



**UNITED STATES**  
**NUCLEAR REGULATORY COMMISSION**  
WASHINGTON, D.C. 20555-0001  
**TRANSMITTAL OF MEETING HANDOUT MATERIALS FOR**  
**IMMEDIATE PLACEMENT IN THE PUBLIC DOMAIN**

*This form is to be filled out (typed or hand-printed) by the person who announced the meeting (i.e., the person who issued the meeting notice). The completed form, and the attached copy of meeting handout materials, will be sent to the Document Control Desk on the same day of the meeting; under no circumstances will this be done later than the working day after the meeting.*  
**Do not include proprietary materials.**

DATE OF MEETING

06/15/2001

The attached document(s), which was/were handed out in this meeting, is/are to be placed in the public domain as soon as possible. The minutes of the meeting will be issued in the near future. Following are administrative details regarding this meeting:

Docket Number(s)	NA
Plant/Facility Name	<b>Nuclear Energy Institute</b>
TAC Number(s) (if available)	NA
Reference Meeting Notice	6/1/01
Purpose of Meeting (copy from meeting notice)	<b>To discuss inspections tests, analyses, and acceptance criteria (ITAAC) related to nuclear power plant construction</b>

NAME OF PERSON WHO ISSUED MEETING NOTICE

Joseph M. Sebrosky

TITLE

Project Manager

OFFICE

NRR

DIVISION

FLO

BRANCH

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DF03

# Resumption of Interactions on ITAAC Verification and Construction Inspection

NEI/NRC Meeting

June 15, 2001

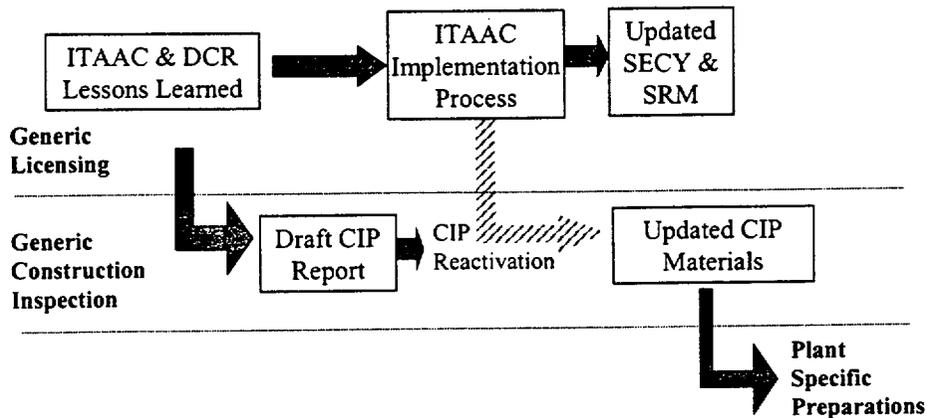


## MEETING PURPOSE

- Resume efforts towards a common understanding of goals, principles and guidance for effective, efficient and predictable ITAAC verification:
  - To provide a complete understanding of this key Part 52 process and support informed business decisions
  - To serve as a platform for construction planning and detailed construction inspection program (CIP) development
- Prioritize topics for future discussion



## CIP Development Process



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## PROPOSED SECTION 52.99 - INSPECTION DURING CONSTRUCTION

- (a) The licensee shall perform and demonstrate conformance with the ITAAC before fuel load. With respect to activities subject to an ITAAC, an applicant for a license may proceed at its own risk with design and procurement activities, and a licensee may proceed at its own risk with design, procurement, construction, and preoperational activities, even though the NRC may not have found that any particular ITAAC has been satisfied.
- (b) A designated officer or manager of the licensee shall notify the NRC that the required inspections, tests, and analyses in the ITAAC have been successfully completed and that the corresponding acceptance criteria have been met.
- (c) In the event that an activity is subject to an ITAAC, and the licensee has not demonstrated that the ITAAC has been satisfied, the licensee may either take corrective actions to successfully complete that ITAAC, or request an exemption from the ITAAC in accordance with the design certification rule or an amendment of the ITAAC under § 52.97(b) of this part, as applicable.
- (d) The NRC shall ensure that the required inspections, tests, and analyses in the ITAAC are performed. The NRC shall verify that the inspections, tests, and analyses referenced by the licensee have been successfully completed and, based solely thereon, find the prescribed acceptance criteria have been met. At appropriate intervals during construction, the NRC shall publish notices of the successful completion of ITAAC in the Federal Register.
- (e) After the Commission has made the finding required by § 52.103(g) of this subpart, the ITAAC do not, by virtue of their inclusion within the DCD or combined license, constitute regulatory requirements either for licensees or for renewal of the license; except for specific ITAAC, which are the subject of a § 52.103(a) hearing, their inclusion will occur upon final Commission action in such proceeding.

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## Significant Common Ground

- Future CIP activities expected to be similar to past
- Expectation of accelerated construction schedules; need for significant up-front and ongoing coordination by NRC and licensee
- Use of information technology to make the CIP more efficient, flexible, manageable, open, robust and auditable
- Notion of significant construction process inspections
- Expectation that ITAAC and risk-insights will improve the safety-focus of future CIP activities
- Distinction between ITAAC & QAP; importance of both



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## GROUND RULES

ITAAC verification and construction inspection processes should:

- Be consistent with Part 52
- Build from understandings established in design certification interactions
- Support aggressive construction schedules and Part 52 goal of predictable, stable licensing process
- Reflect reliance on normal licensee QAP implementation and NRC Part 50 inspection and enforcement (I&E)

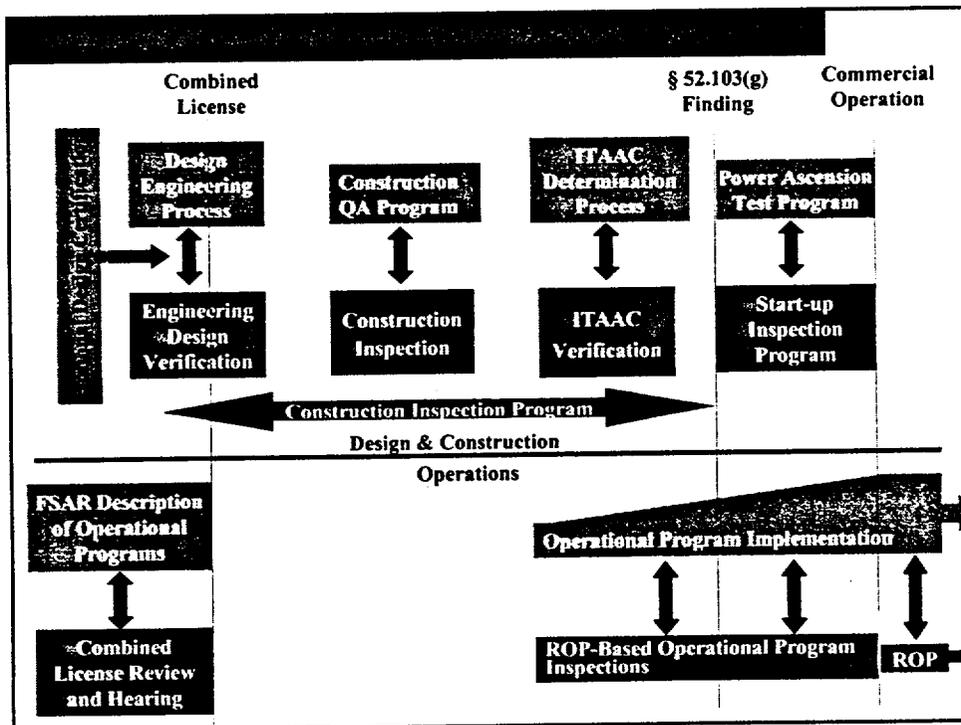


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## Key Concepts

- Engineering design verification - NRC process for verifying that the detailed design and construction drawings are consistent with the design approved in the license.
- Construction QAP - Continuous licensee process for assuring that design and construction activities, including ITAAC ITA, are performed in accordance with the license, NRC regulations and applicable codes and standards, and that SSCs will perform intended functions
- Construction inspection program - The NRC process for assessing the effectiveness of the licensee's construction activities and QAP and thereby providing underlying confidence in end-of-process ITAAC verifications
- ITAAC verification - NRC process for confirming that the licensee has completed specified ITAAC inspections, tests and analyses and that associated acceptance criteria have been met

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## LICENSEE ITAAC DETERMINATION PROCESS

- Specified QAP activities (denoted in CIP) result in licensee determination that one or more ITAAC have been met
  
- Licensee sends "ITAAC Determination Letter" to NRC:
  - Stating that one or more acceptance criteria of the license have been met
  - Identifying that ITAAC determination bases are available for audit
  - Requesting NRC staff confirmation and § 52.99 FRN

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## LICENSEE ITAAC DETERMINATION PROCESS (cont.)

- ITAAC Determination Record available on-site would:
    - Identify the ITA performed and acceptance criteria met (taken directly from the COL)
    - Identify the affected SSCs
    - Contain specific ITA results providing the basis for the ITAAC determination
  
  - Licensee will maintain available for audit
    - ITAAC Determination Record
    - Supporting QAP information
- } Readily retrievable via IMS
- 
- Configuration management controls will preserve the validity of ITAAC determinations

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## Sample ITAAC determination letter to NRC

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## NRC STAFF ITAAC FINDING PROCESS

- NRC receives licensee ITAAC Determination Letter
- NRC staff may base ITAAC findings on one or more of the following:
  - Audit of ITAAC determination bases (IDB) and supporting QAP information
  - Reference to relevant NRC inspection reports
  - Prior observation of licensee performance of specific or representative ITA
  - Verification of specific physical plant condition
- De novo inspection by NRC staff not required

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# ACCEPTANCE CRITERIA DETERMINATION RECORD

PLANT \_\_\_\_\_

High Pressure Core Flooder System  
ITAAC 2.4.2.2  
ASME Code Components Hydrostatic Test

1. Required Inspection, Test, or Analysis

A hydrostatic test will be conducted on those code components of the HPCF system required to be hydrostatically tested by the code.

2. Acceptance Criteria

The results of the hydrostatic test of the ASME Code components of the HPCF system conform with the requirements in the ASME Code, Section III.

3. Test/Inspection Report

See attached "Leak Test Record" (hydrostatic test report) and system test scope.

4. Conclusions

A comparison was performed between the required and actual hydrostatic test(s) pressures and test(s) durations. The scope of each test segment was examined to ensure appropriate overlap and complete testing of the HPCF code components within the HPCF system. The required hydrostatic test pressures and durations were satisfied and the ASME Code components in the HPCF system required by the ASME Code, Section III to be hydrostatically tested were included in the test scope. This satisfies the acceptance criteria for ITAAC 2.4.2.2.

5. Signature

\_\_\_\_\_

\_\_\_\_\_

## **NRC STAFF ITAAC FINDING PROCESS (cont.)**

- Discrepancies noted during audit of IDB, supporting QAP info, or in the field would be referred to the licensee's normal corrective action program
- Unless the discrepancy represents an ITAAC noncompliance, the staff would be expected to make the required § 52.99 finding
- At least 180-days before fuel load, the NRC staff would make a determination regarding the status of ITAAC completion to support the notice of intended operation required by §52.103(a)

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## **Early ITAAC Findings**

- Process should allow findings on system ITAAC line items as they are completed
- Incremental, early ITAAC findings will
  - Promote an orderly and predictable ITAAC verification process
  - Provide meaningful public information
  - Indicate tangible evidence of acceptable construction

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## ITAAC-Informed, Risk-Informed CIP

- ITAAC focus
  - Establishes underlying basis for ITAAC verifications and the NRC's pre-operational finding
  - Ensures focus on the most salient and significant SSCs and features
- Safety focus
  - Applying risk insights will further enhance CIP focus based on safety significance

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## Benefits of Safety-Focused CIP

- Focuses construction inspection activities on safety significant SSCs and functions
- Promotes efficient use of inspection resources
- Basis for risk-informed "smart sampling"
- Systematic, robust basis for CIP

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## Additional Topics for Future Discussion

Further interactions needed to establish common understandings of:

- ITAAC (§ 52.99) and construction process inspections
- Safety-focused, ROP-based inspections of operational programs & transition to start-up
- Engineering design verification
- Alternate approach to ITAAC determination matrix to:
  - Reflect reliance on construction process inspections
  - Preserve distinction between ITAAC and QAP activities



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## SUMMARY AND PATH FORWARD

- Sound ITAAC verification process is vital to assuring predictability and workability of the Part 52 process
- Clarify ITAAC verification process in parallel with -- and to inform -- CIP reactivation
- Do so over the balance of 2001
- NEI to provide white paper as basis for detailed interactions
- SECY and SRM in 2002



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**Meeting With Nuclear Energy Institute  
to Discuss ITAAC  
June 15, 2001**

**Agenda**

<u>Topic</u>	<u>Presenter</u>	<u>Time</u>
I. Opening Remarks	NEI/NRC	9:00-9:10 am
II NEI's view of ITAAC	NEI	9:10-10:30 am
a. Background		
b. Key Concepts		
c. ITAAC verification process		
d. Timing of ITAAC findings		
e. Safety focus		
f. Non-ITAAC findings		
III. Current activities related to the Construction Inspection Program	NRC	10:30 - 11:00 am
IV Public Interaction	All	11:00 - 11:15 am
II. Closing Remarks	NEI/NRC	11:15 - 11:30 am

- NRC Handouts:
- NRC slide presentation
  - SECY-00-0092, "Combined License Review Process"
  - Portion of "Draft Report on the Revised Construction Inspection Program," dated October 1996
  - SECY-94-294, "Construction Inspection and ITAAC Verification"
  - NEI letter dated October 7, 1994, providing comments related to construction inspection and ITAAC verification

# **Current Activities Related to the Construction Inspection Program**

Joe Sebrosky  
June 15, 2001

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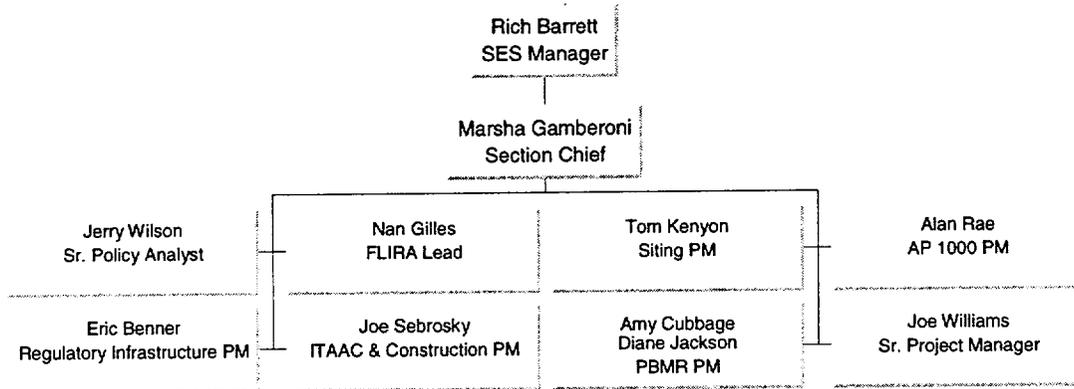
## **Current Activities**

### **Construction Inspection Program Reactivation**

- Future Licensing Organization
- Future Licensing and Inspection Readiness Assessment
- Challenges

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# Future Licensing Organization



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## Construction Inspection Program Reactivation

### FLIRA

- Evaluate Full Range of Licensing Scenarios
- Assess Readiness to Review Applications & Perform Inspections
  - ▶ Staff capabilities
  - ▶ Schedule and Resources
  - ▶ External Support
  - ▶ Regulatory Infrastructure
- Recommendations
  - ▶ Staffing
  - ▶ Training
  - ▶ Contractor Support
  - ▶ Schedules
  - ▶ Rulemakings and Guidance Documents
- Complete Assessment by September 2001

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## **Construction Inspection Program Reactivation**

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### Input for FLIRA

- Licensing Scenarios
  - ▶ Reactivated Plant
  - ▶ Standard Design
  - ▶ Custom Design
- Resource Estimate
  - ▶ Identify the work that needs to be done
  - ▶ Estimate FTE to perform the work
  - ▶ Identify the critical skills that will be needed

## **Construction Inspection Program Reactivation**

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### FLIRA Guidance Documents

- "Draft Report on the Revised Construction Inspection Program, " October 1996
- SECY-94-294, "Construction Inspection and ITAAC Verification"
- SECY-91-041, "Early Site Permit Review Readiness"
- SECY-89-104, "Assessment of Future Licensing Capabilities"

# Construction Inspection Program Reactivation

## Challenges

- Draft CIP report identifies:
  - ▶ Actions associated with future CIP reactivation
  - ▶ Agency and programmatic policy issues
  
- SECY Papers and Draft CIP report do not recognize:
  - ▶ Custom plant scenario (e.g., the PBMR will not be referencing a certified design)
  - ▶ Compressed construction schedule
    - SECY 89-104 assumed 13 years from time of CP application to commercial operation of the plant
    - Draft CIP report assumed 54 months from first concrete pour to commercial operation (48 months until fuel load)
    - Approximately 36 months for the AP600, and 20 months for the PBMR
  - ▶ Use of risk insights in CIP (Draft CIP report does recognize that it should be an input)

## Schedule

ID	Task Name	2001		2002		2003	
		Qtr 1	Qtr 3	Qtr 1	Qtr 3	Qtr 1	Qtr 3
1	Future Licensing and Inspection Readiness Assessment	█					
2	Early Site Permit - 1st application			█	█	█	█
3	Early Site Permit - 2nd and 3rd applications					█	█
4	AP 1000 pre-application review - Phase 2	█	█				
5	AP 1000 design certification review			█	█	█	█
6	PBMR pre-application review	█	█				
7	PBMR combined license application (without ESP)					█	█
8	GT-MHR pre-application review			█	█	█	█
9	IRIS pre-application review			█	█		
10	Regulatory Infrastructure	█	█	█	█	█	█
11	Part 52 Rule		█	█	█		
12	Clarify/modify environmental related regulations			█	█	█	█
13	New Plant Regulatory Framework			█	█	█	█
14	Review/clarify/modify financial related regulations			█	█	█	█
15	Advanced Technology Infrastructure			█	█		
16	Construction Inspection Program Reactivation	█	█	█	█	█	█



## **POLICY ISSUE** **(Notation Vote)**

April 20, 2000

SECY-00-0092

FOR: The Commissioners  
FROM: William D. Travers  
Executive Director for Operations

SUBJECT: COMBINED LICENSE REVIEW PROCESS

PURPOSE:

To request the Commission's approval of the staff's recommendations on a number of issues related to the combined license (COL) review process under 10 CFR Part 52, Subpart C, in response to COMSECYs 95-028 and 98-004, dated September 14, 1995, and April 10, 1998.

BACKGROUND:

Since the issuance of 10 CFR Part 52 in 1989, the NRC staff has issued numerous SECY papers on issues associated with the implementation of Part 52 and held many meetings with the Commission and nuclear industry representatives on these issues. The major focus of the previous papers and meetings was on the implementation of Subpart B of 10 CFR Part 52, "Standard Design Certifications." This paper discusses some of the same issues, but the focus is on implementation of Subpart C of 10 CFR Part 52, "Combined Licenses." Subpart C sets forth a process for issuing COLs for nuclear power facilities. A COL is a license authorizing construction and conditional operation of a nuclear power facility, and it includes inspections, tests, analyses, and acceptance criteria (ITAAC).

The NRC staff sent an earlier version of this paper to the Commission on April 1, 1993 (a copy was placed in the NRC's public document room) and briefed the Advisory Committee on Reactor Safeguards (ACRS) in May 1993. After receiving comments from the industry and the ACRS, the staff made substantial changes to a subsequent version of the paper dated July 31, 1995. The most significant of these changes were removing a proposed license condition regarding detailed design drawings, removing any mention of hold points in the construction inspection process, and revising the format of the generic COL. A notice of a 120-day comment period on an updated version of this paper, dated May 1, 1998, was published in the Federal Register (63 FR 25528, dated May 8, 1998). The updated paper contained a change to the expiration date for the COL (attachment 2, p. 4), under advice from the General Counsel.

CONTACT:  
Jerry N. Wilson, NRR  
415-3145

DISCUSSION:

This paper (1) responds to a portion of Direction-Setting Issue #10, "Reactor Licensing for Future Applicants" (COMSECY-96-059, dated March 18, 1997); (2) presents recommendations on issues related to a COL; and (3) responds to comments submitted by the Nuclear Energy Institute (NEI) on the 1998 version of Attachment 1 (see background discussion). NEI submitted the only comments on this paper, in a letter dated September 8, 1998, and met with the NRC staff to discuss these COL issues on October 21, 1998.

Although an application for a COL is not expected in the near future, many of the policy issues discussed in Attachment 1 of this paper will affect the COL review process. NEI encouraged the NRC to continue discussions on licensing issues and stated that "the viability of the nuclear option in the U.S. depends on the stability and predictability of the COL review processes." The NRC staff intends to continue its interactions with NEI on other COL issues (i.e., issues listed in Section 5 of NEI's comments), as resources permit.

RECOMMENDATIONS:

Based on the discussions in Attachment 1, the staff recommends that the Commission:

1. Approve the proposed ITAAC verification program (attachment 1, pp. 3-4).
2. Approve the treatment of QA deficiencies related to ITAAC verification (attachment 1, p. 6).
3. Approve the form and content of the generic COL (attachment 1, p. 6 and attachment 2).

Note that the staff:

1. will request COL applicants to provide construction information (attachment 1, p. 1).
2. will develop a rule for plant-specific probabilistic risk assessments (attachment 1, p. 2).
3. will develop a rule for certifying that ITAAC have been met (attachment 1, p. 4).

RESOURCES:

The resources for this paper and the Part 52 rulemaking are in the NRR budget.

COORDINATION:

The Office of the General Counsel has no legal objection to this paper. The Office of the Chief Information Officer has reviewed this paper for information technology and information management implications and has no objections. The Office of the Chief Financial Officer has reviewed this paper for resource implications and has no objections.

