35061	Verify pipe and valve supports and snubbers, piping, valves, pumps, motors and instruments were installed to design requirements by doing a 100% walkdown of the system after completion of all system work. Verify during the system walkdown that adequate physical and electrical separation exists between the two trains of the HPCF system and the HPCF system and the RCIC system as described in the system design. IP 49063, 48053, 50073, 51053, 52053, 51063	none	Observe Hi-pot, megger, and continuity testing of the pump motors; Observe vibration testing (coupled and uncoupled); Observe electrical performance of the pump motors during functional testing IP TBD	Review receipt inspection records; Review vibration records (uncoupled and coupled to pump); Review motor Hi-pot and megger test results; Review electrical performance data obtained during functional or logic testing of the HPCF system; Review as-built cable termination records for pump motor power supplies. IP 51055, 51065, 35061	2.4.2.1

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HIGH PRESSURE CORE FLOODER SYSTEM - ITAAC 2.4.2							
INSPECTION AREAS	Procedures Review	Inprocess Inspection	Final Inspection	Independent Testing	Testing & QA	Records Review	ITAAC Number
INSTRUMENTS AND CONTROLS; Flow Element, Discharge and Suction Pressure indicators (local, remote, control room), Position Indication (MOVs, Testable Check)(local, remote, control room), Flow Indication (local, remote, control room), Control Switches for MOVs and Pumps (local, remote, control room), System Interlocks, Control Power, Instrument Power.	Review procurement records for system instruments and for Safety System Logic and Control (SSLC) system components that interface with HPCF instruments and controls; Review engineering provided installation guidance; Review environmental qualifications requirements; Review setpoint methodology; Review electro-magnetic compatibility analyses. IP 52051, 35061	Observe instrument storage before use; Observe installation of HPCF flow element and pressure sensing instruments; Of local, remote, and control room indications for pump suction and discharge pressure, system flow, position indication, breaker positions; Of control switches for pump motors and MOVs; Electrical terminations at sensors; Environmental qualification controls. IP 52053, 35061, 51053	Verify pipe and valve supports and snubbers, piping, valves, pumps, motors and instruments were installed to design requirements by doing a 100% walkdown of the system after completion of all system work. Verify during the system walkdown that adequate physical and electrical separation exists between the two trains of the HPCF system and the HPCF system and the RCIC system as described in the system design. IP 49063, 48053, 50073, 51053, 52053, 51063	none	Observe calibration of flow and pressure sensors; Observe several continuity checks of instrument transmitter cables; Observe instrument response testing from the sensing element to the SSLC system; Logic testing will be reviewed separately IP TBD	Review receipt inspection records; Review instrument test response data; Review setpoint and environmental qualification records; Review trip and calibration data; Review the electro-magnetic compatibility (EMC) compliance plan, including analyses and testing documentation. IP 52055	2.4.2. 1, 6, 7 3.4. 10, 11, 12, 13

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HIGH PRESSURE CORE FLOODER SYSTEM - ITAAC 2.4.2							
INSPECTION AREAS	Procedures Review	Inprocess Inspection	Final Inspection	Independent Testing	Testing & QA	Records Review	ITAAC Number
WATER SUPPLY; Suppression Pool, Condensate Storage Tank,	Review design requirements for minimum water sur[illegible] to suppor HPCF and RCIC system from the suppression pool and the CST; Review HPCF system drawings for connections with RCIC, SPCS, MUWC systems. IP 50071	none	Verify pipe and valve supports and snubbers, piping, valves, pumps, motors and instruments were installed to design requirements by doing a 100% walkdown of the system after completion of all system work. Verify during the system walkdown that adequate physical and electrical separation exists between the two trains of the HPCF system and the HPCF system and the RCIC system as described in the system design. IP 49063, 48053, 50073, 51053, 52053, 51063	none	Observe testing of keep fill system for the HPCF system. IP TBD	Review ITAAC for RCIC, SPCS, and MUWC systems; Review completed test of the HPCF keep fill system.	2.4.2 I

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HIGH PRESSURE CORE FLOODER SYSTEM - ITAAC 2.4.2							
INSPECTION AREAS	Procedures Review	Inprocess Inspection	Final Inspection	Independent Testing	Testing & QA	Records Review	ITAAC Number
LOGIC TESTING; auto initiation signals, manual initiation signals, pump suction valve transfer initiation signals and actual valve operations, vessel water level signals input to operate injection valve (high and low), flooder mode realignment during test mode, minimum pump flow interlock operation, pump operation /suction valves interlock operation.	Review tests on: Auto start signal on high DW or low RV level; manual start; start causes HPCF pump to start, RPV injection valve opens, CST suction valve opens, test return line close signal; Auto transfer of pump suction, CST to SP, on low CST or high SP level; RPV injection valve close signal on high water level or shutdown signal; HPCF restart after shutdown on low RV level; HPCF transfer from test to flooder mode; minimum bypass valve testing; pump interlocks if both suction valves closed. IP TBD	none	none	none	Observe 50% of all logic system testing to verify automatic system responses and interlocks function as designed. IP TBD	Review the results of all of the completed logic testing to verify satisfactory performance of the individual automatic system responses and interlocks. IP TBD	2.4.2 3a, 3b, 3c, 3g, 3h, 3i, 3j, 3k, 3m, 3n, 8, 9

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HIGH PRESSURE CORE FLOODER SYSTEM - ITAAC 2.4.2							
INSPECTION AREAS	Procedures Review	Inprocess Inspection	Final Inspection	Independent Testing	Testing & QA	Records Review	ITAAC Number
INTEGRATED SYSTEM TESTING; Electrical independence between Class 1E divisions and between Class 1E divisions and non-Class 1E equipment; HPCF division flow, injection time, NPSH available, full flow test mode available, satisfactory operation from the control room and remote shutdown panels.	Review tests on: Class 1E division electrical independence; Full flow HPCF system testing in the test mode and injection into the RV; Observe testing of the HPCF system using the controls in the control room and at the remote shutdown panels; Review separation criteria and protective measures between Class 1E and non 1E equipment; Review HPCF system drawings for division of electrical power between class 1E and non 1E equipment. IP TBD	Independently verify that adequate protective measures are established between Class 1E and non 1E equipment is inplace by walking down 5 to 10% of interfaces between Class 1E and non 1E components. If the initial sample failure rate is high or inconsistent increase the sample size as appropriate. IP 51053	Before observing integrated system testing, verify pipe and valve supports and snubbers, piping, valves, pumps, motors and instruments were installed to design requirements by doing a 100% walkdown of the system after completion of all system work. Verify during the system walkdown that adequate physical and electrical separation exists between the two trains of the HPCF system and the HPCF system and the RCIC system as described in the system design. IP 49063, 48053, 50073, 51053, 52053, 51063	none	Observe the following tests: Class 1E division independence testing; HPCF division full flow injection into the RV and using the test return valve; Controls in the control room and at the remote shutdown panels; Verify division flow is not < a straight line between 182 m^3/hr at a dp of 82.8 kg/cm^2 and 727 m^3/hr at a dp of 7 kg/cm^2; 2) within 16 seconds signal; 3) NPSH meets design. IP TBD	Review test results for electrical independence testing, full flow testing, control room and remote shutdown panel testing; Review results of licensees inspection for separation and protective measures between Class 1E and non 1E equipment IP TBD	2.4.2 3d, 3e, 3f, 3l, 6, 7

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