*Frank J. Muraglia*  
for William D. Travers  
Executive Director  
for Operations

Attachments:

1. Combined License Issues
2. Generic Combined License

Commissioners' completed vote sheets/comments should be provided directly to the Office of the Secretary by c.o.b. Friday, May 5, 2000.

Commission staff office comments, if any, should be submitted to the Commissioners NLT April 28, 2000, with an information copy to SECY. If the paper is of such a nature that it requires additional review and comment, the Commissioners and the Secretariat should be apprised of when comments may be expected.

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## COMBINED LICENSE ISSUES

### Contents of an Application

Subpart C of 10 CFR Part 52 delineates the requirements and procedures applicable to the issuance of a combined license (COL) for nuclear power facilities. An application for a COL may, but is not required to, reference a design certification rule (DCR) or an early site permit (ESP), or both. As discussed in Section 52.79, the contents of a COL application depend on whether the applicant references a DCR or an ESP. This paper analyzes the case in which an applicant references a DCR. If an ESP is not referenced in a COL application, all siting issues (including environmental protection, site safety, and emergency planning) must be addressed in the COL application.

A COL applicant will be responsible for submitting all of the information that would be required for an operating license under Part 50, plus the additional information required for issuance of a COL under Subpart C of Part 52, as discussed below. Sections 52.77 and 52.79 require COL applicants to submit relevant information required of applicants for construction permits (CPs) and operating licenses (OLs). Because the COL combines both a CP and an OL, the staff will need, as part of the COL application, all of the information required to make the findings under 10 CFR 50.40, 50.42, 50.43, 50.47, 50.50, 50.57, including those findings concerning the financial and technical qualifications of the applicant, and 10 CFR Part 51. A COL applicant that references a DCR must submit a final safety analysis report (FSAR) that includes a plant-specific design control document (DCD). The plant-specific DCD consists of the generic DCD, as modified and supplemented by plant-specific departures and exemptions. The FSAR also (1) includes the required siting information; (2) demonstrates compliance with site parameters and interface requirements; (3) includes site-specific design information and inspections, tests, analyses, and acceptance criteria (ITAAC); (4) provides any outstanding information regarding emergency plans; (5) includes plant-specific technical specifications; (6) addresses the COL action items; and (7) physically includes the proprietary and safeguards information.

The licensee bears the responsibility for developing and performing ITAAC. The NRC will verify through its inspection program that the licensee has performed ITAAC in an acceptable manner, thereby ensuring there is reasonable assurance that the facility has been built and will operate in accordance with the license and applicable regulations. As discussed further in this paper and in SECY-94-294, "Construction Inspection and ITAAC Verification," close coordination will be required between the licensee and the NRC staff during the construction process to ensure that essential inspections, tests, and analyses are verified in a timely manner. To facilitate this coordination, the staff will need a detailed construction plan, including construction sequence and schedule, along with, or shortly after, the COL application. The staff believes that applicants will be willing to provide this information, especially if, as nuclear industry representatives have suggested, they want to pursue an aggressive construction schedule. Although this information is not required to be submitted, the consequences of not providing it could include diminished coordination between the licensee and the NRC, which could result in difficulty in scheduling inspections. Therefore, the NRC staff will request COL applicants to provide detailed construction plans (note #1).

A COL applicant should also submit a plant-specific probabilistic risk assessment. The staff has discussed its views on this subject in SECY-94-182, "Probabilistic Risk Assessment (PRA)

Beyond Design Certification," dated July 11, 1994 (see staff requirements memorandum on SECY-94-182, dated July 27, 1994). In comment 2.a, NEI stated that "In general, the design certification PRA will be conservative with respect to an individual plant that references the design certification. A plant-specific PRA will not, in most cases, be necessary." NEI requested that a COL applicant be allowed to "demonstrate that the PRA for the design certification is bounding for the applicant's plant" and claims that this is consistent with SECY-94-182 (page 3). The NRC staff disagrees because SECY-94-182 states that "the applicant should be required to (1) update the design certification PRA or (2) complement it with any supplemental PRA analyses, as needed." SECY-94-182 does not contradict the need for a plant-specific PRA, rather it states that a plant-specific PRA should be performed by updating and/or supplementing the design certification PRA to reflect the site-specific design and the as-built plant. This specification includes areas in which design acceptance criteria were provided in lieu of detailed design information, for example, the control room. It is important to integrate the PRA into the entire detailed design of the plant and the construction process. The updated or supplemental PRA models should be consistent with design certification PRA insights and assumptions and should be adequate to support post-certification activities. In this context, any conservative or bounding assumptions made in the PRA should not mask important insights needed to support operation and performance-based regulations. Furthermore, NEI previously agreed to support a generic rulemaking that will require a COL applicant to submit a living, plant-specific PRA that updates and supersedes the design certification PRA (refer to SECY-94-182, page 2, and 62 FR 25817, 3rd column). Therefore, the NRC staff will propose a requirement for COL applicants to submit a plant-specific PRA (note #2) in the upcoming rulemaking on 10 CFR Part 52 (see SECY-98-282).

### COL ITAAC

Section 52.79(c) requires that the COL application include ITAAC that are necessary and sufficient to demonstrate that the facility has been constructed and will operate in conformity with the COL, the Atomic Energy Act of 1954 (1954 Act), and the Commission's regulations. In addition, pursuant to Section 52.103(g), the Commission must find that all acceptance criteria specified in the license are met before facility operation. Because ITAAC are the sole source of acceptance criteria, it is essential that the COL ITAAC include all significant issues that require satisfactory resolution before fuel loading. The COL ITAAC consist of the ITAAC from the referenced DCR (Tier 1 information), plus the ITAAC resulting from the COL proceeding, which include the ITAAC for the site-specific design information and the regulations applicable to a COL applicant.

In Section 1 of its comments, NEI stated that the intent of Part 52 and Congress was for COL ITAAC to pertain only to hardware and design-related issues. NEI stated further that providing ITAAC on "programmatic topics" is neither required nor preferred. The NRC staff disagrees with NEI's claim. The Energy Policy Act of 1992 and Part 52 [Sections 52.79(c) and 52.97(b)(1)] clearly require that ITAAC must verify that applicable regulations have been met before a facility can be authorized to operate. These regulations make no distinction between hardware and design-related issues, versus "programmatic topics." Thus, the so-called "programmatic" ITAAC (i.e., emergency plans) are consistent with the licensing process in Part 50 [Section 50.57(a)(1)] and were included by Congress and understood by the Commission to be prerequisites for operation under a COL. In addition, the NRC has already approved so-called "programmatic" ITAAC as part of the design certification process and, therefore, are

required to be successfully completed before the Commission can authorize operation. In conclusion, "programmatic" ITAAC are necessary to meet the requirements of 10 CFR Part 52 and the 1954 Act. The staff is willing to work with the nuclear industry to develop COL ITAAC that are as precise and objective as practical but will also ensure that the COL ITAAC can verify that all applicable regulations are met (see SECY-95-090).

### Verification of ITAAC

The licensee documentation requirements for a facility that is licensed under Part 52 are similar to the documentation requirements under Part 50. The difference is that under Part 52, the documentation should be formatted to demonstrate the bases for successful completion of ITAAC. The licensee should certify to the NRC that ITAAC have been successfully performed and that the acceptance criteria have been met. The ITAAC certification letter should identify the specific ITAAC that have been completed; it should identify, in summary form, the bases for the conclusion that ITAAC have been met; and it should identify the location of any supporting documentation that is available for audit. The supporting documentation may include such items as test reports, engineering analyses, calculations, drawings, vendor component tests, inspections, quality assurance (QA) records, and other facility records.

The design descriptions and functional system drawings available for review during the design certification and COL application stages are sufficient to perform licensing reviews and make final safety determinations but are not adequate for actual construction or construction inspection activities. Therefore, before construction begins on any given portion of the facility, the licensee should ensure that the certified design, plus site-specific design information in the COL application, including that required by the design acceptance criteria (DAC), has been translated into detailed, plant-specific design and construction drawings. The level of detail in the certified design and the use of DAC allow for some variation in implementing the certified design. The applicant or licensee also has some flexibility in completing the final design by means of the change process in each DCR. The NRC staff will verify completion of ITAAC by the licensee and conformance with the approved design in part by using these detailed drawings. Therefore, the licensee should ensure that the drawings and other documentation reflect the final as-built configuration of the facility so that they can be used as part of the bases, where appropriate, for demonstrating conformance with the COL ITAAC.

In SECY-94-294, NRR outlined its program to develop a new construction inspection program to accommodate the requirements of future reactors licensed under Part 52 and to incorporate lessons learned from experience with the current construction inspection program (CIP). The staff completed a draft report on "The Revised Construction Inspection Program," dated October 1996, and placed it in the Public Document Room. When implemented, one of the objectives of the CIP will be to inspect the licensee's process for performing ITAAC and to inspect the licensee's program for ensuring that ITAAC are met. This inspection could include the results of the preoperational test program, QA program, and various facility construction programs. The staff expects that there will be significant interaction between the licensee and the NRC throughout the facility construction stage. Increased NRC onsite staffing, the formal designation of mandatory verification activities by the COL ITAAC, and the optional implementation of a "sign-as-you-go" (SAYGO) inspection program will create a more structured and a more interactive environment. In addition to an increased NRC onsite presence, NRR will have an active role in the construction verification activities. NRR will (1)

retain program management responsibility (including the functions of interpreting DCR and COL requirements); (2) coordinate the inspection program and licensing activities; and (3) issue periodic Federal Register notices. The staff expects that the licensee will submit periodic construction status and completion reports, in order to facilitate issuance of Federal Register notices under Section 52.99 regarding the successful completion of ITAAC. A condition was included in the generic COL that requires the licensee to state, under oath or affirmation, that the COL ITAAC have been met [item 2.D(1)]. Also, the NRC staff will propose a requirement for COL applicants to certify that ITAAC have been met (note #3) in the upcoming rulemaking on 10 CFR Part 52 (see SECY-98-282).

The NRC's inspection program is written to provide general guidance to the inspection staff on a wide range of construction, preoperational, startup, and power operation areas. The inspection staff will adapt the general inspection guidance to develop a site-specific inspection plan that incorporates the specifics of the COL ITAAC and license conditions. The NRC's acceptance of ITAAC will be based upon licensee completion reports and independent NRC inspection and design review activities. The inspection program will provide for independent verification of site activities that support ITAAC. Although the results of specific NRC inspections will have a direct impact on the staff's conclusions regarding the successful completion of ITAAC, the NRC inspection program will not be limited to verification of specific ITAAC requirements. For example, the NRC inspection program might identify deficiencies in the QA program that are not related to the successful completion of ITAAC but could result in an enforcement action (see discussion on role of QA program). The NRC staff recommends that in developing the verification program, licensees also include appropriate mechanisms for controlling ITAAC activities that are not safety-related but that play a significant role in the verification of the design integrity of the as-built facility. Therefore, the staff expects that because of the special significance of ITAAC in demonstrating conformance of the as-built facility with the approved design, the licensee will implement administrative requirements or processes for the verification of ITAAC that are similar to those implemented for the conduct of the initial test program (ITP). In comment 2.b, NEI requested clarification of this statement and subsequently stated that the industry does not want a requirement for ITAAC verification to result in duplicative programs. The staff agrees that a licensee should not have to verify an ITAAC that was already verified as part of an existing program, e.g. ITP. However, the remaining ITAAC need to be verified under a program that is commensurate with the significance of ITAAC to the licensing process. The staff requests approval of the ITAAC verification program outlined above (recommendation #1). In light of the NRC staff's revised reactor oversight initiative, it may be appropriate to revisit aspects of the construction inspection and enforcement programs when future nuclear power plant applications are announced.

#### Role of the Quality Assurance Program

The NRC staff anticipates that there will be design, construction, and testing activities related to ITAAC verification for which the staff will not be able to rely solely on NRC inspections to verify proper completion. For these activities, the staff must rely on the licensee's QA program to provide suitable controls for effective verification. The staff must have confidence that the licensee's QA program is adequate and that it is being properly implemented so that design, construction, or testing deficiencies are identified, documented, and corrected. The QA requirements of Appendix B to Part 50 apply to all safety-related activities being conducted by the licensee during the design, construction, and operations phase, including those safety-

related activities performed to satisfy ITAAC. For example, preoperational test program testing performed to demonstrate that safety-related structures, systems, and components (SSCs) will perform satisfactorily in service must be conducted under a program that satisfies Criterion XI, "Test Control," of Appendix B to Part 50 and may also satisfy testing required by the ITAAC process. The scope of the initial test program, however, is not limited to just safety-related SSCs. Specifically, Regulatory Guide (RG) 1.68, "Initial Test Programs for Water-Cooled Nuclear Power Plants," Revision 2 (August 1978), specifies the scope of plant SSCs to be tested to satisfy the requirements of Criterion 1, "Quality standards and records," of Appendix A to Part 50, and Appendix B to Part 50. Although testing is required for all SSCs within the scope of RG 1.68, it is not required that all of them be tested to the same stringent requirements. Accordingly, the administrative requirements that govern the conduct of the test program, for example, test program objectives, phases, organizational elements, personnel qualification, review, evaluation and approval of test results, test records retention, and so on, contain provisions for the application of such administrative controls in a manner commensurate with the safety significance of the SSCs within its scope. Because the ITAAC process includes safety-related activities that must be conducted under a QA program that meets the requirements of Appendix B to Part 50, licensees must develop programmatic controls and procedures that delineate how such activities will be implemented.

As discussed in public meetings with NEI representatives, there may be deficiencies identified by the QA program that are relevant to ITAAC and that must be addressed by the licensee before the NRC can find that the ITAAC have been successfully completed. NEI representatives asserted that quality assurance and quality control (QA/QC) deficiencies have no relevance to ITAAC findings. The NRC staff disagrees with any assertion that QA/QC deficiencies have no relevance to the determination of whether ITAAC have been successfully completed. Simply confirming that ITAAC had been performed in some manner and a result obtained apparently showing that the acceptance criteria had been met would not be sufficient to support a determination that ITAAC had been successfully completed. The manner in which ITAAC are performed can be relevant and material to the results of the ITAAC. For example, in conducting ITAAC to verify a safety-related pump's flow rate, it is necessary, even if not explicitly specified in the ITAAC, that the gauge or instrument used to verify the pump flow rate be calibrated in accordance with the requirements of Appendix B to Part 50 and that the test configuration be representative of the final as-built plant conditions (i.e., valve or system lineups, gauge locations, system pressures, or temperatures). Otherwise, the acceptance criteria for pump flow rate could apparently be met while the actual flow rate in the system could be different than that required by the approved design. Therefore, the NRC staff has determined that a QA/QC deficiency may be considered in determining whether an ITAAC has been successfully completed if (1) the QA/QC deficiency is directly and materially related to one or more aspects of the relevant ITAAC (or supporting Tier 2 information) and (2) the deficiency (considered by itself, with other deficiencies, or with other information known to the NRC) leads the NRC to question whether there is a reasonable basis for concluding that the relevant aspect of the ITAAC has been successfully completed. This approach is consistent with the NRC's current methods for verifying initial test programs.

The NRC staff recognizes that there may be programmatic QA/QC deficiencies that are not relevant to one or more aspects of a given ITAAC under review and, therefore, should not be relevant to or considered in the NRC's determination as to whether that ITAAC has been successfully completed. Similarly, individual QA/QC deficiencies unrelated to an aspect of the

ITAAC in question would not form the basis for an NRC determination that an ITAAC has not been met. Using the ITAAC for pump flow rate example, a specific QA deficiency in the calibration of pump gauges would not preclude an NRC determination of successful ITAAC completion if the licensee could demonstrate that the original deficiency was properly corrected (e.g., analysis, scope of effect, root cause determination, and corrective actions, as appropriate) or that the deficiency could not have materially affected the test in question. Furthermore, during the development of ITAAC, the design certification applicants determined that it was impossible (or extremely burdensome) to provide all details relevant to verifying all aspects of ITAAC (e.g., QA/QC) in Tier 1 or Tier 2. Therefore, the NRC staff accepted the applicants' proposal that top-level design information be stated in the ITAAC to ensure that it was verified, with an emphasis on verification of the design and construction details in the "as-built" facility. To argue that consideration of underlying information, which is relevant and material to determining whether ITAAC have been successfully completed, is not necessary ignores this history of ITAAC development.

In summary, the NRC staff recommends that the Commission support the conclusion that underlying information (such as QA/QC deficiencies), which is relevant and material to ITAAC, must be considered in determining whether ITAAC have been successfully completed (recommendation #2). In addition, there may also be deficiencies identified that are not relevant to ITAAC. These deficiencies may still need to be addressed by the licensee, but they will not delay a finding on successful ITAAC completion or plant operation.

#### COL Form and Content

Although Subpart C of 10 CFR Part 52 does not specifically discuss the form or content of a COL, Section 52.97(b)(1) requires that ITAAC be identified within the COL. The NRC staff prepared a generic COL (Attachment 2) on the basis of recently issued operating licenses and the requirements of 10 CFR Part 52. The NRC staff recommends that the form and content of the generic COL be approved (recommendation #3). In its Section 3 comments, NEI proposed several changes to the previous generic COL that are addressed below.

In comment 3.a, NEI stated that it was appropriate to include license conditions on startup and power ascension tests but commented on the wording in former condition 2.J. The staff did not adopt NEI's suggested wording, but deleted former conditions 2.H, 2.I, and 2.J and revised 2.D to provide specific license conditions for fuel loading and startup testing. In comment 3.b, NEI stated that conditions 2.A and 2.B(2) should use the term "plant-specific design control document" rather than "final safety analysis report" (FSAR). The staff disagrees because use of the term "final safety analysis report" in these conditions is correct. The plant-specific design control document is a subset of the FSAR that is required by 10 CFR 52.79. In comment 3.c, NEI stated that condition 2.G should include 10 CFR 52.97 for completeness. The staff agrees with this comment and modified condition 2.G. In comment 3.d, NEI points out that 10 CFR 52.97(b)(1) requires that ITAAC be identified within the combined license. The staff agrees and identified the COL ITAAC in license conditions 2.C and 2.D(1) and incorporated the COL ITAAC [including Tier 1 information] into the license [see item 2.D(4)].

In comments 3.e through 3.h, NEI states that there is no reason for COL holders to implement operational requirements in Title 10 that are applicable to the generic COL during the period of construction. These operational requirements include technical specifications, financial

protection, emergency preparedness, and so on. The NRC staff agrees that some operational requirements are not applicable during the period of construction. However, the staff disagrees with NEI's list and believes that some operational programs will apply (e.g. security and safeguards plans). The staff has included an effectiveness statement for these operational requirements in condition 2.I. In addition, the Commission plans to consider the desirability of stating in Part 52 that the "operational requirements" become effective only after the Commission has made the finding under 10 CFR 52.103(g) in the upcoming Part 52 rulemaking.

The specified duration for the generic COL is 40 years from the date of issuance. This is a change from the 1993 version of this paper and is necessary to comply with Section 103.c of the 1954 Act, which provides that "[e]ach [commercial] license shall be issued for a specified period, as determined by the Commission, depending on the type of activity to be licensed, but not exceeding forty years[.]" Because a COL is clearly a license for the purposes of Section 103.c, the duration of a COL is limited to 40 years from the date of COL issuance. Accordingly, Section 52.83, which requires "that the initial duration of the [COL] may not exceed 40 years from the date on which the Commission makes the findings required under Section 52.99" appears to be inconsistent with the 1954 Act. However, a COL issued under Part 52, with a duration beginning on the date of issuance, would provide a term of full-power operation that is less than the 40-year duration of a full-power OL issued under Part 50. In Section 4 of its comments, NEI disagreed with the above legal analysis but has stated that the nuclear industry would support legislation to address the duration issue. The NRC staff agrees with NEI that a legislative clarification is the best way to eliminate the uncertainty associated with the duration of a COL. The Commission has requested Congress to pass clarifying legislation on the duration of a COL.

GENERIC COMBINED LICENSE

[NAME OF NUCLEAR FACILITY]

[NAME OF NUCLEAR FACILITY OWNER]

Docket No. 52-[XXX]

License No. NPF-[XX]

1. The Nuclear Regulatory Commission (the Commission) has found that:
  - A. The application for a combined license (COL) filed by [name of nuclear facility owner(s) (the licensee)][, which references Appendix \_\_\_ to 10 CFR Part 52,] complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the applicable regulations set forth in 10 CFR Chapter I, and all required notifications to other agencies or bodies have been duly made;
  - B. The applicable requirements set forth in 10 CFR 52.77, 52.78, 52.79, 52.81, 52.83, 52.85, 52.87, 52.89, [52.91, if applicable], and 52.97 [and Appendix \_\_\_ to 10 CFR Part 52] have been met;
  - C. There is reasonable assurance that the facility will be constructed and will operate in conformity with the application, as amended, the provisions of the Act, and the applicable regulations set forth in 10 CFR Chapter I, except as exempted from compliance in Section 2.F below;
  - D. There is reasonable assurance (i) that the activities authorized by this COL can be conducted without endangering the health and safety of the public and (ii) that such activities will be conducted in compliance with the applicable regulations set forth in 10 CFR Chapter I, except as exempted from compliance in Section 2.F below;
  - E. The licensee is technically and financially qualified to engage in the activities authorized by this COL in accordance with the applicable regulations set forth in 10 CFR Chapter I;
  - F. The licensee has satisfied the applicable provisions of 10 CFR Part 140, "Financial Protection Requirements and Indemnity Agreements."
  - G. The issuance of this license will not be inimical to the common defense and security or to the health and safety of the public;
  - H. The issuance of this license is in accordance with 10 CFR Part 51 and all applicable requirements have been satisfied; and

- I. The receipt, possession, and use of source, byproduct, and special nuclear material as authorized by this license will be in accordance with the applicable regulations in 10 CFR Parts 30, 40, and 70.
2. On the basis of the foregoing findings regarding this facility, COL No. NPF-[XX] is hereby issued to [licensee], to read as follows:
    - A. This license applies to the [Name of Nuclear Facility], a light-water nuclear reactor and associated equipment (the facility), owned by the licensee. The facility is located and is described in the licensee's final safety analysis report (FSAR), as supplemented and amended, and the licensee's environmental report, as supplemented and amended.
    - B. Subject to the conditions and requirements incorporated herein, the Commission hereby licenses the licensee:
      - (1) Pursuant to Sections 103 and 185.b of the Act and 10 CFR Part 52, to construct, possess, use, and operate the facility at the designated location in accordance with the procedures and limitations set forth in this license;
      - (2) (i) Pursuant to the Act and 10 CFR Part 70, to receive and possess at any time, special nuclear material as reactor fuel, in accordance with the limitations for storage and amounts required for reactor operation, described in the FSAR, as supplemented and amended;  
  
(ii) Pursuant to the Act and 10 CFR Part 70, to use special nuclear material as reactor fuel, after the finding in Section 2.D(1) of this license has been made, in accordance with the limitations for storage and amounts required for reactor operation, and described in the FSAR, as supplemented and amended;
      - (3) Pursuant to the Act and 10 CFR Parts 30, 40, and 70, to receive, possess, and use, at any time, any byproduct, source, and special nuclear material as sealed neutron sources for reactor startup, sealed sources for reactor instrumentation and radiation monitoring equipment calibration, and as fission detectors in amounts as required;
      - (4) Pursuant to the Act and 10 CFR Parts 30, 40, and 70, to receive, possess, and use in amounts as required, any byproduct, source, or special nuclear material without restriction to chemical or physical form, for sample analysis or instrument calibration or associated with radioactive apparatus or components; and
      - (5) Pursuant to the Act and 10 CFR Parts 30 and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.

C. The license is subject to, and the licensee shall comply with, all applicable provisions of the Act, and the rules, regulations, and orders of the Commission, including the COL inspections, tests, analyses, and acceptance criteria (ITAAC) contained in Appendix A of this license.

D. The license is subject to, and the licensee shall comply with the conditions set forth in 10 CFR Chapter I, now or hereafter applicable [consistent with the requirements in Section VIII of Appendix \_\_ to 10 CFR Part 52]; and the conditions specified and incorporated below:

(1) Nuclear Fuel Loading

(i) The licensee shall state under oath or affirmation to the Commission that the acceptance criteria in the COL ITAAC have been met.

(ii) The licensee is authorized to load fuel into the reactor vessel and perform precritical testing (zero power) after the Commission has found, in accordance with 10 CFR 52.103(g), that the acceptance criteria have been met.

(2) Low-Power Testing

Upon approval of the Director of the Office of Nuclear Reactor Regulation, the licensee is authorized to perform low-power testing and operate the facility at reactor steady-state core power levels, not in excess of [XX] megawatts thermal (5-percent power), in accordance with the conditions specified herein.

(3) Maximum Power Level

Upon approval of the Director of the Office of Nuclear Reactor Regulation, the licensee is authorized to perform power ascension testing and operate the facility at reactor steady-state core power levels, not in excess of [XXXX] megawatts thermal (100 percent power), in accordance with the conditions specified herein.

(4) Incorporation

The COL ITAAC, plant-specific Technical Specifications, Environmental Protection Plan, and Antitrust Conditions contained in Appendices A, B, C, and D, respectively, of this license are hereby incorporated into this license.

E. The licensee shall report any violations of the requirements in Section 2.D of this license within 24 hours. Initial notification shall be made in accordance with the provisions of 10 CFR 50.72, with written follow up in accordance with the procedures described in 10 CFR 50.73.

- F. The following exemptions are authorized by law and will not endanger life or property or the common defense and security. Certain special circumstances are present and these exemptions are otherwise in the public interest. Therefore, these exemptions are hereby granted.
- [(1) LISTING OF EXEMPTIONS FROM DESIGN CERTIFICATION RULE (DCR)]  
[(2) LISTING OF EXEMPTIONS WHICH ARE OUTSIDE THE SCOPE OF DCR]
- G. The licensee shall fully implement and maintain in effect all provisions of the physical security, guard training and qualification, safeguards contingency plans, and all amendments made pursuant to the authority of 10 CFR 50.90, 50.54(p), 52.97[, and Section VIII of Appendix \_\_\_ to Part 52] when nuclear fuel is first received onsite, and continuing until all nuclear fuel is permanently removed from the site.
- H. The licensee shall have and maintain financial protection of such type and in such amounts as the Commission shall require in accordance with Section 170 of the Atomic Energy Act of 1954, as amended, to cover public liability claims.
- I. The following operational requirements that are applicable to this license will become effective after the Commission finds that the acceptance criteria in this license (COL ITAAC) have been met in accordance with 10 CFR 52.103(g):
- (1) emergency plans,
  - (2) technical specifications,
  - (3) ...
- J. After the Commission has made the finding required by 10 CFR 52.103(g), the COL ITAAC [not including the Tier 1 information from the referenced design certification rule (DCR)] do not constitute regulatory requirements either for licensees or for renewal of the license; except for specific ITAAC, which are the subject of a Section 103(a) hearing, their expiration will occur upon final Commission action in such proceeding.
- K. This license is effective as of the date of issuance and shall expire at midnight on [the date 40 years from the date of issuance].

FOR THE NUCLEAR REGULATORY COMMISSION

Samuel J. Collins, Director  
Office of Nuclear Reactor Regulation

Appendices:

Appendix A - COL ITAAC [including Tier 1 information]

Appendix B - Technical Specifications [plant-specific]

Appendix C - Environmental Protection Plan

Appendix D - Antitrust Conditions

Date of Issuance:

*NOTE: The copies of this document do not contain the attachments*

**DRAFT REPORT ON THE REVISED  
CONSTRUCTION INSPECTION PROGRAM**

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**Inspection Program Branch  
Division of Inspection and Support Programs  
Office of Nuclear Reactor Regulation  
US Nuclear Regulatory Commission**

**October 1996**

**DRAFT REPORT ON THE REVISED  
CONSTRUCTION INSPECTION PROGRAM**

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**ATTACHMENTS: Program Documentation**

1. Draft Inspection Manual Chapter 2512
2. Tables of Inspection Procedures Assigned to Future Preoperation Phase Inspection Manual Chapters
3. Inspection Procedure Form and Content Guidance
  - Sample Inspection Procedures
4. CIP Information Management System (CIPIMS) Description

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**CONSTRUCTION INSPECTION PROGRAM FOR EVOLUTIONARY AND ADVANCED REACTORS**

**I. EXECUTIVE SUMMARY**

In 1991, the Office of Nuclear Reactor Regulation (NRR) started a revision to the Construction Inspection Program (CIP) governed by Inspection Manual Chapter (IMC) 2512, "Light Water Reactor Inspection Program - Construction Phase." The purposes of this project were to address programmatic weaknesses in the NRC construction inspections that had been identified during the licensing of several plants, and to develop an inspection program to meet the needs of evolutionary and advanced reactors. Program development continued into the mid-1990's, when, because of NRC staff resource constraints and a lack of nuclear power plant construction, the project was suspended upon completion of the program's generic features. The program described in this draft report presents a framework from which the CIP can be reactivated to support NRC inspections at a future nuclear power plant. At that time, many of the issues and assumptions described in this report will have been clarified, which will allow the CIP to be finalized. The revised CIP can be applied to plants licensed under either 10 CFR Part 50 or 52.

The CIP described in this document assumes that the program will be reactivated to support the first new construction project, and that the experience gained from the implementation of the CIP at this plant will be incorporated into further refinements to the program. This report describes the process and assumptions used in developing the new program, and forwards a draft revision to IMC 2512. New features of this inspection program include a continuous NRC onsite inspection presence that matches inspector expertise to inspection needs, an inspection procedure format that more clearly defines the attributes (and associated acceptance criteria) that must be inspected, and a dedicated CIP Information Management System (CIPIMS) that is to be used to implement the CIP in concert with the inspection manual. Many of the features described in the report, such as Sign-As-You-Go (SAYGO) and construction project sequencing, are the result of interactions between the NRC and the nuclear power industry, including the Nuclear Energy Institute.

Attachment 1 to this report is the draft revision to IMC 2512; attachment 2 contains tables of preoperation phase inspection procedures; attachment 3 provides inspection procedure format and content guidance; and attachment 4 provides a description of the CIPIMS.

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### **II. BACKGROUND**

#### **A. HISTORY OF THE REVISED CONSTRUCTION INSPECTION PROGRAM**

In 1991, the Office of Nuclear Reactor Regulation (NRR) began to revise the Construction Inspection Program (CIP) to incorporate lessons learned from previous construction experience and to accommodate requirements for future reactors that would be licensed under 10 CFR Part 52. The initial objectives for revising the CIP were established in references 12 and 13, and the staff's overall plan of action to develop the CIP were transmitted to the Commission in SECYs 92-436 and 92-134 (references 2 and 3, respectively). The revised CIP that resulted from this effort provides enhanced guidance and capabilities for the gathering, recording, and reporting of construction inspection information. The program improvements have centered on the use of a systems-based inspection planning methodology, computerization of the inspection program, and a continuous onsite inspection presence throughout plant construction.

At the start of program development, a working group was established to collate the construction inspection experience from throughout the NRC. This group pursued several avenues of inquiry, and the concepts that best suited the needs of the NRC were incorporated into the CIP revision. The more significant issues are discussed in various places within this report, and in the SECY papers pertaining to this topic (see references). The working group completed its activities in late 1992.

Two parallel, interdependent paths were taken in revising the CIP. One path, which revised the program's policies and structure, resulted in the draft documentation contained in this report. The other path was the development of a personal computer-based system that would assist future NRC staff in implementing the CIP.

#### **Data Base Management System Development**

As discussed in SECY 92-134, a data base development program was embarked upon to provide the capability to record inspection information in a retrievable and repeatable format. A contract was established with the US Department of Energy's Pacific Northwest Laboratory (PNL). Under this contract (JCN L-2502), PNL was to develop a series of relational data base management systems that would be integral to the revised CIP. The prototype system was developed for application by the NRC resident inspector office at the Bellefonte Nuclear Plant construction site, and could have been adapted to construction inspections at other sites at which construction might have resumed. The eventual objective of the JCN L-2502 project was to develop a more capable management system based on the lessons learned from developing the Bellefonte Data Base Management System (DBMS). This final system was intended for deployment at future nuclear power plant construction sites.

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Data from the 268 Bellefonte construction inspection reports, which dated from the mid-1970's, was manually transcribed and categorized into a format that was compatible with entry into a data base. Late in the development of the Bellefonte DBMS, an electronic text search and retrieval capability, using ZYIndex software, was incorporated. In support of this, all of the Bellefonte inspection reports were scanned into electronic format. However, in late 1994, as part of a restructuring of its nuclear power program, the Tennessee Valley Authority (TVA) cancelled the Bellefonte project. Also, because there were no other deferred plants at which construction was resumed, the prototype DBMS was never deployed, and was therefore never field tested to see how well it assisted in the recording and display of inspection information during a construction project.

The main lessons learned from the Bellefonte DBMS were that, for such a system to be useful, it would need to be user-friendly (fairly simple to operate and easy to understand), and the inspection data would need to be collected and recorded in a structure that was compatible with a DBMS. Based on in-office testing, the staff found that, for computerizing the records of a previously existing body of construction inspection reports, the text search and retrieval capability was more useful than a data base in reconstructing the status of a construction inspection program. This characteristic was primarily due to the limited functionality of the DBMS, which resulted from the attempt to "force-fit" data that was never intended to go into a data base.

### **Experience at the Watts Bar Nuclear Power Plant**

In 1994, during the final phases of construction inspection at Watts Bar, all the Watts Bar inspection reports were scanned into electronic format so that they could be searched with ZYIndex software. The objective of doing this was to allow NRC staff to assess the completeness of the construction inspections, which had been ongoing since the 1970's, at that site in preparation for the issuance of its operating license. Although this system did not precisely mimic the direction taken in the development of the data base system, the construction inspection program reconstitution effort at Watts Bar proved the viability of using computerized methods to store and retrieve inspection information, and to use that information to develop conclusions on the safety of a plant's construction and conformance to construction permit conditions in support of plant licensing.

### **Future Reactors**

At the same time the revised CIP was being developed, NRR was developing policy for implementing 10 CFR Part 52. As part of this effort, NRR reviewed the designs for two evolutionary nuclear power plants, the General Electric (GE) Advanced Boiling Water Reactor (ABWR) and the Combustion Engineering (CE) System 80+. The staff intended to revise

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the Bellefonte DBMS into a generic system that could conform to both the 10 CFR Parts 50 and 52 licensing processes. This generic system, called the CIP Information Management System (CIPIMS), is described in attachment 4 to this report. The CIPIMS and revised inspection program documentation were modeled on the GE ABWR, since this design was the farthest along in the 10 CFR Part 52 licensing process when CIPIMS development began.

For the future, NRR staff had intended to update the CIP and CIPIMS to design-specific versions as design certification was completed for different evolutionary and advanced nuclear power plant designs. These design-specific systems would then be modified into plant-specific versions as applications for construction permits or combined licenses were submitted by applicants and reviewed by the staff. Although the ABWR was used as the model on which to base the program's structure, very little effort would be required to adapt the program to a different design.

### **Suspension of CIP Development**

In late 1994, because of a reevaluation of NRC priorities, and the lack of a final design certification for any plant, NRR decided to suspend the project to revise the CIP upon completion of the generic CIPIMS. The program was to be put in a condition from which development could be resumed at some time in the future upon receipt of a license application. This report is intended to achieve this objective.

### **B. LESSONS LEARNED FROM PREVIOUS NRC CONSTRUCTION INSPECTION EXPERIENCES, OBSERVATIONS FROM OTHER PROGRAMS AND ATTRIBUTES OF THE REVISED CIP**

A variety of programs, activities, and experiences were researched in developing the revised CIP. Among these were the most recent NRC construction inspection programs that were implemented at US sites, including Seabrook, Comanche Peak, South Texas, Watts Bar, and Bellefonte. Also reviewed were nuclear power plant construction and inspection practices overseas and the use of modular construction techniques in the US shipbuilding industry.

The lessons learned and the associated attributes of the new CIP that are discussed in this section represent an amalgamation of the insights gained during the above reviews. The purposes of this section are to summarize experience that has been used in developing the CIP and to provide a list of issues that should be considered by the NRC staff when reactivating the CIP. Individual insights are not discussed in detail, nor are they mapped to their sources.

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**Inspection Program Management**

- o For future construction projects, the objectives of the inspection program should be derived from the conclusions that will be needed to support the NRC licensing decisions that will be made when construction is complete. This approach will enhance the likelihood that enough inspection data will exist to assess the adequacy of plant construction and readiness to commence operations. These objectives should be considered in establishing the inspection methodologies to be employed (e.g., inspection sample selection, inspection type, etc.) and the format and content of inspection documentation.
- o In the past, construction inspections were often scheduled on the basis of inspector availability. Inspections were therefore performed on activities that happened to be in progress at the time of the inspection, resulting in a less-than-optimum sample selection. Because the revised CIP plans for a continuous onsite presence of inspectors, future construction inspections should be scheduled on the basis of construction progress. All aspects of the construction inspection program, including inspection planning, scheduling, preparations, and implementation, should be conducted in a way that will ensure all necessary attributes are properly inspected.
- o The proper mix of skills and experience among inspectors, particularly during the NTOL phase at a plant, is necessary to ensure effective implementation of the inspection program.
- o For future plants, the CIP must be able to support NRC action on a licensee's certification of readiness to load fuel, or that all ITAACs have been completed satisfactorily. The inspection staff should be fully aware, in advance, of all issues the licensee will address in its certification.
- o To ensure expeditious closure of NRC activities at the end of construction, NRR and regional management must work together to ensure that the status of all inspection and licensing issues are tracked and raised to the appropriate level of management.
- o Inspection results must be assessed to verify that inspection requirements are met, and that they support the objectives of individual inspection procedures and of the construction inspection program.
- o In some past cases, the CIP did not consistently guide NRC inspectors and managers toward effectively integrating inspection findings. These failures to integrate findings generally resulted from both programmatic and implementation weaknesses.

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To address this problem, the revised CIP incorporates the concept of significant findings, and the ability to group several findings to support one conclusion (like an ITAAC or a SAYGO point), in the CIP Information Management System (CIPIMS). This formalized structure for integrating findings will assist NRC managers in developing an accurate characterization of the adequacy of plant construction.

- o A plan for the transition from the construction phase to the operations phase should be made well in advance of the completion of plant construction. This transition plan, which can be viewed as an exit strategy from the CIP, should be based on projected inspection workload, and must account for necessary turnover of issues.
- o It is necessary to ensure that each phase of the preoperational inspection program is properly completed. To the maximum extent possible, all issues (such as licensee test exceptions or construction deficiencies) must be closed out before the programs are officially considered complete. Items that are carried over into the operating phase must be extensively documented, and, in particular, their closure requirements must be identified.
- o The reduction of the number of resident inspectors assigned to a plant should be delayed until after the completion of construction and preoperational testing. This delay will limit the distractions on the operations resident inspectors by providing construction inspectors who can close out remaining open items and respond to any construction-related issues that emerge. This practice would also enhance the quality of the turnover of inspection responsibility from the construction phase to the operations phase. Resident inspection staffing should remain enhanced until acceptable operational performance has been demonstrated.
- o There have been several cases in which allegations were filed very late in plant construction, and the NRC was not always ready to respond to the late filed allegations. NRC management should ensure that the agency's program for addressing allegations will allow the timely evaluation of the safety impacts, technical merit, and the impact on a plant's readiness to operate, of any contentions that surface late in the construction process. The improved inspection documentation required by the revised CIP will assist NRC management to appropriately and expeditiously review and evaluate any allegations before the authorization to operate is scheduled to be issued.

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### **Inspection Program Structure and Implementation**

The program must be structured to guide inspectors to inspect needed items, and to provide a coherent and simple method for them to record necessary information.

- o Onsite inspections should begin during site preparation before the COL or CP is issued. A continuous onsite inspection staff must be established and maintained throughout construction. To ensure that the wide variety of construction activities are covered by appropriately qualified inspectors, and because of the phased nature of many of those activities, the mix of expertise among the resident inspection staff should be rotated.
- o Inspection requirements should be made as objective as possible, lending themselves to clear determinations that critical attributes either have or have not been met. Establishing discrete, objective inspection requirements would limit the need for subjective interpretations of acceptability, and major inspection program conclusions can be based on a sizable body of accumulated objective information.
- o Objective inspection requirements should be established, to the maximum possible extent, for systems, structures, and components, as well as for plant programs. Each inspection procedure should clearly state how much inspection should be performed in order to consider the procedure complete.
- o Constructing a plant in a short period of time means that activities will happen rapidly and in parallel with each other, which will place significant demands on inspection resources. Planning and scheduling therefore need to be closely coordinated with plant construction plans.

### **Inspection Documentation**

At the end of the construction process, it will be imperative that the NRC possesses a fully documented body of inspection data to support the findings that need to be made to allow plant operation.

- o In some past construction projects, inspection reports did not fully document all areas that had been evaluated during plant construction. The resulting incomplete inspection documentation resulted in a lack of auditable trails that could be used to respond to questions raised during the process leading up to issuance of an operating license. Also, inspection reports did not always clearly identify the items that had been inspected in the plant.

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The revised CIP requires that individual samples (such as identification numbers for welds, pipe supports, and cable terminations) be recorded in the CIPIMS. In addition, each construction inspection in the future should be considered satisfactorily complete only after supervisory or management personnel determine that the inspection is fully documented.

- o In the past, NRC inspection reports generally focused on the deficiencies identified during the inspections, without providing much detail on positive inspection findings. Such unbalanced inspection reporting resulted, in some cases, in the NRC staff having to perform extensive reviews during the final stages of plant licensing to provide additional information to support licensing decisions. In some cases, the staff reperformed inspections that had already been done but had not been properly recorded. To reduce the necessity for performing such followup reviews, future construction inspections should document both satisfactory and unsatisfactory findings.

### **Quality Processes**

- o Because NRC inspections are done on a sampling basis, the CIP must guide inspections toward assessing the effectiveness of the licensee's quality programs. To the extent possible, all construction inspections should assess QA/QC effectiveness, and the results must be thoroughly documented and integrated. Ideally, the breadth and depth of the NRC's verification that a plant's QA/QC is effective will be such that any demonstrated or alleged lapses in quality can be shown to be isolated in nature, as opposed to being generic.
- o The assessment process must begin with inspections of the design engineering process, including engineering quality assurance, to ensure that the licensee can accurately translate high level design requirements into detailed engineering and fabrication drawings.
- o The licensee's management of quality control records is an integral part of the quality process. In order to verify the overall adequacy of licensee QA records management process, the CIP must inspect all aspects of QA/QC records, from creation through storage.

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- o The identification of construction problems, and the timeliness and extent to which they are corrected, are effective measures of licensee management's control over onsite activities. NRC experience shows that, if the licensee deals thoroughly with corrective action, including the identification and correction of root causes, there is a good chance that the overall quality of the construction is good. If these areas are weak, it is likely that there are lapses in quality; such a case would be evident if repetitive problems occur.

### **Future Construction Techniques**

Throughout the development of the revised CIP, it was assumed that future plants will be built with extensive use of modular construction techniques in order to meet the rapid construction goals that have been established by the nuclear industry.

- o Because of the expected rapid pace of future nuclear power plant construction, the NRC will need to exert more effort than in the past to ensure that construction inspection does not become a critical path activity. A scheduling program has been included in the CIPIMS to assist in inspection planning.
- o To assist in more effective inspection scheduling, the licensee's construction plan should be incorporated, if possible, into the construction inspection schedule. This schedule should be updated as the construction plan is modified.
- o Technical reviews and design engineering inspections should begin in conjunction with application review, since initial design engineering will be done during this phase.
- o Depending on the extent of modular construction employed, the inspection staff should consider the locations at which inspections need to be performed. In general, however, critical attributes should be inspected onsite to the maximum feasible extent.
- o Scheduling modular construction inspections may be difficult, since the fabrication of modules and major plant components could begin many months before the COL is issued and the first structural concrete is poured.
- o The development of new engineering design technologies will need to be accounted for as the inspection procedures for the revised 2511 and 2512 inspection programs are developed. For example, it is likely that computer aided engineering (CAE) will be used to perform detailed plant design. The NRC currently has no guidance for inspecting CAE.

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- o A licensee's plans to transport and install modules in a plant need to be assessed to identify potential modes of degradation. Modules will require inspection to verify that they have not degraded during transit or installation. Examples include: verifying that a licensee applies enough additional stiffening to a module's structure to allow it to be lifted, and; ensuring that modules are able to be lifted from the top, as well as being supported from beneath.
- o Depending on the extent and location of automated welding, there may be opportunities to economize NRC inspection resources if repeatable, high quality processes are verified to be in use.

### **C. EXPECTED LICENSING AND CONSTRUCTION ENVIRONMENT**

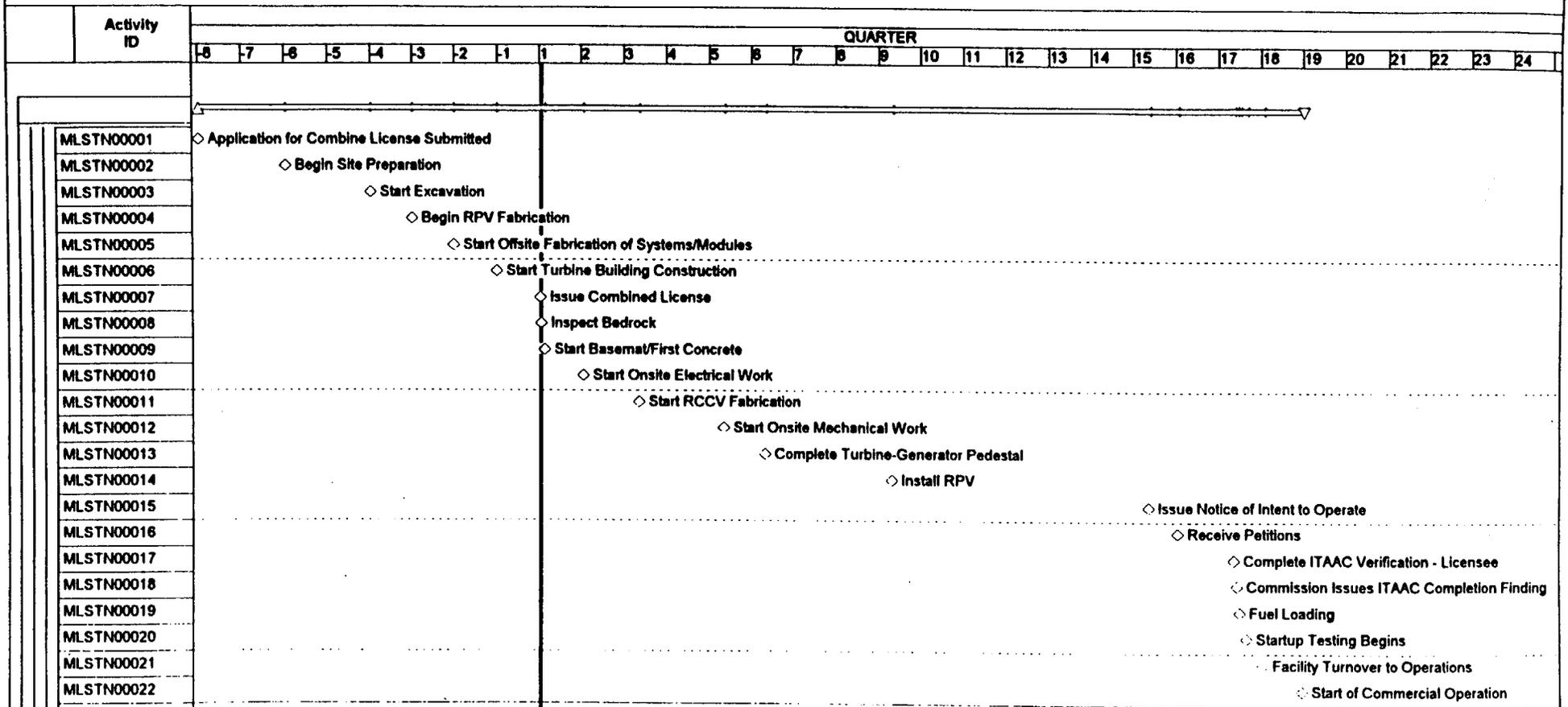
The purpose of this section is to outline aspects of the expected licensing and construction environment that will impact the structure and implementation of the CIP.

The assumptions used in this section were derived from a variety of sources that were reviewed throughout CIP development, including the projected use of advanced/modular construction techniques and resulting construction inspection requirements for evolutionary LWRs. When the CIP is reactivated, the staff should review the actual licensing and construction environment, identify conditions that differ from those discussed here, and modify the CIP as necessary.

#### **Licensing**

Future US nuclear power plants may be licensed under either 10 CFR Parts 50 or 52, as discussed in references 1, 2, 3 and 5. The CIP, including IMC 2512 and the CIPIMS, has been structured to accommodate either licensing method. Because 10 CFR Part 52 includes ITAACs, it is the more limiting process in terms of constraints on the CIP. The CIP has therefore been modeled around 10 CFR Part 52. In terms of the CIP, the only substantial programmatic difference between the two licensing methods is that, for plants licensed under 10 CFR Part 50, matters pertaining to ITAACs can be truncated from the CIP without any adverse impact on the remainder of the inspection program.

# POSTULATED COMPOSITE CONSTRUCTION AND LICENSING SCHEDULE



### ASSUMPTIONS

- a 18 months of site preparation are needed before the first concrete pour.
- b The first concrete pour for the basemat starts immediately after the combined license is issued
- c Fuel load occurs 48 months after the first concrete pour.
- d Commercial operation starts 54 months after the first concrete pour.
- e Startup testing begins immediately after the NRC makes its ITAAC completion finding

### ACRONYMS

- RPV - Reactor Pressure Vessel
- RCCV - Reinforced Concrete Containment Vessel
- ITAAC - Inspections, Tests, Analyses, and Acceptance Criteria

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Figure W

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The new CIP was developed in parallel with the design certification processes of two evolutionary LWR designs, the General Electric Advanced Boiling Water Reactor (GE ABWR) and the Combustion Engineering System 80+. The ABWR was used as a generic model for the CIP, since its draft certified design material was the more fully developed of the two at the time CIP development began. The use of the ABWR example to provide a structure for the program and its information management system will have no substantive impact on CIP reactivation because the CIP will need to be customized for each future plant, regardless of its design. The CIP will also apply equally well to any advanced LWR designs.

### **Construction**

Future US nuclear power plants are likely to be built more rapidly than their predecessors. The basic goals assumed in developing the CIP were: the first evolutionary LWR will be built in 54 months from the first concrete pour to commercial operation; and, there will be 18 months of site preparation work before the first concrete pour, followed by 48 months until fuel load.

This shorter time compared to previous US nuclear power plant construction projects will be achieved by the following actions:

- The detailed engineering design will be essentially complete by the start of construction;
- Advanced construction techniques will be used to improve efficiency and shorten construction time --
  - o modular construction techniques will allow several different fabrication activities to be done in parallel, rather than sequentially.
  - o modularization will permit craft work to be done away from the immediate construction site, reducing the number of people who need access to a given plant area at the same time.
  - o extensive use of multiplexing will reduce the overall number of cable raceways and cable pulls, thus simplifying plant design, cutting overall construction effort, and reducing cost.
- Fabrication of plant modules and major components are expected to begin well before COL issuance. For example, the generic CIP assumes that a reactor pressure vessel (RPV) will require just under three years from start of manufacture to installation in the plant. The CIP also assumes that RPV installation will occur about two years after COL issuance; this will result in RPV fabrication

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beginning about nine months before COL issuance. Similar scenarios could occur for other major plant components and modules. The net result of these early starts of fabrication will be that hardware inspections will need to begin before the start of onsite construction.

- Plant construction will rely heavily on detailed planning and scheduling to integrate design, procurement and fabrication requirements. The CIP assumes that this planning will occur in advance of the start of site preparation work.

To effectively inspect such a construction project under these assumptions, the CIP should allow for the following:

- The NRC will need a group of several inspectors dedicated to the project to perform the required inspections of construction activities occurring in parallel both on- and off-site, and;
- The core of the project inspection team will need to be established well before ground breaking to allow them to gain a detailed familiarity with the construction master plan and plant engineering design, and to develop the NRC's inspection plan for the project.

The Postulated Composite Construction and Licensing Schedule (Figure W), which depicts major milestones in the licensing and construction of a new nuclear power plant, is based on the above assumptions. Some of the milestones represent the most limiting cases in terms of available planning time for the NRC. These milestones are intended to provide a conceptual planning framework for future NRC construction inspections, and should not be construed as regulatory expectations that the staff intends to impose on future applicants and licensees.

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### **Sign-As-You-Go (SAYGO)**

Because of the expected rapid pace of plant construction, and the need for the NRC to systematically inspect a wide range and depth of construction activities, the staff anticipates that extensive coordination between the licensee and the NRC will be required. This coordination could be done by instituting a Sign-As-You-Go (SAYGO) process. The possibility of including SAYGO in the CIP was first discussed in SECY 92-134, "NRC Construction Inspection Program for Evolutionary and Advanced Reactors Under 10 CFR Part 52" (reference 3). For each future construction project, the mechanics of the SAYGO program will need to be negotiated between the licensee and the NRC staff. The use of a SAYGO process would be voluntary on the part of a licensee.

As discussed in SECY 92-134, SAYGO is a structured method to establish that regulatory commitments have been met, to enhance the stability and predictability of the licensing process, and to identify and resolve construction problems early in the project so as not to adversely affect the licensing process. At a nuclear power plant construction site, SAYGO would be a phased verification program in which the licensee certifies to the NRC that certain aspects of construction have been completed adequately, and the NRC staff would perform direct inspection to verify that the certification is accurate. These licensee certifications and NRC verifications would occur at review points, known as SAYGO points, that the NRC would identify in conjunction with the licensee in the early phases of the construction project. The SAYGO points to be met throughout construction should be established before the first structural concrete pour occurs, and should include milestones for ITAAC verifications and significant inspection findings. It should be noted that a SAYGO concept does not include the use of "hold points" at various stages of construction.

SAYGO could be implemented for plants licensed under either 10 CFR Parts 50 or 52. For plants licensed under 10 CFR Part 52, the NRC and licensee could establish links between SAYGO points and ITAACs. A comprehensive SAYGO program could connect various construction and verification activities and provide inspection continuity from site preparation through start-up testing and commencement of full-power operation. The NRC's construction inspection procedures would provide the inspection requirements for determining if the sign-as-you-go activities are acceptable.

For a SAYGO process to work, the licensee and the NRC must agree on the following before plant construction begins:

- o the mechanics of the SAYGO implementation process;
- o content and timing of SAYGO points;
- o acceptance criteria for each SAYGO point.

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The staff's verifications that SAYGO points are complete would have the stature of inspection findings, and would not be licensing decisions. Also, there is no assurance that satisfaction of SAYGO criteria will preclude those criteria from coming under scrutiny during a licensing hearing or during the Commission's deliberations regarding the authorization to load fuel.

The CIP Information Management System (CIPIMS) structure can accommodate SAYGO in a variety of ways:

- o The NRC and the licensee could identify systems-based milestones, along with critical attributes and acceptance criteria. These could then be tied either to specific inspection procedures (IPs); or, temporary instructions (TIs) could be developed, one for each SAYGO point. The TIs could be self-contained, their critical attributes could be linked to attributes in specific IPs, and credit could be given to both the IMC 2512 inspection and the SAYGO process.
- o Instead of a systems-based SAYGO structure, the NRC and licensee could adopt a time-phased approach consisting of SAYGO points at regular intervals, in which the progress made on individual systems and structures would be assessed up to that time in construction.

In the future, when the CIP is reactivated for inspecting a new construction project, the NRC staff should review SECY 92-134 (reference 3) for additional background on how SAYGO would be applied for plants licensed under 10 CFR Part 52. NUREG-1278, "Vogtle Readiness Review," (reference 4) should also be reviewed for lessons learned from the implementation of SAYGO at the Vogtle nuclear power plant in the 1980's.

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**III. CIP IMPLEMENTATION**

**A. OVERVIEW OF PREOPERATION INSPECTION PROGRAMS**

The revision of the Inspection Manual Chapter (IMC) 2512 Construction Inspection Program will necessitate some redistribution of inspections among the four NRC inspection programs for preoperational nuclear power plants. This section outlines the projected scope, for future nuclear power plants, of the following Inspection Manual Chapters (IMCs) of the Light Water Reactor Inspection Program:

IMC 2511	Pre-CP Phase
IMC 2512	Construction Phase
IMC 2513	Preoperational Testing and Operational Preparedness Phase
IMC 2514	Startup Testing Phase

The tables that follow this overview list the existing inspection procedures that currently apply to each program, along with their proposed distribution among the various programs following CIP revision. Also listed in the table are inspection procedures that should be developed to support CIP implementation.

**2511 - Pre-Construction Permit (Pre-CP) Phase**

For future plants, this program is expected to be similar in scope and applicability to the existing IMC 2511 program for site characterization and preparation activities. The Pre-CP inspection program's focus will be on QA programs and implementation; site preparations including installation of services, support facilities, and non safety-related systems, structures, and components; and environmental protection considerations. Inspections of activities authorized by an Early Site Permit (ESP), if applicable, should be conducted under this inspection program. The Pre-CP program should be completed at about the same time as a plant's combined license (COL) or CP is issued. The IMC 2511 program is expected to run concurrently with the CIP for several months because, as discussed earlier in this report, construction inspections will probably start before COL or CP issuance. The results of the Pre-CP inspections will provide the initial baselines of several construction phase inspections, particularly in the quality assurance area.

IMC 2511 will need to be reviewed and revised, regardless of the method used to license a future plant, to ensure that it is compatible with the revised CIP. One item requiring significant attention will be the ESP process, especially identifying the scope of, and demarcations between, licensing reviews and inspections. Beyond identifying IMC 2511

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inspection procedures that could apply to the CIP, no substantial activity has been performed to update the Pre-CP inspection program under the CIP revision project. Therefore, when the NRC staff reactivates the preoperational inspection programs for a future plant, a "zero-based" review of the IMC 2511 inspection program should be performed.

### **2512 - Construction Inspection Phase**

This program applies to the construction phase and will be implemented as discussed in this report. The scope of the revised CIP has been established to encompass all activities that might impact ITAAC verification. The revised CIP therefore includes activities that are currently addressed in IMCs 2511 and 2513, in addition to the current IMC 2512. The revised CIP focuses on design work, ITAAC verification, QA programs and implementation, construction processes, and preoperational testing. Many inspections similar to those previously performed for preoperational testing under IMC 2513 have been included in the revised CIP to maintain continuity with plant systems inspections and ITAAC verification. The CIP will end when fuel load is authorized or an operating license (OL) is issued, as applicable.

### **2513 - Preoperational Testing Phase**

This program will start during the last part of the construction phase and will continue through low power testing. Inspections will remain similar to those included in the current version of IMC 2513, with the major exception of those inspections that would verify ITAAC completion. The operational readiness team inspections performed under this program will focus on management oversight, QA program and implementation for operations, plant procedures, operations, maintenance, plant support (radiological controls, security, EP, chemistry, training, and fire protection) and operator licensing. Aside from identifying IMC 2513 inspections that would apply to the revised CIP, the Preoperational Testing inspection program was not revised as part of the CIP revision project.

### **2514 - Startup Test Phase**

This program will start at fuel load authorization or OL issuance, as applicable, and end when the plant enters the operational phase, at which point the operations inspection program will be implemented at the plant. The startup testing inspection program is expected to be similar in scope and content to the existing 2514 program, although some revisions will likely be needed to accommodate evolutionary and/or advanced reactor designs.

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### **B. CIP DESCRIPTION**

The revised CIP consists of two major components, draft IMC 2512 and the CIPIMS. These components are closely integrated, and must be used together.

The draft IMC 2512 included in this report details the CIP's structure, inspection planning and scheduling requirements, and interfaces with other programs. It is designed to provide a generic framework on which the NRC inspection program can be implemented at a future nuclear power plant construction site. When CIP development is resumed, the draft IMC 2512 must be finalized. The CIPIMS is described in attachment 4 to this report. The staffing and organizational requirements of the CIP are discussed in the CIP Reactivation section of this report.

#### **Inspection Sampling**

The draft IMC 2512 does not contain detailed guidance for selecting inspection samples. As part of CIP reactivation, policies for inspection sampling must be developed and included in the final IMC 2512, and corresponding guidance should be incorporated into construction inspection procedures. Sampling policies and guidance should be approved for use by cognizant NRC managers.

During CIP revision, NRR staff investigated the use of statistical methods and probabilistic safety assessments in identifying areas that should be inspected. These two topics are briefly discussed in the following paragraphs.

#### **Statistical Methods**

Several approaches to inspection sampling were considered during the development of the CIP revision. One approach that was discussed in references 1 and 2 was the development and implementation of statistical sampling methods with the goal of obtaining, at the end of a plant's construction phase, a confidence statement about the quality of plant construction. This statement could potentially be applied to either the plant as a whole, or it could consist of a series of statements about various aspects of plant construction (e.g., concrete pouring, pipe welding, etc.). Because of staff resource limitations and time constraints, no detailed research along these lines was performed beyond identifying the scope of the issue, as discussed here.

The major difficulty with applying statistical sampling to a nuclear power plant construction inspection program would arise from the attempt to make confidence statements about the many non-homogeneous processes that occur in phases at a construction site. This characteristic

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contrasts with continuous processes, such as factory assembly lines, in which activities occur in a standardized, repetitive manner under controlled conditions, and which result in large populations of inspectable items. A confidence statement comprised of non-homogeneous items (for example, cable routing and snubber installation) may not be statistically valid.

During development of the revised CIP, the staff did, however, identify past examples in which statistically based inspection sampling was used with success. These examples included assessing the adequacy of a large population of completed welds in safety related piping systems at one nuclear power plant, and assessing the adequacy of containment coatings at another plant.

In the mid-1970's, the NRC performed a series of statistically based operating phase inspections at Three Mile Island Unit 1. The evaluation of this trial inspection program was forwarded to the Commission on February 11, 1977 by reference 14. These inspections were done independently of, and in parallel with, the traditional NRC inspection process. This trial program showed that strictly statistically based sampling was, on balance, not an optimal method of inspection planning because: the statistical method identified no significant safety concerns that the traditional method failed to identify; the traditional method successfully identified significant safety concerns that the statistical method did not identify, and; the statistically based method was comparatively more resource-intensive.

In summary, except in unique applications with fairly narrow scopes and homogeneous sample populations, NRR managers concluded that the use of statistical sampling methods in construction inspections was of limited utility. When the CIP is reactivated, the application of statistically based sampling methods to specific sample populations should be reevaluated.

### **Probabilistic Risk Assessment (PRA) Insights**

In developing the revised CIP, the staff identified some methods for incorporating PRA insights into construction inspections. These methods should be developed further when the CIP is reactivated, and should be based on the PRAs that would be included in the material supporting a plant's license application. The NRC should perform sensitivity, uncertainty, and importance analyses to identify those plant SSCs whose passive failure (due to inadequate construction) would most greatly impact the plant's risk profile. In this way, the more risk significant SSCs would be identified, and construction inspection samples could be skewed toward those SSCs.

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**C. INSPECTION FINDINGS AND INSPECTION FOLLOWUP**

The majority of the following discussion will focus on CIP inspection findings of various types. As used here, the term "finding" applies to a statement by NRC management regarding some aspect of plant construction; these findings will be based on the results of construction inspections. The final portion of this discussion will briefly address the identification, tracking, and closure of inspection results that require inspector followup.

**The Need To Make Findings**

As has been stated elsewhere, the fundamental purpose of the CIP will be to verify that plants are built according to their designs. CIP findings will:

- o provide bases for NRC management conclusions, such as those required by:
  - 10 CFR 50.57
  - Inspection Procedure (IP) 94300, "Status of Plant Readiness for an Operating License"
  - construction permits, or
  - combined licenses (including inspections, tests, analyses, and acceptance criteria (ITAACs));
- o support agency conclusions on the adequacy of generic construction activities/processes, and;
- o inform the licensee and the public of the progress of the inspection program.

**Types of Findings**

Although there are significant differences in the findings that must be made under 10 CFR Parts 50 and 52, respectively, the inspection activities that support these methods are essentially the same.

**10 CFR Part 50 plants:** Under 10 CFR Part 50, issuance of the construction permit resolves only questions regarding the general aspects of design and construction of the proposed facility. The details of the plant design, the nature of the tests and inspections to be performed to verify that the design and construction are completed in an acceptable fashion, and the criteria for evaluating the adequacy of the design and construction, are generally not available at the time of issuance of the construction permit. As a result, issues remain to be resolved prior to issuance of the operating license. Section 50.57 contains a range of findings that must be made with respect to these

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issues, and the CIP is generally structured to support management's ability to make the findings. In some cases, as specified in Section 50.57, the Director of Nuclear Reactor Regulation can make these pre-licensing findings.

For plants licensed under 10 CFR Part 50, CIP inspection results will be used to assess a plant's readiness to be granted an operating license. This assessment is currently made by the cognizant regional administrator under IP 94300, who would provide a recommendation to the Director of Nuclear Reactor Regulation for issuing an operating license.

**10 CFR Part 52 plants:** For plants licensed under 10 CFR Part 52, the output of the CIP will be used to support a staff recommendation to the Commission regarding a licensee's readiness to load fuel. As part of issuance of a combined license (COL), the NRC will approve details of the plant design, the nature of the tests and inspections to be performed to verify construction, and the acceptance criteria for construction. Section 52.103 provides that, once construction has been completed, the finding that must be made is limited in scope to a determination that the pre-approved inspections, tests and analyses have been performed and the associated pre-approved acceptance criteria have been met. It is the licensee's responsibility to perform all required ITAACs, while the NRC staff's role is to verify satisfactory licensee completion of ITAACs. One of the functions of the CIP for plants licensed under 10 CFR Part 52 is to guide NRC verification of the licensee's completion of ITAACs so that the findings specified in Sections 52.99 and 52.103 can be made.

Several policy issues related to the impact of inspection results on ITAAC verification remain under consideration. These issues, which must be resolved before the reactivated CIP is implemented, are summarized in the policy issues section of this report.

- a. 10 CFR Part 52.99: 10 CFR Part 52.99 states, in part, that at "appropriate intervals during construction, the NRC staff shall publish in the Federal Register notices of the successful completion of inspections, tests and analyses." These notices will document that the licensee has informed the NRC of ITAAC completion, and that the NRC staff has verified this completion. The exact protocol of licensee notification to NRC of ITAAC completions, NRC staff verification of the same, and the subsequent publication of the Federal Register notice, remains to be established. The following discussion presents some concepts on this topic that should be considered in establishing these protocols.

As discussed previously in this report, some ITAAC verifications will be relatively simple, in that they will involve comparisons of system performance measurements and observations against established

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criteria. ITAACs 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 ITAACs from the GE ABWR design certification ITAACs (reference 11) 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. Because these ITAACs are limited in scope and will be completed over a short time span (mostly as part of preoperational testing), they will require comparatively little effort for verification and subsequent notification in the Federal Register in accordance with 10 CFR Part 52.99.

In contrast, other ITAACs will be accomplished over long periods of time. For these ITAACs, many separate inspections will be performed over a long period of time to verify their different attributes. When the final construction activity associated with a particular ITAAC is completed, the sum of the results of these inspections will support the conclusion that the ITAAC has been met. It is envisioned that NRC verification that these ITAACs are met will rely on a combination of inspections performed on respective systems, structures, and components (SSCs) and of significant inspection findings, which are discussed in detail below.

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 construction activity associated with this ITAAC could span an estimated three and a half years. 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 inspections that verify 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 specifications for the control building have properly prescribed the attributes of a door that will possess a three-hour fire rating. When the results of these inspections are coupled with inspector verification of proper installation, there would be high confidence that the acceptance criteria of the inspections, tests and analyses have been met.

NRC verification that this control building ITAAC has been satisfied will also depend on observations of licensee activities for similar

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attributes elsewhere in the plant. Assuming these activities are satisfactory in terms of the processes and materials used, as well as the effectiveness of the quality assurance oversight, these observations can contribute to the conclusions regarding the fire protection envelope in the control building. The character of these other observations, and the extent to which they would apply to this ITAAC, will need to be determined in accordance with the resolutions of policy issues during the reactivation of the CIP.

The concepts discussed above are very similar to the notion of significant inspection findings, which are discussed later in this section.

- b. 10 CFR Part 52.103(g): This section states: "Prior to operation of the facility, the Commission shall find that the acceptance criteria in the combined license are met." Since IP 94300 will also apply to plants licensed under 10 CFR Part 52, the content of this inspection procedure will need to be revised to accommodate the finding on the status of ITAAC completion.

**Sign-As-You-Go (SAYGO):** As discussed earlier in this report, a SAYGO program of inspection milestones, known as SAYGO points, jointly agreed on between the NRC and a licensee could be implemented at a future nuclear power plant construction project. As the criteria for each SAYGO point are successfully met by the licensee and verified by NRC, their completion would be documented in inspection reports (IRs). At the option of NRC management, these SAYGO completions could be noticed in the Federal Register; however, the agency has not yet established a policy for this matter. SAYGO could be applied to any future plant, regardless of its licensing method.

SAYGO points can be viewed functionally as analogous to ITAACs, except that they are not specifically provided for in 10 CFR Part 52. Although some SAYGO points could be tied to ITAACs, the SAYGO process is separate from ITAAC verifications.

**Significant inspection findings:** The concept of significant inspection findings was introduced in SECY 94-294, "Construction Inspection and ITAAC Verification" (reference 1), as a mechanism to announce broad staff conclusions regarding significant construction activities or processes. These findings are intended to be NRC staff actions to assist in managing the inspection program, and they should be based on aggregated inspection results documented in the CIPIMS. At its option, the staff may coordinate significant inspection findings with applicable ITAACs and SAYGO points. Significant inspection findings are not required by regulations, and they should be used strictly as an NRC program management tool and as a vehicle for public notice. The following discussion contains many similarities to the outlines discussed above for ITAAC verification and SAYGO.

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In the past, the staff's judgments about construction acceptability have been based largely on the determinations of the acceptability of generic aspects of plant construction, be they processes or the as-built acceptability of hardware items found throughout the plant. The revised CIP will incorporate, and enhance, this philosophy by formalizing and publicizing these judgments through the use of significant inspection findings. The following items have been identified as possible candidates for significant inspection findings:

- o site preparation
- o structures
- o equipment fabrication
- o equipment placement
- o equipment operation
- o geotech/foundations
- o structural concrete
- o masonry
- o concrete expansion anchors
- o structural steel and supports
- o safety related piping
- o pipe supports and restraints
- o mechanical components/equipment
- o heating, ventilation and air conditioning
- o electrical components
- o electrical cable and terminations
- o instrumentation and controls (I&C) components
- o I&C tubing and supports
- o penetrations
- o welding
- o non-destructive examination
- o reinforcing bar (including couplings)
- o quality assurance/quality control programs
- o training
- o personnel qualifications
- o equipment and material qualifications
- o records
- o measuring and test equipment

Most of these elements apply, in one way or another, across a variety of SSCs throughout a nuclear power plant. Because of the sampling nature of NRC construction inspections, it is not feasible to inspect each of these elements for each system or structure in the plant. Rather, a broad sample of each element should be inspected, and an inspection finding pertaining to each element should be made. Each of these findings could then be applied throughout the plant. The above list is not intended to be all-inclusive, and items can be added, combined, or deleted as necessary during CIP reactivation.

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### **When to Make Findings**

When the NRC project team is formed, one of its major activities will be to develop the site specific inspection plan. During this planning stage, the staff must determine the significant inspection findings that will need to be made during plant construction, what body of inspections will be used to make the significant findings, and when the findings will be made. These significant findings will also need to be tied, as necessary, to specific ITAACs. If a SAYGO process is used, the interface of the findings with SAYGO points must be clearly identified.

These planning activities should be completed before the COL or CP is issued to ensure that the regulatory plan of action is as clear as possible by the time construction begins.

**Significant inspection findings:** Significant inspection findings should be made early in the chronological process of installing a particular type of component or commodity. For example, a finding on reinforcing bar installation could be made when 25% of all reinforcing bars have been installed. This finding would remain effective for the construction period, and its validity would be periodically verified by NRC inspections.

The initial inspections that support significant inspection findings will need to use fairly comprehensive and extensive IPs that are structured to validate given activities or processes. Once the significant findings are made, subsequent inspections to periodically revalidate the findings will use the same IPs, but with their scope reduced. It must be emphasized that a finding made at the 25% point could not be considered the NRC's final conclusion on a particular activity, since the inspected activity will continue.

**Management of Findings:** Inspection activities that impact a significant inspection finding will be tracked using the CIPIMS. This can be done by determining which IP occurrences will apply to a given significant finding, ITAAC verification, or SAYGO point.

- a. **Significant Inspection Findings:** Consider the installation of structural concrete at an ABWR as an example of how to set up the inspection plan to make a significant finding. As can be seen in the hypothetical extract of a plant construction and inspection schedule shown in Figure X, there are three inspection procedures pertaining to this activity: IP 46051, "Structural Concrete Procedure Review;" IP 46053, "Structural Concrete Work Observation;" and IP 46055, "Structural Concrete Record Review." To allow for early inspection of concrete installation activities (if needed), the first occurrence of each procedure is shown on the schedule as occurring before COL issuance. For the purposes of this example, the first opportunity for performance of all three inspection

## STRUCTURAL CONCRETE SIGNIFICANT FINDING

Act ID	Description	19																																																											
		2000					2001					2002					2003																																												
		D	J	A	F	M	A	M	J	J	J	A	S	O	N	D	D	J	A	F	M	A	M	J	J	J	A	S	O	N	D	D	J	A	F	M	A	M	J	J	J	A	S	O	N	D	D	J	A	F	M	A	M	J	J	J	A	S	O	N	D
<b>01 - MAJOR MILESTONES</b>																																																													
1010	Concrete Installation																Concrete Installation																																												
1020	Issue Combined License						Issue Combined License																																																						
1030	Start Reactor Bldg Basemat						Start Reactor Bldg Basemat																																																						
1040	Start RCCV Fabrication											Start RCCV Fabrication																																																	
1050	Install Reactor Pressure Vessel																Install Reactor Pressure Vessel																																												
<b>02 - SYSTEM MILESTONES</b>																																																													
2010	Control Bldg Concrete Complete																Control Bldg Concrete Complete																																												
2020	RadWaste Bldg Concrete Complete																RadWaste Bldg Concrete Complete																																												
2030	Turbine Bldg Concrete Complete																Turbine Bldg Concrete Complete																																												
2040	Service Bldg Concrete Complete																Service Bldg Concrete Complete																																												
2050	Reactor Bldg Concrete Complete																Reactor Bldg Concrete Complete																																												
<b>03 - INSPECTION ACTIVITIES</b>																																																													
<b>03.01 - Concrete Procedures Review (IP 46501)</b>																																																													
3011	1st Inspection (4 hours)	1st Inspection (4 hours)																																																											
3012	2nd Inspection (40 hours)						2nd Inspection (40 hours)																																																						
3013	3rd Inspection (4 hours)											3rd Inspection (4 hours)																																																	
3014	4th Inspection (4 hours)																4th Inspection (4 hours)																																												
3015	5th Inspection (4 hours)																5th Inspection (4 hours)																																												
<b>03.02 - Concrete Work Observation (IP 46503)</b>																																																													
3021	1st Inspection (8 hours)	1st Inspection (8 hours)																																																											
3022	2nd Inspection (80 hours)						2nd Inspection (80 hours)																																																						
3023	3rd Inspection (8 hours)											3rd Inspection (8 hours)																																																	
3024	4th Inspection (8 hours)																4th Inspection (8 hours)																																												
3025	5th Inspection (8 hours)																5th Inspection (8 hours)																																												
<b>03.03 - Concrete Record Review (IP 46505)</b>																																																													
3031	1st Inspection (8 hours)	1st Inspection (8 hours)																																																											
3032	2nd Inspection (40 hours)						2nd Inspection (40 hours)																																																						
3033	3rd Inspection (8 hours)											3rd Inspection (8 hours)																																																	
3034	4th Inspection (8 hours)																4th Inspection (8 hours)																																												
3035	5th Inspection (8 hours)																5th Inspection (8 hours)																																												
<b>04 - SIGNIFICANT FINDINGS</b>																																																													
4010	Structural Concrete Significant Finding																Structural Concrete Significant Finding																																												

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FIGURE X

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procedures is assumed to occur immediately before and after the COL is issued, which would equate to the second occurrence of each IP. The second occurrences of IPs 46051, 46053, and 46055 are planned to require 40, 80, and 40 hours of inspection, respectively, and will be completed about three months after COL issuance.

Cognizant NRC management will review the inspection results to determine if a significant finding can be made. Assuming the inspection results demonstrate that the licensee's process for installing structural concrete is acceptable, a significant inspection finding to this effect will be made by the end of the fourth month after COL issuance, as shown in Figure X.

The remaining occurrences of these inspection procedures would be used to monitor licensee performance in this area to verify the continued validity of the conclusions stated in the significant inspection finding. Note that the subsequent inspections are planned to require much less effort than the inspections performed before the significant finding is made. The lead inspectors for each discipline will select which portions of each procedure to perform during the monitoring phase, as opposed to fully performing the procedures as in the period preceding the significant finding. The staff hours shown for each of these inspections is a baseline estimate; the actual staff hours should be based on the amount of inspection effort required to verify the continued adequacy of structural concrete activities.

This significant inspection finding could contribute to the basis of verification that the following ABWR design certification ITACs have been met:

2.14.1.1 Primary Containment System

Basic Configuration (including basemat, vertical portions of the reinforced concrete containment vessel (RCCV), RPV pedestal, RCCV diaphragm floor, and top of RCCV)

2.15.10.1 Reactor Building

Basic Configuration (including exterior walls, basemat, inter-divisional walls and floors, and R/B roof)

2.15.12.1 Control Building

Basic Configuration (including exterior walls, basemat, interdivisional and steam tunnel walls and floors, and the main control area envelope)

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2.15.13.1 Radwaste Building

Basic Configuration (including basemat and below grade external walls)

Additionally, this finding could apply to any applicable COL ITAACs, SAYGO points, or other regulatory requirements or license conditions.

In the CIPIMS, the significant finding milestone should be scheduled, the inspection procedure cycles that will support the significant finding should be linked in the data base module, then the significant finding should be linked with the appropriate ITAACs and SAYGO points to which it pertains.

In practice, the process outlined above will be structured by the NRC project team, who will judge when inspections will be performed and findings made on the basis of a plant's design and construction schedule.

Experience has shown that NRC inspections often have items requiring followup, and such may be the case with significant inspection findings. The existence of inspection followup items may not necessarily prevent the issuance of a significant inspection finding, if those items are limited in scope and are not of a nature that they would invalidate the overall conclusion being made. In such a case, the outstanding items would be treated like any other followup issue arising from an inspection, as discussed later in this chapter.

- b. ITAAC Verification and SAYGO Points: Planning for ITAAC verifications and for SAYGO points will require more detailed input from the licensee's construction schedule than will be the case for significant findings. Beyond this difference, however, the inspection schedule and data base can be set up to accommodate these findings using a similar process as used for significant findings.

**Public Notice**

To help maintain the openness of the construction inspections at a future nuclear power plant, the following methods of providing public notice of inspection activities could be considered for implementation when the CIP is reactivated.

**Significant Findings:** Significant findings will be issued by the resident inspection staff either as part of routine inspection reports or by special inspection reports. The NRR staff should periodically

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publish Federal Register notices that identify recently issued inspection reports containing significant findings. One advantage to publicizing the issuance of significant findings in the Federal Register would be to provide the public and industry with an early opportunity to review and comment on the progress of construction inspection.

**SAYGO Points and ITAAC Verifications:** For SAYGO points and ITAAC verifications, the resident inspection staff will make recommendations to the cognizant NRR project director, who will ensure that each finding satisfies appropriate license conditions and regulatory requirements. SAYGO notifications and 10 CFR 52.99 Federal Register notices will be issued by the cognizant NRR division director.

**10 CFR Part 50.57 and Part 52.103(g):** The issuance of these findings will be done in accordance with the regulations and NRC policies existing at the time the findings need to be made. In general, the cognizant division director, with inputs from the resident inspection staff and the project director, will make the recommendations for these findings to the Director of Nuclear Reactor Regulation.

**Start of Construction Inspection:** The staff is considering publishing Federal Register notices to state when inspection activities at a construction site begin. Although these notices are not required by Part 52 or the Atomic Energy Act, they will improve public knowledge and allow for timely public participation.

### **Inspection Followup**

Outstanding items arising from construction inspections, including enforcement items, will be recorded in the CIPIMS in accordance with the instructions contained in draft IMC 2512 (reference 10). They will be disposed of as directed by the NRC policies that exist when the plant is under construction. Inspection results requiring further inspector action are currently managed through the Inspection Followup System (IFS), which tracks violations (VIOs), unresolved items (URIs), and inspection followup items (IFIs). When identified, these items are entered into the IFS data base, and their entries could be periodically updated until they were closed in an inspection report. The CIPIMS is structured to perform this inspection followup function, and it therefore is intended to replace IFS (or its successor) for new construction plants.

**Followup:** The CIPIMS should be used to schedule the followup and closure of each violation, unresolved item, or inspection followup item. Each item can be assigned to an already scheduled inspection cycle, or, if there is no planned inspection available, an additional cycle of the procedure that was used to identify the item (or another procedure cycle, as appropriate) should be scheduled. When planning and scheduling inspection followup and closeout, it is essential to review

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each item, identify the critical attributes that require reinspection, and clearly indicate these in the inspection planning section of the CIPIMS.

**Linkage to ITAACs:** The CIPIMS allows inspection staff to tie individual violations, unresolved items, and inspection followup items to specific ITAACs. Each one of these must be assessed to determine if it materially applies to an ITAAC, and, if so, the extent to which it impacts the NRC's ability to verify that the licensee has successfully completed the requirements pertaining to the ITAAC. This determination is additional to the requirements of the IFS, and the ultimate closure of the item must also account for the ITAAC impact. The general definition of what types of things pertain to ITAAC are still being explored as a policy issue. Therefore, it is not possible to go into further detail on this matter, and instead leave it as a process whose mechanics will need to be defined when the CIP is reactivated.

### **D. NRC ORGANIZATION**

The "Postulated Licensing and Construction Schedule" depicted as Figure W in the "Expected Licensing and Construction Environment" section of this report is intended to present a scenario that would be very demanding on the NRC so that it can be used as a planning tool for future personnel, resource, and program needs. The NRC does not expect that a utility must meet this schedule as a condition for licensing. Under this scenario, a utility would have begun material procurement and fabrication of major components and modules by the time it applies for a COL or a construction permit.

It follows, then, that early establishment of the NRC project team will be necessary for the agency to gain a detailed understanding of an applicant's design, plans, and schedule for constructing a plant, which will be used to develop and implement NRC inspection plans. Further, to carry out the construction inspection program for a future nuclear power plant, the NRC will need to establish its inspection teams well before onsite construction actually begins (this need was identified on the basis of past and present nuclear power plant construction experiences).

**Organization:** The project team will consist of three groups: a resident inspection office; the cognizant regional office, and; a project directorate in headquarters. The following organizational descriptions are based on projections of the necessary functions and personnel to reactivate and implement the CIP. When the CIP is reactivated, these functions, and the inter-organizational relationships and reporting structures, should be evaluated in the context of the contemporary NRC organization to ensure that the CIP will be efficiently implemented.

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- o A resident inspection office established at the start of construction will implement the CIP for the plant. For the purposes of this discussion, start of construction is defined as the time when plant component fabrication (for example, a reactor pressure vessel or a prefabricated module) begins in a factory, or at the commencement of any other licensee activities that require inspection. In the earliest phases of plant construction (e.g., site preparation), the resident inspection office would operate from either the cognizant regional office or NRC headquarters, and would shift to the site when the pace of activities requires significant inspection coverage. The office will consist of 6 to 12 technical staff, plus administrative support, who would rotate on and off site according to the needs for different types of expertise to verify satisfactory completion of various phases of plant construction. The following personnel, whose duties and responsibilities are defined in draft IMC 2512, would provide the core of the resident inspection office staff, and would be augmented by specialist inspectors.
  - Senior Construction Site Representative
  - Site Chief Structural Inspector
  - Site Chief Mechanical Inspector
  - Site Chief Electrical and Instrumentation Inspector
  - Construction Site Scheduler
  
- o The cognizant regional office would oversee the implementation of the onsite inspection program and would provide inspection resources and other technical support as necessary. The regional office organization for construction could, for example, be a task force made up of a manager supported by a technical staff of project engineers, reactor engineers, and inspectors of varying disciplines.
  
- o A group in NRC headquarters would oversee licensing aspects of plant construction. The staff would consist of a Senior Executive Service manager and an appropriate combination of project managers, project engineers, and support staff. This staff would also be responsible for issuing Federal Register notifications of successful ITAAC completion for plants licensed under 10 CFR Part 52. The headquarters organization envisioned for the next nuclear power plant built in the US would consist of:
  - project director
  - project managers for licensing and policy issues
  - project engineers for technical issues
  - prospective resident inspection staff for developing the site-specific construction inspection program
  - licensing assistant(s) (as needed)
  - clerical support (as needed)

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The project directorate's involvement with CIP details will include reactivating the CIP (discussed below), and overseeing the programmatic aspects of CIP implementation. This organization may be streamlined as issues are resolved and the inspection and licensing process enters a routine mode. The organization may also be adjusted as lessons learned from the lead plant are incorporated into planning.

**Establishing the Project Team:** The headquarters project directorate should be the first organization created, and should be established at the first credible indication that a reactor will be ordered, and license application made. Initially, this staff will coordinate license reviews, and be responsible for making recommendations regarding the approval of a COL or CP, as appropriate, in response to a license application. This staff will also take the lead in reactivating the CIP, and some of its members would be the cadre around which the resident inspection office would be formed.

CIP-related items to be developed during application review will include: defining the inspection program to be implemented at the site; establishing the plant-specific COL ITAAC (if the plant is licensed under 10 CFR Part 52), and; establishing SAYGO points (if so desired by the applicant). Close coordination with other NRC organizations will be necessary for many aspects of CIP reactivation, such as updating the CIPIMS to the current state of the art and developing inspection procedures. The minimum estimated level of effort that will be needed to reactivate the CIP is 8 FTE (4 staff for two years).

**Obtaining Expertise:** Another area to be addressed in conjunction with CIP reactivation will be the identification of the types of expertise needed to carry out construction inspections. The staff will have to determine if sufficient technical expertise is available within the NRC to perform the inspections. Arrangements must be made for the training and qualification of sufficient staff, and these arrangements will need to be made early enough to avoid impacting the inspection schedule. Similarly, if it is determined that obtaining contract expertise is required, NRC management will need to consider the long lead times associated with establishing technical assistance contracts.

### **E. ACTIONS ASSOCIATED WITH FUTURE CIP REACTIVATION**

The following list is a general series of NRC actions that should be taken to reactivate the CIP when it becomes apparent that a nuclear power plant will be ordered. This list is only intended to be a starting point for reactivating the program, and it should be reviewed and understood within the context of this draft report.

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1. Form NRC Project Team.
2. Review draft CIP report and other program documentation:
  - o develop plan to resolve policy issues;
  - o information and computer software related to Construction Inspection Program Information Management System (CIPIMS);
  - o update CIPIMS software to contemporary standards --
    - to the degree possible, the CIPIMS has used commercial off- the-shelf-software, so the basic system architecture should be easily transferred and updated;
  - o determine exactly how the CIPIMS data base needs to be structured to allow the public to have electronic access to inspection information;
  - o identify computer hardware needs;
  - o identify NRC staff computer training needs.
3. Obtain information from applicant and from other NRC organizations:
  - o contents of combined license (COL);
  - o ITAACs;
  - o detailed engineering design;
  - o construction schedule;
  - o SAYGO proposal.
4. Investigate construction methods to be used; identify locations at which fabrication, and therefore construction inspections, will occur. Pertinent issues include:
  - o engineering design for modular construction;
  - o transportation arrangements for modules;
  - o engineering design details;
  - o equipment procurement schedules.

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5. Identify the endpoint of the construction inspection program to be implemented at the construction site:
  - o establish program goals and assumptions --
    - if the plant is to be licensed under 10 CFR Part 52, identify contents of the section 52.103g finding
    - if plant is licensed under Part 50, identify contents of the section 50.57 findings;
  - o establish program timing and content --
    - finalize IMC 2511 -- determine scope and endpoint of the early site permit/site preparation inspections to be done under this pre-construction inspection program
    - finalize IMC 2512 -- will include IMC 2513 Appendix A inspection procedures (IPs), and all 2513 Appendix B IPs that are covered by ITAACs
    - review and revise IP 94300, "Status of Plant Readiness for an Operating License," to support program objectives
    - begin revising IMCs 2513 and 2514.
6. Identify significant findings to be made during plant construction:
  - o using the list of possible significant inspection findings provided in this report, develop a final list of findings, and determine for each one --
    - contents/basis
    - timing for making the finding
    - cross reference which inspections will be used to support the issuance of significant inspection findings;
  - o integrate findings with ITAAC verifications and SAYGO points (significant findings, ITAACs, and SAYGO points should be determined in conjunction with each other);
  - o superimpose the significant inspection finding milestones on the NRC construction inspection schedule.
7. Outline the inspection procedures needed to support significant findings, ITAACs, and SAYGO points:
  - o define scope of each inspection;
  - o develop inspection sampling criteria.

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8. Staffing:

- o identify staffing needs;
- o identify knowledge and expertise requirements for inspectors;
- o identify inspector training needs;
- o procure training for inspectors.

9. Generate resource estimates of inspectors for entire CIP:

- o resident inspectors;
- o specialist inspectors;
- o contractors;
- o inspection teams.

10. Develop new inspection procedures (IPs):

- o prioritize procedure development based on need date --
  - it will not be necessary to have all of them done right away (therefore, IP development can be "level loaded" in conformance with available resources; this will also allow for improvement of later IPs based on experience gained from in-office and field use of the IPs that are developed first).
- o ensure that improved procedures are developed for inspecting welding and non-destructive examination activities (commitment made in SECY 92-436)

11. Interfaces with Other NRC Activities:

- o update Management Directive 8.6 to include guidance on performing Systematic Assessments of Licensee Performance (SALP) for nuclear power plants under construction;
- o update the Vendor Inspection Program as necessary to conform to construction inspection requirements, and identify interfaces with the CIP.

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12. Begin inspections:
  - o early inspections to be performed in conjunction with application reviews.
13. Fully staff resident inspector office:
  - o consider permanently relocating the office to the construction site during the later phases of site preparation.
14. NRC issues COL or construction permit.
15. Implement CIP in accordance with revised IMC 2512.
16. Finalize IMCs 2513 and 2514; begin preoperational testing inspections under IMC 2513 late in plant construction:
  - o make a plan to transition from construction phase to operations phase inspections under IMCs 2514 and 2515.
17. Issue findings as needed to support NRC licensing decisions, as appropriate for the method used to license the plant.
18. Complete IMC 2512 for the construction project.

**F. OUTSTANDING POLICY ISSUES**

Several policy issues relevant to construction inspection and ITAAC verification remain under consideration. Many of these issues were discussed in the following references:

- SECY 94-294, "Construction Inspection and ITAAC Verification" (reference 1)
- SECY 92-436, "Status of Development of the NRC's New Construction Inspection Program" (reference 2)
- SECY 92-134, "NRC Construction Inspection Program for Evolutionary and Advanced Reactors under 10 CFR Part 52" (reference 3)

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- Memorandum to the Commission from J. M. Taylor, EDO, forwarding the draft Commission Paper, "10 CFR Part 52 Combined License (COL) Review Process and COL Form and Content" (reference 5)
- Memorandum to the Commission from J. M. Taylor, EDO, forwarding the draft Commission Paper, "ITAAC Verification and Construction Inspection Under 10 CFR Part 52" (reference 15)

The following list briefly summarizes unresolved policy questions pertaining to construction inspection at future nuclear power plants. In addition to issues discussed in the above references, the list includes several items that were identified during the writing of this draft report. As mentioned earlier, in the report section discussing the required actions associated with CIP reactivation, a plan to review and resolve these issues should be prepared developed soon after the resumption of CIP development. The policy questions are presented without elaboration, since background information on them can be found elsewhere in either this draft report or its references. The structure of the revised CIP is flexible enough to accommodate the resolutions of these issues when the CIP is reactivated in the future.

### **Agency Level Policy Issues**

The following issues pertain to the nature of the findings to be made under 10 CFR Part 52.

1. What will be the Commission's expectations of staff information to support the section 52.103(g) findings?
2. Is it possible for the Commission to delegate the section 52.103(g) finding authority to the EDO? If so, would the Commission delegate it?
3. Once an ITAAC has been announced in the Federal Register as being complete (per the requirements of section 52.99), what would be its legal standing? Would it have the same weight as a finding made under 10 CFR Part 52.103(g)?
4. What would constitute prima facie evidence that a particular ITAAC might not have been met?
5. What types of activities could impact an ITAAC? What specific attributes would be included as part of an ITAAC? What activities, although closely related to an ITAAC, would be treated as a 10 CFR Part 50 problem that would not necessarily preclude NRC verification that an ITAAC has been met?
6. How would deficiencies in a quality assurance process impact ITAAC findings?

## Programmatic Policy Issues

1. Determine the best method of publicizing significant findings, including whether to publish them in the Federal Register.
2. Determine if significant findings should be issued by routine or special inspection reports.
3. Refine the guidance on how the different types of inspection findings shall be made and who should make them.
4. Clarify the organizational structure and responsibilities for developing and implementing the CIP, including the roles of regional offices.
5. Define the extent of design engineering evaluations to be done as part of license application review, and the extent to which design engineering will be inspected under the CIP. It will be necessary to validate "first-of-a-kind engineering," and the design engineering and design change processes, to ensure fidelity of construction drawings to approved design.
6. Define the protocol of licensee notification to NRC of ITAAC completions, NRC staff verification of the same, and the subsequent publication of Federal Register notices.
7. Review and revise inspection procedure 94300, "Status of Plant Readiness for an Operating License," to be consistent with 10 CFR Part 52 and CIP requirements.
8. Develop a policy to implement a Sign-As-You-Go (SAYGO) process for future nuclear power plant construction projects.
9. Establish policy for publicizing/docketing construction inspection reports (including the particulars of inspection report formats, and the format that should be used to make reports available electronically to the public).
10. Establish the significance of NRC management's certification that a construction inspection procedure has been satisfactorily completed, particularly with respect to ITAAC verifications, significant findings, and SAYGO points.
11. Develop policies for inspection sampling.

#### IV. ACRONYMS

ABWR	Advanced Boiling Water Reactor
CAD	Computer Aided Design
CAE	Computer Aided Engineering
CDR	Construction Deficiency Report
CE	Combustion Engineering
CIP	Construction Inspection Program
CIPIMS	CIP Information Management System
COL	Combined License
CP	Construction Permit
CSS	Construction Site Scheduler
DBMS	Data Base Management System
ESP	Early Site Permit
FTE	Full Time Equivalent
GE	General Electric
HPCF	High Pressure Core Flooder system
IMC	Inspection Manual Chapter
IP	Inspection Procedure
IR	Inspection Report
ITAAC	Inspections, Tests, Analyses, and Acceptance Criteria
LWR	Light Water Reactor
PRA	Probabilistic Risk Assessment
QA	Quality Assurance
QC	Quality Control
RCCV	Reinforced Concrete Containment Vessel
RPV	Reactor Pressure Vessel
SAYGO	Sign As You Go
SCEI	Site Chief Electrical and Instrumentation Inspector
SCMI	Site Chief Mechanical Inspector
SCSI	Site Chief Structural Inspector
SCSR	Senior Construction Site Representative
SSC	Structure, System, or Component
TI	Temporary Instruction
UNR	Unresolved item
VIO	Violation

## V. REFERENCES

1. SECY 94-294, "Construction Inspection and ITAAC Verification" (December 5, 1994)
2. SECY 92-436, "Status of Development of the NRC's New Construction Inspection Program" (December 31, 1992)
3. SECY 92-134, "NRC Construction Inspection Program for Evolutionary and Advanced Reactors under 10 CFR Part 52" (April 15, 1992)
4. NUREG-1278, "Vogtle Unit 1 Readiness Review" (September 1987)
5. Memorandum to the Commission from J. M. Taylor, EDO, forwarding the draft Commission Paper, "10 CFR Part 52 Combined License (COL) Review Process and COL Form and Content" (April 1, 1993)
6. Inspection Manual Chapter (IMC) 2511, "Light Water Reactor Inspection Program - Pre-CP Phase" (April 1, 1978)
7. IMC 2512, "Light Water Reactor Inspection Program - Construction Phase" (December 17, 1986)
8. IMC 2513, "Light Water Reactor Inspection Program - Preoperational Testing and Operational Preparedness Phase" (January 1, 1984)
9. IMC 2514, "Light Water Reactor Inspection Program - Startup Testing Phase" (August 21, 1989)
10. Draft IMC 2512 (attachment 1 to this report)
11. General Electric Advanced Boiling Water Reactor ITAACs (versions dated April - June, 1993)
12. SRM COMIS 91-015 (November 21, 1991)
13. Memorandum to the Commission from J. M. Taylor, EDO: "Seabrook - The Staff's Review of the Office of the Inspector General (OIG) Report 90-31H - 'Review of the NRC Staff's Responses to Congressional Inquiries Regarding Joseph Wampler and the Welding Program at Seabrook Nuclear Station'" (February 12, 1992)
14. Memorandum to the Commission from E. Volgenau, Director, Office of Inspection and Enforcement: "Inspection Program Utilizing Statistical Sampling Inspection Techniques" (February 11, 1977)
15. Memorandum to the Commission from J. M. Taylor, EDO, forwarding the draft Commission Paper, "ITAAC Verification and Construction Inspection Under 10 CFR Part 52" (January 28, 1994)

12/19/94  
Date

J  
Initials



**POLICY ISSUE**  
(Information)

December 5, 1994

SECY-94-294

**FOR:** The Commissioners  
**FROM:** James M. Taylor  
Executive Director for Operations  
**SUBJECT:** CONSTRUCTION INSPECTION AND ITAAC VERIFICATION  
**PURPOSE:**

To present the staff's initial views on how the NRC will inspect future nuclear power plant construction projects that may be licensed under either 10 CFR Part 50 or 10 CFR Part 52. This paper also gives the Commission a status report on the development of the new Construction Inspection Program (CIP) as a followup to SECY 92-436.

**SUMMARY:**

The staff is developing a new CIP for future nuclear power plants licensed by the NRC under 10 CFR Part 50 or 52. The CIP is intended to enhance the current inspection program for Part 50 applications, verify that the licensee has satisfactorily completed the requirements for inspections, tests, analyses, and acceptance criteria (ITAAC), and verify that the licensee meets combined license (COL) conditions not related to ITAAC.

On January 28, 1994, the staff released a draft version of this paper for public comment with the title "ITAAC Verification and Construction Inspection Under 10 CFR Part 52." This initial paper prompted important discussions between the staff, the ACRS and industry. As a result of these interactions, the NRC is still considering significant issues including the nature of the findings that need to be made under 10 CFR Part 52, the manner in which ITAAC should be performed and met, the appropriateness of a Sign-as-You-Go (SAYGO) process, and what items should be included in COL applications. Each of these matters will either be addressed as part of, or affected by the staff's efforts to develop the design certification rule and establish the form and content of a COL. The CIP is intended to be flexible enough to accommodate the resolutions of these issues.

**NOTES:** TO BE MADE PUBLICLY AVAILABLE  
IN 10 WORKING DAYS FROM THE  
DATE OF THIS PAPER

**CONTACT:**  
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The following topics are addressed in this paper: objectives of construction inspection, methods of performing ITAACs, NRC staff inspection findings, SAYGO, engineering design verifications, evolutionary light-water reactor construction, use of a database to help manage and document inspections, the need for the CIP to assess the effectiveness of licensee quality assurance activities, inspection program development activities, and publication of construction inspection results.

#### **BACKGROUND:**

Subpart C of Part 52 describes a process for issuing a COL for nuclear power plants. A COL is a single license authorizing construction and operation of a nuclear power facility. A COL will include ITAACs to give reasonable assurance that the facility has been constructed and will operate consistent with the license, the provisions of the *Atomic Energy Act*, and NRC regulations.

The staff has submitted various Commission papers on 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 design review, final design approval, and certification of standard designs. Several papers also provided concepts and plans that the staff is considering implementing during the period between COL issuance and plant operation.

On April 1, 1993, the staff submitted the draft Commission paper, "10 CFR Part 52 Combined License (COL) Review Process and COL Form and Content," in which it discussed the content of a COL application, the form and content of a COL, COL ITAACs, the transition from high-level certified design information to detailed design and construction drawings, and the role of the quality assurance (QA) program in ITAACs. The staff discussed incorporating a SAYGO 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."

The staff has revised the views expressed in the draft paper on ITAAC verification and construction inspection that was forwarded to the Commission on January 25, 1994, and issued to the public for review and comment on January 28. The staff's views expressed herein on these subjects may change as experience is gained in the design certification of the General Electric (GE) Advanced Boiling Water Reactor (ABWR) and the Asea Brown Boveri/Combustion Engineering (ABB/CE) System 80+.

After issuing a COL under Part 52, NRC will focus on inspecting construction activities to verify that the licensee has satisfactorily completed all COL license conditions, including ITAACs. This focus will be consistent with NRC's practice for plants issued a construction permit under Part 50. The staff reviewed the ITAACs for the design certification of the evolutionary designs and is using these ITAACs in developing the CIP.

DISCUSSION:Objectives of Construction Inspection

The NRC inspects the construction of each nuclear power plant to verify that it is built in conformance with the regulations and with its design as described in the applicable license or construction permit. The new CIP will enhance the inspection of Part 50 construction projects by using electronic means to plan and document its actions, and to track issues. Although NRC will do most of the same inspection activities during construction of a plant licensed under Part 52 as it did for Part 50 construction projects, the objectives of doing safety verifications will differ. This paper will focus on implementing the CIP in the inspection of nuclear power plants constructed under a COL because the 10 CFR Part 50 regulatory findings for nuclear power plant construction inspection are established.

Section 52.103(g) states, in part: "Prior to operation of the facility, the Commission shall find that the acceptance criteria in the combined license are met." The staff's recommendation to the Commission for this finding will be based on the results of the inspection program implemented during construction.

Performing ITAAC

In building a plant licensed under 10 CFR Part 52, a licensee will do all inspections, tests, and analyses (ITAs) described in the plant's COL to demonstrate that the plant is constructed in accordance with its approved design. Section 52.99 states, in part, that

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.

The NRC will perform inspections throughout plant construction to assess the effectiveness of a licensee's process for doing the ITAs. These inspections will include witnessing or reviewing the conduct of sample ITAs that will, in combination with evidence of completion of all ITAs, enable NRC to conclude that the ITAs have been performed. The staff will systematically plan construction inspections to ensure they cover all plant systems and structures appropriately. This systematic planning will be important for those ITAACs that require a series of inspections to enable NRC to verify that the licensee met the ITA acceptance criteria.

The ITAACs are generally written as final verifications of satisfactory plant construction, and they routinely refer to *as-built* configurations or conditions. On the basis of an initial review of existing ABWR ITAACs, the staff estimates that licensees will likely complete most of the ITAACs late in the construction of a plant (Figure 1).

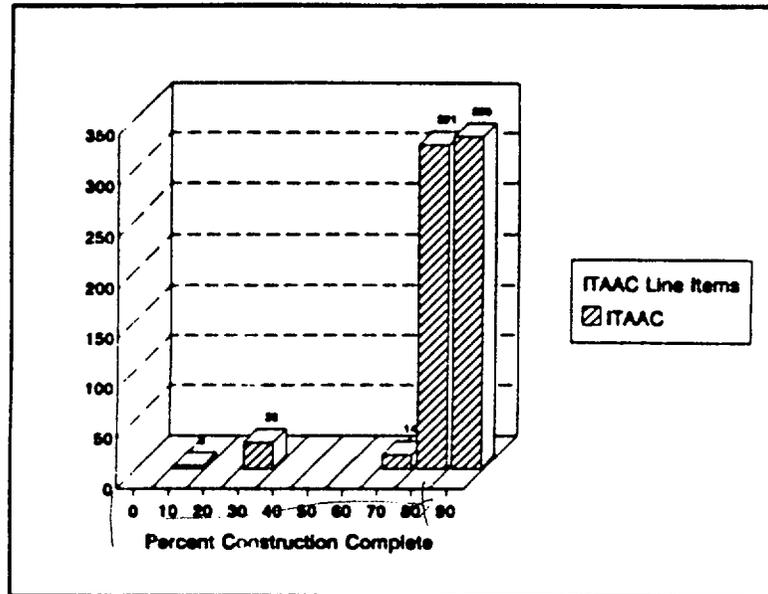


Figure 1. Final ITAAC Verification

#### NRC Staff Inspection Findings

The staff will verify the completion of certain ITAACs by simply comparing system performance measurements and observations against established criteria. ITAACs of this type will normally be accomplished within a well-defined period during construction, and their completion will be easily documented. Examples of such ITAACs follow: verification that alarms for a particular system exist or can be retrieved in the main control room; verification that water is pumped by a system at a rate greater than a prescribed minimum flow rate; and verification that prescribed system valve interlocks function. The licensee will do other ITAACs over a long period of construction, and NRC will perform many inspections to verify their various attributes. When the final construction activity for an ITAAC is completed, all results of these inspections will support the conclusion that the ITAAC has been met.

A sample ITAAC acceptance criterion for the ABWR control building (C/B) 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 the construction activity for this ITAAC would span more than 3 years, beginning in the first year of construction. NRC will do the final verification of this ITAAC by directly inspecting the construction and as-built condition of the control building and observing licensee activities for similar features elsewhere in the plant. For example, samples of concrete placement will be observed throughout the plant. If the processes and materials used in pouring concrete are satisfactory, and if the quality assurance oversight is effective, these inspection observations will contribute to staff conclusions about the control building fire protection envelope.

NRC verifications for many ITACs will rely on both system-specific observations and generic conclusions regarding the adequacy of construction activities throughout the plant. These inspection conclusions will pertain to such generic activities as site preparation, structures, and equipment fabrication, placement, and operation. The staff will manage construction inspections so that inspection findings can be systematically made, as illustrated in the conceptual model of an inspection plan for the ABWR high-pressure core flooder (HPCF) system (Attachment 1). The plan delineates activities and components for constructing a safety system, arranges them in matrix format by inspection, and lists the guiding inspection procedures. Planning inspections by system will apply equally well to plants licensed under 10 CFR Part 50, since both the old and the new CIPs are done to verify that a plant is constructed in accordance with its license.

#### Sign-as-You-Go

The new CIP will readily accommodate a Sign-as-You-Go (SAYGO) process during plant construction, if a licensee uses such a process for a plant licensed under either Part 50 or 52. Aspects of the CIP that will apply directly to SAYGO include systematic inspection planning and scheduling, enhanced documentation of inspection results, and the emphasis on validating the overall effectiveness of licensee quality assurance processes.

#### Engineering Design Verifications

In the draft Commission paper "10 CFR Part 52 Combined License (COL) Review Process and COL Form and Content," the staff stated that design descriptions and functional system drawings available for review during the design certification and COL application stages are adequate for licensing reviews and final safety determinations, but not for actual construction or construction inspection activities. Licensees will therefore need to follow design engineering and design change methods that effectively translate high-level certified design information into detailed design and construction drawings. The change processes for a design certification rule will allow a licensee some latitude in implementing the methods used to design, build, and test a nuclear power facility.

The NRC will inspect and review the adequacy of licensee design engineering early in a construction project, possibly beginning soon after receipt of a licensing application; first-of-a-kind engineering for the lead plant of each certified design will be assessed during these inspections. As plant construction progresses, NRC will determine if the engineering design is adequate primarily through performance-based inspections to verify that plant systems and components are installed and tested to applicable standards, certified design information, and ITACs. NRC will also assess the effectiveness of the licensee's design change process in maintaining the fidelity of high-level certified design information that is translated into construction drawings.

### 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 fuel loading. To meet this schedule, many of the construction methods to be used will differ from the methods used to build existing plants. They will likely use highly efficient advanced construction techniques such as prefabricating plant equipment and systems, and constructing systems and structures in modules of various sizes. The modules would need to be engineered carefully, and fabricated to close tolerances. Some critical fabrication activities for these modules may be performed in offsite factories or onsite prestressing areas before the modules are permanently installed. NRC will need to coordinate with the licensee to verify satisfactory completion of these activities, and the CIP will be broad enough to allow the staff to properly inspect a variety of fabrication methods. NRC will prepare new guidance for inspecting the shipping, receipt, and storage of major components and prefabricated modules to verify that appropriate measures are taken to prevent equipment being damaged or degraded during these activities.

### Use of a Data Base

The results of NRC construction inspections will be documented in a data base of inspection findings throughout the construction of a nuclear power plant. The data base will also be used to plan and schedule required inspections. 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. The data base will allow for the extensive and detailed recordkeeping needed to document this large amount of inspection data in a systematic and retrievable manner. At the end of plant construction, NRC will use the information from the data base for licensing actions under either Part 50 or 52.

### Quality Assurance

A licensee building a nuclear power plant will be responsible for determining the adequacy of all safety-related activities performed at a construction site, and all ITAAC-related activities that are not safety-related. Licensees will ensure, through quality assurance and quality control (QA/QC) processes, that those activities have been done in accordance with accepted industry standards and governing NRC regulations. While the quality assurance requirements of 10 CFR Part 50, Appendix B, will apply for safety-related activities, the staff assumes that similar quality assurance processes will be implemented for ITAAC activities that are not safety related. The new CIP will devote particular attention to verifying the effectiveness of licensee, constructor, architect-engineer, and vendor QA/QC programs throughout the construction period. These inspections will include observations of in-process work and QA/QC activities, performance of independent nondestructive examination and comparison of results, procedure and records reviews, and technical audits. The inspection program will be broad enough to allow the NRC to make accurate

conclusions about the effectiveness of a licensee's quality programs.

### NRC Organization

To inspect the construction of a future nuclear power plant, the NRC will establish a project team when a utility applies for a COL or a construction permit. Early establishment of the team will allow the NRC to gain a detailed understanding of an applicant's design, plans, and schedule for constructing a plant, which will be used to develop and implement NRC inspection plans. The project team will consist of three groups:

- o resident inspection office established at the start of construction will implement the inspection program at the construction site. The office will consist of between 6 and 12 technical staff, and other 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 The cognizant regional office will oversee the implementation of the onsite inspection program. The regional office will issue inspection reports, coordinate inspection planning, and obtain inspection resources and other technical support as necessary.
- o A group in the Office of Nuclear Reactor Regulation (NRR) will oversee licensing aspects of plant construction. The staff would consist of a director from the Senior Executive Service and an appropriate combination of project managers, project engineers, and support staff. This staff will also be responsible for issuing *Federal Register* notifications of successful ITAAC completion for plants licensed under 10 CFR Part 52.

### Inspection Program Development

The staff is developing the new CIP for future nuclear power plants to include new inspection manual guidance and a computer data base management system (DBMS) to improve documentation of inspection results. This revised program will incorporate applicable elements of the current preconstruction, construction, preoperational, and startup testing inspection programs, and will also implement the inspection and concepts described herein. This program will improve the coordination of systematic construction inspections, including regional team inspections and teams from NRC headquarters for specialized areas, such as vendor inspections. Under the new CIP, NRC inspection activity for a plant will begin before the beginning 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 state which aspects of plant construction and licensee activities the NRC will inspect, which standards will be applied to NRC inspections, and when the inspections will be done.

The staff completed the initial version of the CIP DBMS for use in planning and documenting inspections at the Bellefonte construction site. The DBMS is

a personal computer system and includes data files of coded inspection information from NRC inspection reports for Bellefonte since 1975. Region II personnel will use the DBMS in reviewing inspection programs for completeness and in planning future inspections at the Bellefonte site if construction resumes. The staff is converting the Bellefonte DBMS into a generic CIP DBMS for advanced reactors that incorporates the inspection requirements described herein. This generic DBMS can be modified as necessary for each reactor design.

The new CIP inspection manual chapter will outline the structure and methods to be used by inspectors to perform and document construction inspections, including ITAAC-related inspection activities. This manual chapter will also give managers and inspectors guidance on developing appropriate inspection sample sizes, frequencies, and techniques. The manual chapter and companion DBMS will include a program structure with as much detail as available plant design information will allow. The staff will complete this activity by the end of 1995, at which time the program and all associated development records will be archived for future use. The staff will continue developing the CIP when it receives an application for either a construction permit or COL. Details such as new inspection procedures and plant license conditions will be incorporated into the manual chapter and DBMS concurrent with the staff's licensing application reviews. The inspection manual chapter will include hierarchical tables of system information cross-referencing components, inspection attributes, inspection procedures, technical references, and ITAACs. After completing the CIP, the staff will make the CIP and associated inspection procedures available for public comment.

The staff is preparing guidance for future construction inspection reports to follow the structure of the inspection program. The report format will include narrative summaries of inspection activities and results, conclusions derived from inspection efforts, and pertinent inspection information from the DBMS. To support this new reporting guidance, the staff is including a report generation module in the CIP DBMS. This feature will allow narrative discussions of the inspection reports and programs to be composed within the DBMS software, and the data records pertaining to a particular inspection will be appended to the inspection report electronic file. The staff will place a paper copy of the resulting inspection reports on the plant docket, and is considering making the entire DBMS available to the general public in electronic read-only format.

#### Public Notice

The staff will make periodic notifications to the public in accordance with Section 52.99 of Title 10, which states, in part, that at

appropriate intervals during construction, the NRC staff shall publish in the *Federal Register* notices of the successful completion of inspections, tests and analyses.

The staff is also considering publishing *Federal Register* notices to state when inspection activities at a construction site begin, and may periodically

publish notices of inspection reports containing significant inspection findings. Although these notices are not required by Part 52 or the *Atomic Energy Act*, they will improve public knowledge and allow for timely public participation. These notices will be in addition to the staff's normal procedure of publicly docketing inspection reports.

**CONCLUSION:**

The staff will continue developing the CIP and will inform the Commission as significant activities are completed.

**COORDINATION:**

The staff submitted a draft version of this paper to the ACRS and OGC and made it publicly available on January 28, 1994. The staff briefed the ACRS and met with the Nuclear Energy Institute (NEI) to discuss the matters herein. NEI commented on the draft paper in an October 7, 1994, letter to Mr. Dennis M. Crutchfield, Associate Director for Advanced Reactors and License Renewal, NRR. The staff clarified certain issues raised by NEI and will work to resolve others.

The staff resolved and incorporated OGC's comments. The staff and OGC are finding new issues regarding construction inspection and ITAAC verification while preparing the proposed rulemaking package for the GE ABWR and the ABB/CE System 80+ design certifications. However, OGC has no legal objection to this paper, subject to the condition that the positions described herein are not necessarily final NRC positions. The staff and OGC will need to further consider the issues discussed herein. The final CIP will reflect the final agency policy on these matters.

  
James M. Taylor  
Executive Director  
for Operations

Attachment: Hardware Inspection Matrix Block  
Detail for ABWR HPCF System

DISTRIBUTION:  
Commissioners  
OGC  
OCAA  
OIG  
OPA  
OCA  
REGIONS  
EDO  
ACRS  
SECY

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

**HIGH PRESSURE CORE FLOODER SYSTEM - ITAAC 2.4.2**

<b>INSPECTION AREAS</b>	<b>Procedures Review</b>	<b>Inprocess Inspection</b>	<b>Final Inspection</b>	<b>Independent Testing</b>	<b>Testing &amp; QA</b>	<b>Records Review</b>	<b>ITAAC Number</b>
<b>PIPE, VALVE, INSTRUMENT SUPPORTS AND SNUBBERS; Location, Orientation, Mounting</b>	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

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
<p>PIPE; Material, Installation, Boundary, Alignment, Welding.</p>	<p>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.</p> <p>IP 49051, 55050, 35065</p>	<p>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 measures.</p> <p>IP 49063, 48053, 55050, 570XX, 35061</p>	<p>Verify pipe and valve supports and snubbers, piping, valves, pumps, motors and instruments were installed to design requirements by walking down the accessible portion 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 RCIC system as described in the system design.</p> <p>IP 49063, 48053, 50073, 51053, 52053, 51063, 71710</p>	<p>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.</p> <p>IP 570XX</p>	<p>Review and observe the ASME Section III hydro-static test of the installed HPCF system.</p> <p>IP TBD</p>	<p>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.</p> <p>IP 49065, 35061</p>	<p>2.4.2.1, 2, and 5; 3.3.1, 2, and 3 (for HPCF system only)</p>

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
<p>VALVES - MOTOR OPERATED, CHECK, MANUAL; Installation, Orientation, Welding, Power Supplies, Testing</p>	<p>Review procurement specifications for valves, motor operators; review engineering instructions for location &amp; 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 and seismic qualification requirements.</p> <p>IP 50071, 51051, 35061</p>	<p>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, limiter torque installation, MOV motor terminations, power supply verification and MOV testing. Observe installation of testable check valve.</p> <p>IP 50073, 51053, 51063, 35061</p>	<p>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.</p> <p>IP 49063, 48053, 50073, 51053, 52053, 51063</p>	<p>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.</p> <p>IP 570XX</p>	<p>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 <math>\leq</math> to 16 seconds upon receipt of an actuation signal; MOV automatic controls and functions will be reviewed during logic testing.</p> <p>IP TBD</p>	<p>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.</p> <p>IP 50075, 51055, 51065, 35061</p>	<p>2.4.2.1, 2, 4a, 4b, 8</p>

HIGH PRESSURE CORE FLOODER SYSTEM - ITAAC 2.4.2

INSPECTION AREAS	Procedures Review	Inprocess Inspection	Final Inspection	Independent Testing	Testing & QA	Records Review	ITAA Numb
<p>PUMPS; Installation, Alignment, Operation, Testing</p>	<p>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; Review seismic qualification requirements</p> <p>IP 50071, 35061</p>	<p>Observe storage of the pumps before use; Verify reasonable alignment with suction and discharge piping; Observe alignment of pumps and motors.</p> <p>IP 50073, 35061</p>	<p>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.</p> <p>IP 49063, 48053, 50073, 51053, 52053, 51063</p>	<p>none</p>	<p>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<sup>3</sup>/hr at a dp of 82.8 kg/cm<sup>2</sup> and 727 m<sup>3</sup>/hr at a dp of 7 kg/cm<sup>2</sup>; 2) HPCF system flow is achieved within 16 seconds of simulated initiation signal; 3) NPSH available exceeds NPSH required.</p> <p>IP TBD</p>	<p>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.</p> <p>IP 50075, 35061</p>	<p>2.4.2 1, 3c 3e, 3</p>

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
<p>PUMP MOTORS; Installation, Power Supplies, Electrical Connections, Alignment, Operation, Testing</p>	<p>Review procurement records for pump motors; Review engineering provided installation guidance; Review environmental and seismic 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.</p> <p>IP 51051, 35061</p>	<p>Observe storage of the pump motors before use; Observe alignment of pumps and motors; Observe termination of electrical power supplies; Observe rotation check;</p> <p>IP 51053, 51063, 35061</p>	<p>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.</p> <p>IP 49063, 48053, 50073, 51053, 52053, 51063</p>	<p>none</p>	<p>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</p> <p>IP TBD</p>	<p>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.</p> <p>IP 51055, 51065, 35061</p>	<p>2.4.2.1</p>

**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
<p><b>INSTRUMENTS AND CONTROLS;</b>                      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.</p>	<p>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 and seismic qualifications requirements; Review setpoint methodology; Review electro-magnetic compatibility analyses.</p> <p>IP 52051, 35061</p>	<p>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.</p> <p>IP 52053, 35061, 51053</p>	<p>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.</p> <p>IP 49063, 48053, 50073, 51053, 52053, 51063</p>	<p>none</p>	<p>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</p> <p>IP TBD</p>	<p>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.</p> <p>IP 52055</p>	<p>2.4.2.1, 6, 7</p> <p>3.4.10, 11, 12, 13</p>

**HIGH PRESSURE CORE FLOODER SYSTEM - ITAAC 2.4.2**

<b>INSPECTION AREAS</b>	<b>Procedures Review</b>	<b>Inprocess Inspection</b>	<b>Final Inspection</b>	<b>Independent Testing</b>	<b>Testing &amp; QA</b>	<b>Records Review</b>	<b>ITAAC Number</b>
<p><b>WATER SUPPLY; Suppression Pool, Condensate Storage Tank.</b></p>	<p>Review design requirements for minimum water supply to support HPCF and RCIC system from the suppression pool and the CST; Review HPCF system drawings for connections with RCIC, SPCS, MWC systems.</p> <p>IP 50071</p>	<p>none</p>	<p>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.</p> <p>IP 49063, 48053, 50073, 51053, 52053, 51063</p>	<p>none</p>	<p>Observe testing of keep fill system for the HPCF system.</p> <p>IP TBD</p>	<p>Review ITAAC for RCIC, SPCS, and MWC systems; Review completed test of the HPCF keep fill system.</p>	<p>2.4.2.1</p>

**HIGH PRESSURE CORE FLOODER SYSTEM - ITAAC 2.4.2**

<b>INSPECTION AREAS</b>	<b>Procedures Review</b>	<b>Inprocess Inspection</b>	<b>Final Inspection</b>	<b>Independent Testing</b>	<b>Testing &amp; QA</b>	<b>Records Review</b>	<b>ITAAC Number</b>
<p><b>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.</b></p>	<p><b>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.</b></p> <p><b>IP TBD</b></p>	<p><b>none</b></p>	<p><b>none</b></p>	<p><b>none</b></p>	<p><b>Observe 50% of all logic system testing to verify automatic system responses and interlocks function as designed.</b></p> <p><b>IP TBD</b></p>	<p><b>Review the results of all of the completed logic testing to verify satisfactory performance of the individual automatic system responses and interlocks.</b></p> <p><b>IP TBD</b></p>	<p><b>2.4.2, 3a, 3b, 3c, 3g, 3h, 3i, 3j, 3k, 3m, 3n, 8, 9</b></p>

**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
<p><b>INTEGRATED SYSTEM TESTING; Electrical independence between Class IE divisions and between Class IE divisions and non-Class IE equipment; HPCF division flow, injection time, NPSH available, full flow test mode available, satisfactory operation from the control room and remote shutdown panels.</b></p>	<p>Review tests on: Class IE 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 IE and non IE equipment; Review HPCF system drawings for division of electrical power between class IE and non IE equipment.</p> <p>IP TBD</p>	<p>Independently verify that adequate protective measures are established between Class IE and non IE equipment is in place by walking down 5 to 10% of interfaces between Class IE and non IE components. If the initial sample failure rate is high or inconsistent increase the sample size as appropriate.</p> <p>IP 51053</p>	<p>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.</p> <p>IP 49063, 48053, 50073, 51053, 52053, 51063</p>	<p>none</p>	<p>Observe the following tests: Class IE 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 &lt; a straight line between 182 m<sup>3</sup>/hr at a dp of 82.8 kg/cm<sup>2</sup> and 727 m<sup>3</sup>/hr at a dp of 7 kg/cm<sup>2</sup>; 2) within 16 seconds signal; 3) NPSH meets design.</p> <p>IP TBD</p>	<p>Review test results for electrical independence testing, full flow testing, control room and remote shutdown panel testing; Review results of licensee inspection for separation and protective measures between Class IE and non IE equipment</p> <p>IP TBD</p>	<p>2.4.2. 3d, 3e, 3f, 3i, 6, 7</p>



NUCLEAR ENERGY INSTITUTE

October 7, 1994

Ron Simard  
DIRECTOR,  
ADVANCED REACTORS PROGRAMS

Mr. Dennis Crutchfield  
Associate Director for Advanced Reactors  
and License Renewal  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555

Dear Mr. Crutchfield:

This letter provides industry comments on the draft Commission paper, "Construction Inspection and ITAAC Verification Under 10 CFR Part 52," that the staff made available earlier this year as a vehicle for public discussion. In preparing these comments, we benefited from discussing the key principles in the paper, and underlying NRC staff intent, during a public meeting on September 14, 1994.

The NRC staff's draft paper and these comments have been thoroughly reviewed and discussed by NEI's ALWR Regulation Working Group (ARWG), whose membership includes industry personnel familiar both with Part 52 and with issues relating to construction inspection. Based on these discussions, we have identified several important conflicts between the construction inspection process outlined by the staff's draft paper and understandings reached through prior extensive NRC/industry interactions on design certification issues.

**Discussion**

Over the past few years, the NRC staff and industry have put considerable resources into understanding the ITAAC concept within Part 52 and defining the set of ITAAC for particular standard designs. Much emphasis has been placed on assuring that ITAAC contribute to predictability and stability and minimize uncertainty in the Part 52 licensing process. Until recently, less attention has been given to the process for actually *implementing* ITAAC; the draft Commission paper represents an important early step in this regard. As the industry and NRC staff begin to define the process for construction inspection under Part 52, particularly as it relates to ITAAC implementation, priority focus must be maintained on assuring certainty in the Part 52 process and predictability in meeting established plant construction schedules. We believe the industry and NRC have a common interest in the development of an efficient, effective construction inspection process, free of undue delays that were all too common in the past.

It is in this respect - - the vital need to assure predictability, stability and certainty in all phases of the Part 52 process - - that the industry has significant concerns with the draft paper. In general, the draft paper is at odds with understandings achieved through great efforts on the part of both the industry and NRC staff on concepts such as Tier 1, ITAAC, and the role of the quality assurance program, that are fundamental to the workability of the Part 52 process. Our major concerns are outlined below and are discussed in greater detail in the enclosure to this letter.

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**Quality Assurance Program vs. ITAAC:** The draft Commission paper reflects an unnecessarily broad view of the inspections involved in determining that an individual ITAAC has been met. In particular, the staff's proposed concept of "compound ITAAC" effectively sweeps a wide range of quality assurance program (QAP) activities into Tier 1/ITAAC space, in contrast to prior industry/NRC agreements regarding delineation of Tier 1 vs. Tier 2 and the role of the construction QAP.

**"Bridge Concept":** "Bridge concept" is the term used by the staff to describe the process of shifting from high level certified design information to the detailed design information used for construction. ITAAC, on the other hand, relate to as-built physical and functional verifications. The draft Commission paper inappropriately links "bridge concept" implementation, and therefore detailed engineering, directly to Tier 1/ITAAC verification. Moreover, the suggestion that NRC staff assessment of "bridge concept" adequacy would not be complete until late in the construction process introduces a significant licensing instability as well as uncertainty in meeting established schedules. Also, the "bridge concept," as described in the draft paper, seems to impinge upon the traditional role of the QAP.

**Sign-As-You-Go Process:** We agree with the NRC staff that an effective, efficient sign-as-you-go (SAYGO) process, consistent with Part 52, will be an essential part of a systematic ALWR construction inspection process. However, we do not share the NRC staff view, indicated by the draft Commission paper, that the vast majority of ITAAC determinations, and therefore SAYGO notifications, must occur near the end of the construction process. Rather, to provide for meaningful public information and tangible evidence of construction progress, SAYGO points can and should be defined throughout the construction process. Definition of an effective SAYGO process will need to be addressed in conjunction with other ITAAC implementation issues raised by the draft Commission paper.

The industry supports the concept of a parallel process for documenting the satisfactory completion of quality related construction activities other than ITAAC verification. As discussed further in the enclosure, we recommend additional industry/NRC staff interactions to clarify this process and use of a term other than "interim acceptability findings" by the NRC staff to describe such a process. In general, the NRC staff view in this area appears to be substantially similar to the industry's, as discussed in our February 18, 1992, draft paper titled, "NRC Program for Periodic Validation of Compliance for a Combined License." For ease of reference, a copy of that paper is included with the enclosure.

**General:** The perception created by the draft paper is of a construction inspection process vastly different from past practice and significantly more complex. In this regard, we believe the draft paper would send an inaccurate and undesirable message to the Commission, industry and general public. The construction inspection process established must instill confidence, not uncertainty, in the ability to build, inspect and start up ALWRs on schedule. We note that the NRC staff has provided assurances contrary to the impression left by the draft paper to the ACRS on August 5 and to the industry on September 14. Specifically, the NRC staff stated their view, shared by the industry, that the process should be basically the same as in the past, but enhanced to be more systematic, especially with respect to efficient record keeping and retrieval. It is important that the perception created by the draft paper be corrected.

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Crutchfield  
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The issues raised by the draft Commission paper are complex. They are also vital to the successful implementation of the Part 52 process. Recognizing the importance of the topic, we appreciate that the NRC staff published its views on construction inspection and ITAAC verification in draft form to facilitate public discussion and development of common understandings. Additionally, we agree with the staff that now, rather than later, is the time to establish the general framework, philosophy and approach for actually implementing ITAAC. It is now, while the industry and NRC personnel most familiar with Part 52 and ITAAC are available for the task, that continuity with past understandings can best be assured.

We recognize that Commission interest in this area is high, and we are prepared to interact with the NRC staff on an expedited basis to address issues raised by the draft Commission paper. We believe it is in the interests of the Commission, NRC staff, and industry that the paper sent to the Commission be consistent with understandings reached during interactions related to design certification and reflect a workable process for ITAAC implementation. Accordingly, we recommend and request that a detailed paper on this topic not be sent to the Commission until the NRC staff and industry have adequate opportunities to address fundamental issues and assure consistency with established Part 52 principles.

We will contact you shortly to follow up this letter and discuss opportunities for interacting with the NRC staff in this vital area. In the meantime, if you have any questions, please do not hesitate to call.

Sincerely,



Ron Simard

RLS/net  
Enclosure

c: F. Gillespie

Enclosure to NEI letter (Simard to Crutchfield), dated October 7, 1994

This enclosure provides further discussion of major industry concerns with the draft Commission paper titled, "Construction Inspection and ITAAC Verification Under 10 CFR Part 52," dated January 25, 1994.

### Role of Quality Assurance Program (QAP) vs. ITAAC

#### Background and Discussion

In various papers and meetings, the industry and NRC staff have recognized and underscored the importance of the QAP in the Part 52 process as a well-proven and accepted method for verifying construction practices. Indeed, the role of the QAP in the design, construction, licensing and operation of nuclear power plants is expected to be essentially the same under Part 52 as in Part 50 licensing. Thus, the owner/operator's QAP plan will be reviewed against the criteria of Part 50, Appendix B, and approved by the NRC as part of COL issuance. QAP implementation by the plant owner/operator, and NRC inspection and audit thereof, will provide reasonable assurance that quality related activities are implemented properly in accordance with the terms of the COL. The NRC staff has recognized that the QAP will remain an enforceable process under Part 52 that will identify and correct deficiencies in the on-going plant design and construction processes.

In contrast to the role of the QAP, ITAAC are required specifically by Part 52 and constitute a predetermined set of as-built physical and functional verifications that are necessary and sufficient to provide reasonable assurance that a plant has been built and will operate in accordance with the design certification. The legal significance of ITAAC under Part 52 is indicated by their role as the sole basis for the Commission's § 52.103(g) finding prior to operation of the facility. Significantly, Part 52 also makes compliance with ITAAC acceptance criteria the exclusive basis for the post-construction hearing opportunity that precedes the § 52.103(g) finding. The industry envisions that ITAAC implementation, i.e., performance of specified inspections, tests and analyses, as well as determining and documenting that acceptance criteria are met, will be encompassed by the owner/operator's approved QAP.

In addition to assuring that the quality of plant construction is in accordance with the COL, accepted industry standards and governing NRC regulations, proper QAP implementation under Part 52 will provide underlying confidence and support for licensee determinations and NRC staff verifications that ITAAC have been met. Thus, under Part 52, QAP activities are important unto themselves and in their support for ITAAC determinations. It should be noted that a QAP deficiency could impact the satisfaction of

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an ITAAC only if the deficiency precludes a determination that related acceptance criteria in the ITAAC have been met. The draft paper should reflect that the NRC staff, upon verifying that all ITAs have been performed and the associated acceptance criteria met, will so inform the Commission in order to support the Commission's finding required by § 52.103(g), notwithstanding that there may be other conditions of the COL to be met prior to operation.

Because of the special legal significance of ITAAC under Part 52, both the industry and NRC staff have placed extraordinary emphasis on understanding the two-tier approach and the careful and precise delineation of Tier 1, including ITAAC. For the same reason, equal emphasis must be applied toward continuing the two-tier approach into the COL phase and maintaining the analogous distinction between QAP implementation and ITAAC verification. If we are not vigilant of this in defining the process for implementing ITAAC, our earlier efforts will have been for naught, and markedly increased complexity and uncertainty in the construction and licensing process will result.

#### QAP vs. ITAAC - Specific Comments

In light of the foregoing, the paper sent to the Commission on this topic should reflect the distinction between ITAAC and the QAP activities that may support a given ITAAC determination. The concept of "compound ITAAC" introduced by the staff is an example of how this vital distinction can be eroded. In the example used by the staff regarding the fire rating of the main control area envelope, there is no question that many steps and inspections over a long period of time will contribute to and support licensee determination and NRC verification that this ITAAC has been met. However, it does not follow that each of the many steps and inspections involved thus become parts of a "compound" ITAAC. Rather, the NRC staff's verification of this ITAAC might entail consideration of the various QAP records produced at each step to provide an objective, integrated assessment of the fire rating of the main control room envelope. The effect of the approach indicated by the draft paper is to elevate the range of normal procurement, fabrication and construction activities to Tier 1, contrary to explicit understandings reached during design certification interactions that such matters warrant Tier 2 treatment only, including verification via QAP implementation. We strongly urge the staff to avoid introducing new ITAAC concepts and terminology, i.e., "simple" and "compound" ITAAC, in the paper sent to the Commission.

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Enclosure 3 to the draft Commission paper gives rise to the same concern. The table is titled, "Hardware Inspection Matrix Block Detail - High pressure Core Flooder System (HPCF) - ITAAC 2.4.2." Despite the reference to ITAAC 2.4.2, the matrix largely delineates the spectrum of QAP inspections that the NRC staff expect to perform for this system. The impression and effect is that all the inspections noted are part of ITAAC 2.4.2, which they are not. For example, because a final "100 percent walkdown" is not required by the ITAAC, there is no relevance to the ITAAC, and care must be taken to avoid suggesting otherwise.

A further fundamental concern is also raised regarding the final "100 percent walkdown" identified in the HPCF example. While NRC inspectors may choose to walk down a system following completion of all work, it is not clear, as suggested by the staff in their draft paper and in the September 14 meeting, why a "100 percent walkdown" should be established in advance as a necessary requirement for all systems, or even all safety-related systems. Requirement of a final "100 percent walkdown" would be redundant in many cases to previous inspection activities and suggests little recognition of, or confidence in, the owner/operator's QAP, or that ITAAC associated with this system will have been successfully performed. Further industry - NRC staff discussion is recommended regarding the scope and purpose of the final inspection walkdown envisioned by the staff.

In sum, the importance of the full range of inspection activities described in the draft paper is generally not in question; except for the "final 100 percent walkdown" as noted above, the types of inspections noted are consistent with past practice and are generally expected to be performed during future nuclear plant construction. Δ issue is the need to sustain the important distinction between ITAAC and normal QAP activities because of the special legal significance of ITAAC under Part 52. The challenge is no different from that dealt with during design certification interactions, and we are confident that the industry and NRC staff can again come to common agreement and appropriate language to describe the ITAAC implementation process.

### "Bridge Concept"

#### Background and Discussion

The NRC staff use the term "bridge concept" to describe the process used to shift from the high-level certified design information to the detailed design and construction drawings used to design and build the plant. Under Part 52, the licensee's design authority will complete the detailed plant design consistent with both tiers of the

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approved standard design referenced in the COL. Thus, it should be noted that the approved Tier 2 design is a significant part of the "bridge" between the Tier 1 (certified) design and the detailed engineering.

Taken together, Tier 1 and Tier 2 of design certifications embody the resolution of all safety issues associated with standard plant designs. Design review of safety issues associated with the plant-specific design (site-specific engineering and "DAC" implementation) will be completed during the COL application and construction process and will be documented in the licensee's final safety analysis report (and updates thereto). As detailed design work is completed, any deviations from the approved standard or plant-specific design information will be in accordance with the Part 52 change control process, including NRC staff approval or notification of changes, as appropriate, and will be reflected in the licensee's final safety analysis report (or update thereto). These deviations from the referenced design certification may include updated reference to revised codes, standards or regulatory guides (if any), as well as changes necessitated during the detailed engineering or construction processes.

The NRC staff has stated their intent to audit the design authority's engineering process and detailed engineering to establish confidence that the detailed design is consistent with the design certification and to become familiar with detailed design information in support of construction inspection activities. In this regard, detailed design information, e.g., construction drawings, is expected to be essentially complete and available to the NRC staff to support assessment of "bridge concept" implementation before the first concrete is poured. In addition, this information will be organized and readily retrievable for audit by NRC staff inspectors for purposes of verifying consistency with the approved standard and plant-specific design of the COL, including any changes thereto. It is not expected that the NRC staff would perform a 100 percent audit of this information. However, consistent with past practice, the staff may choose to employ vertical slice audits or other audit techniques to establish confidence in the design authority's process for completing the design. Having established the effectiveness of the design authority's engineering process, it is expected that the NRC staff would thereafter choose to perform spot checks of detailed engineering implementation.

#### "Bridge Concept" - Specific Comments

The industry recognizes the need for the NRC staff to become familiar with detailed A1WR design information and assure consistency with the design certification. However, in the main control building fire rating example, the draft Commission paper indicates that "part of the staff's assurance that this IFAAC is met will involve

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verification that engineering details will properly implement the high level design commitments ... " (i.e., the "bridge concept"). Again, because of the special legal significance of ITAAC, we must emphasize the need for ITAAC to be distinct from other programmatic activities, such as "bridge concept" and QAP implementation. Like the QAP, we would characterize the NRC staff's notion of "bridge concept" as contributing to and supporting ITAAC determinations. To include the "bridge concept" as part of ITAAC (as in the "compound" ITAAC example) goes beyond the purpose described by the staff and understood by the industry, i.e., establishing confidence that engineering details are consistent with the design certification. Moreover, linking "bridge concept" implementation to ITAAC verification could potentially implicate detailed design information in Tier 1, a result that is clearly not desired or intended by either the industry or the NRC staff. NRC staff audits of design engineering implementation, i.e., the "bridge concept," should be a process separate and distinct from parallel construction inspection activities, including ITAAC.

Also at odds with the stated purpose of the "bridge concept" is the discussion on page eight of the draft Commission paper. The draft paper states, "(D)uring the later phases (of bridge concept implementation), 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."

This description of the later phases of the "bridge concept" seems to converge with the traditional purpose of QAP implementation as recognized on page nine of the draft paper. To avoid undue confusion of the two related activities, we recommend the NRC staff limit the scope of the "bridge concept" to verification of engineering details and processes as has been described by the staff and understood by the industry. The "bridge concept" should not extend to the inspection of plant systems and components as this is within the traditional mission of the QAP.

It is apparent that more discussion is needed to establish common understandings of what the "bridge concept" entails. It may be advantageous for the NRC staff to develop, with input from the industry, an inspection module to guide the audit of design engineering processes.

## Sign-As-You-Go (SAYGO) Process

### Background and Discussion

The industry supports a SAYGO process of Federal Register notices of successful ITAAC completion, consistent with the provisions of Part 52. "SAYGO points" would indicate successful completion of logically grouped sets of ITAAC. It is expected that logical "SAYGO points" will be identified based on industry and NRC staff interactions on overall construction and inspection schedules. When developing plant-specific schedules, emphasis will be placed on identifying meaningful SAYGO opportunities throughout the construction process, consistent with the intent of Part 52. The industry feels strongly that the SAYGO process should not impact the progress of work in the field, i.e., "SAYGO points" must not become hold points in the construction process.

In addition to SAYGO notifications of ITAAC completion, both the industry and the NRC staff have recognized the merit in a parallel process for notifying the public regarding completion of construction activities other than ITAAC. The industry outlined a comprehensive process for quality-related activity completion notifications (both ITAAC and non-ITAAC) in its February 18, 1992, draft paper titled, "NRC Program for Periodic Validation of Compliance for a COL" (attached). The NRC staff's draft paper outlines a similar concept.

### SAYGO - Specific Comments

The draft Commission paper, e.g., Figure 1, reflects a pre-judgment on the part of the NRC staff that the vast majority of ITAAC determinations, and therefore SAYGO notifications, must occur near the end of the construction process. Such "backloading" of staff approvals of ITAAC would be contrary to the intent of Section 52.99 which calls for Federal Register notices of successful ITAAC completion at appropriate intervals during construction. Moreover, the delaying and concentration of staff approvals at the end of the construction process would be inconsistent with the goal of reduced licensing uncertainty under Part 52 and the need to assure predictability in meeting established construction schedules.

We believe SAYGO notices can be structured to indicate satisfactory completion of work spanning several systems buildings or completion of work within a specific system building. In this way, we expect that SAYGO opportunities can be defined throughout the construction process to provide meaningful public information and tangible evidence of construction progress. The paper sent to the Commission should

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reflect that there are various options to be considered in defining the SAYGO process, including the approach envisioned by § 52.99 and the industry. We believe the discussion in the draft paper may be interpreted by the Commission, industry and general public as prematurely foreclosing preferred options for SAYGO process implementation.

The staff's draft paper also introduces the concept of "interim acceptability findings" which, like SAYGO notifications, would be noticed in the Federal Register. The staff indicates that these interim findings would be used to support specific ITAAC conclusions. As previously noted, the staff's concept is similar to that which has been envisioned and proposed by the industry. As discussed in the meeting on September 14, we share with the NRC staff the goal of a process for providing early, meaningful public notices of staff-approved construction activities, both ITAAC and non-ITAAC. However, as was also apparent from the discussion on September 14, common understandings are needed regarding (1) the framework of an overall periodic notification process and (2) the relationship of the SAYGO/ITAAC portion of the process with that for other (non-ITAAC) quality related activities.

At the September 14th meeting, the NRC staff recognized that the term "interim acceptability findings" used in the draft Commission paper was not appropriate. We agree. The term "interim" does not convey the requisite degree of finality that should attend such staff approvals. The industry and NRC staff agreed during the meeting that staff approvals of ITAAC and other (non-ITAAC) quality-related activities should reflect a high degree of finality, consistent with the provisions of Part 52. Additionally, the term "findings" may cause unnecessary confusion with the Commission's finding prior to operation required by § 52.103. We propose consideration of terminology based on the industry's February 18, 1992, draft paper on this subject. In that paper, the industry described SAYGO as a subset of a larger process for periodic validation of compliance (PVC) notifications. Thus, there would be PVC/SAYGO notifications of successfully completed ITAAC activities and other PVC notifications regarding NRC staff approval of other (non-ITAAC) quality-related activities.

The questions of when ITAAC can be met and the approach to take on PVC/SAYGO are not discrete issues, but rather must be addressed in conjunction with other ITAAC implementation issues raised by the draft Commission paper and discussed herein. Because the industry and NRC staff have not yet had opportunity to work through the fundamental issues associated with ITAAC implementation, we urge the staff to delay sending a detailed paper on this topic to the Commission at this time, especially one that may preclude consideration of important options.

Enclosure to NEI letter (Simard to Crutchfield), dated October 7, 1994

### **General Perception**

As noted in the cover letter, the perception created by the draft paper is of a construction inspection process vastly different from past practice and significantly more complex. We believe the draft paper would send an inaccurate and undesirable message to the Commission, industry and general public. We appreciate that the NRC staff has verbally stated their view, shared by the industry, that the process will be basically the same as in the past, but enhanced to be more systematic, especially with respect to efficient record keeping and retrieval. We believe the paper sent to the Commission should emphasize up front that the future construction inspection process will be very similar to that of the past, but with enhancements stemming from past lessons learned, advances in information management techniques, the Part 52 process, etc.

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## DRAFT WHITE PAPER

### NRC PROGRAM FOR PERIODIC VALIDATION OF COMPLIANCE PROGRAM FOR A COMBINED OPERATING LICENSE (COL)

#### **PURPOSE**

The purpose of this paper is to outline the industry understanding and to obtain NRC confirmation of a process for a systematic, disciplined, and phased review of a COL's construction activities under 10 CFR Part 50 and Part 52.

#### **BACKGROUND**

The NRC and the industry have long been concerned about the inability of a number of utilities to satisfactorily complete nuclear plant construction on time, within budget, and in compliance with NRC requirements and the utilities' commitments. A number of these problems appear to have been the result of (1) an inability to demonstrate the requisite quality and/or compliance to NRC requirements and utility commitments, or (2) late identification of concerns of significant quality-related breakdowns.

These problems were addressed during construction and licensing of Georgia Power's Vogtle facility through a program called the Vogtle Readiness Review Program. This program provided for systematic NRC Staff inspection and acceptance of each type of construction activity. The Vogtle Readiness Review Program demonstrated that NRC Staff inspection and acceptance of quality program related activities (QRA) under Part 50 can be successfully conducted in a phased manner.

The lessons learned for the Vogtle Readiness Review can be combined with the provisions of Part 52 to provide for a systematic, disciplined, and phased review of a COL's construction activities under Parts 50 and 52. Specifically, under Part 50, an approach similar to the Vogtle Readiness Review Program could be formalized, and notices of acceptance of QRA could be periodically issued by the NRC Staff under Part 50. Similarly, under 10 CFR 52.99, the NRC Staff will be required to conduct inspections to determine whether the inspections, tests, analyses and acceptance criteria (ITAAC) required by Part 52 have been satisfactorily completed and to publish notice of such completion in the Federal Register at appropriate intervals during construction. Under Part 52, this process is known as "Sign-As-You-Go" (SAYGO). These distinct NRC Staff inspection activities under Part 50 and Part 52 can be combined to form the basis for a single program, called the Program for Periodic Validation of Compliance (PVC). This program would provide for a

systematic, disciplined, and phased review of a COL's quality program related and ITAAC activities.

To be effective, a PVC Program should accommodate considerations of the work progress logic, the construction schedule, the normal QRA, and the normal NRC Staff inspection program. Early (15%-25% complete) evaluations of each type of construction activity (e.g., concrete placement, cable pulling) should identify the majority of licensing, technical, and/or QRA concerns associated with the activity. An effective PVC Program would serve as the basis for the NRC Staff's review and acceptance of the programmatic adequacy of quality program related activities and of completed construction work, including satisfaction of the ITAAC.

## COMPARISON OF PART 50 AND PART 52 INSPECTION PROCESSES

To understand how the PVC Program would operate, the Part 50 and Part 52 processes are summarized below.

### A. Part 50 Process

10 CFR Part 50 establishes a two-step process for licensing nuclear power plants. Under the first step, an applicant for a construction permit (CP) for a plant submits a Preliminary Safety Analysis Report (PSAR) which includes a preliminary description of the design and safety assessment of the plant. Additionally, the PSAR must include a description of the quality assurance program (QAP) that will be applied to the design, construction, inspection and testing of the plant under 10 CFR Part 50, Appendix B, "to provide adequate confidence that a structure, system, or component will perform satisfactorily in service." Following NRC Staff review and acceptance of the PSAR and public hearings, a CP is issued authorizing the applicant to construct the plant in accordance with the Commission's regulations and the principal architectural and engineering criteria in the PSAR.

During construction, the CP holder must develop the final design for the plant, construct the plant in accordance with the design, perform inspections and tests of the plant pursuant to the QAP, and submit a Final Safety Analysis Report (FSAR) to the NRC. The NRC Staff performs its own periodic inspections and audits to determine the adequacy of the design, construction, applicant inspection and testing activities for the plant; reviews the FSAR; performs reviews and inspections to determine the adequacy of programs and personnel for plant operation; and provides an opportunity for a public hearing. Following successful completion of

each of the foregoing, an operating license (OL) is issued for the plant.

## B. Part 52 Process

Part 52 provides a more structured process for obtaining licenses and enhancing the efficiency of the regulatory process. Part 52 complements Part 50 and is dependent upon, and utilizes many of the concepts and requirements embodied in, Part 50.

Under Part 52, an applicant may apply for a combined construction permit and operating license (COL) for a nuclear plant. A COL applicant must submit a FSAR under Part 50, which includes a description of the OAP under Appendix B to Part 50. Additionally, the application must contain proposed ITAAC that "are necessary and sufficient to provide reasonable assurance that, if the tests, inspections and analyses are performed and the acceptance criteria met, the facility has been constructed and will operate in conformity with the license, the provisions of the Atomic Energy Act, and the Commission's regulations." Following review and acceptance of the FSAR and public hearings, the NRC issues a COL, which includes ITAAC.

The FSAR submitted by a COL applicant may reference a standard design. A design certification rule will identify two tiers: Tier One is the certified design which contains top level design criteria and performance standards, as well as corresponding ITAAC. Tier Two is the remaining information in the Standard Safety Analysis Report (SSAR) for the standard design. Tier Two also contains the validation attributes which will be used to demonstrate compliance with Tier One acceptance criteria that do not lend themselves to direct verification. The information in Tier One cannot be changed without an exemption from or amendment of the design certification. The information in Tier Two may be changed by a COL holder under a process analogous to the process in 10 CFR 50.59 for changes in the FSAR by a licensee under Part 50. An application for a certified design also must contain proposed ITAAC that "are necessary and sufficient to provide reasonable assurance that, if the tests, inspections and analyses are performed and the acceptance criteria met, a plant which references the design is built and will operate in accordance with the design certification" (i.e., Tier One). A COL applicant that references a certified design must apply the ITAAC for the certified design to those portions of the plant covered by the design certification.

A COL licensee must construct the plant in accordance with the FSAR and the QAP and successfully complete the ITAAC. Pursuant to 10 CFR 52.99, the NRC Staff is required to conduct inspections to ensure performance and satisfaction of the ITAAC and periodically publish Federal Register notices of successful completion of various portions of the ITAAC. Prior to fuel loading, the Commission must also find under 10 CFR 52.103 that the acceptance criteria in the COL have been met. Public hearings are not conducted by a Licensing Board prior to fuel loading unless a petitioner shows that the acceptance criteria in the COL have not been met.

## **PROPOSAL**

10 CFR Part 50 provides for NRC inspections to assure the acceptability of work performed. To provide additional predictability and certainty, to provide for a more systematic assessment of quality, and to assure thorough documentation of both licensee and NRC Staff activities, the NRC Staff and the COL licensee would conduct a PVC Program during the design, construction, and testing of a facility licensed under Part 52. This Program would build upon the lessons learned in the Vogtle Readiness Review Program and would provide for a systematic and timely NRC Staff review and acceptance of quality program related activities (design, procurement, construction, and testing) under Part 50 and ITAAC activities under Part 52.

The key programmatic steps for a PVC program under Part 50 (Quality Program Related Activities) and Part 52 (ITAAC) are provided below.

### **A. Part 50-Quality Program Related Activities-(Readiness Review Program)**

Activities associated with the design, procurement, construction, and testing of a nuclear plant occur in various phases. To provide stability and predictability to the regulatory process, a COL applicant would draft a Readiness Review Program and would arrange with the NRC Staff to conduct periodic inspections and issue formal notices of acceptance of quality program related activities under Part 50. These phases would parallel those of the plant in order to ensure the timely identification and correction of any NRC Staff concerns or conditions adverse to quality.

The approach for each phase would consist of the following key steps:

- (1) The licensee would provide the NRC Staff with schedules which, for each type of activities, identify the timing of the licensee's activity in question. These schedules would be provided sufficiently in advance of the activity to enable the NRC Staff to properly plan and implement its inspections in parallel with the licensee's activities.
- (2) The licensee would conduct and document inspections and periodic evaluations of QRA and inform the NRC of the licensee's determination of compliance and readiness for NRC signoff.
- (3) NRC Staff would plan and perform its inspections during and/or shortly after the performance of the activity.
- (4) NRC Staff would promptly inform the licensee of any concerns or deficiencies identified during its inspections. The licensee would promptly evaluate and take any corrective actions that may be necessary for the concerns or deficiencies. The licensee would also inform the NRC Staff of the results of the evaluations and any corrective actions. The NRC Staff would perform any necessary follow-up inspections or reviews to determine the acceptability of the evaluations and any corrective actions.
- (5) Upon an NRC Staff determination that the activity in question has been satisfactorily completed (including any necessary corrective actions), NRC Staff would issue a formal notice of acceptance. This notice of acceptance would be filed on the licensee's docket and would be placed in the applicable NRC public document rooms (PDRs).
- (6) Following issuance of the NRC Staff formal notice of acceptance, the licensee would not make any change which would decrease the level of safety or quality of the activity reviewed without prior approval of the NRC Staff.
- (7) Following issuance of the NRC Staff formal notice of acceptance, the NRC Staff would reconsider the acceptability of the completed activity only if new information provides reasonable cause to believe that deficiencies exist in the activity that would result in a structure, system, or component being unable to perform satisfactorily in service. However, the NRC would continue to perform inspections of ongoing activities to assure compliance with the accepted

program and acceptability of the ongoing activities. These ongoing NRC inspection activities would be documented in a formal notice of acceptance that would be filed on the licensee's docket and placed in the applicable PDRs.

The formal notices of acceptance discussed above would be issued under Part 50, and would not supplant issuance of the periodic notices of successful completion of the ITAAC under 10 CFR 52.99. Conversely, the failure to issue a formal notice of acceptance under Part 50 would not necessarily preclude the NRC from finding that the ITAAC had been satisfactorily completed under 10 CFR 52.99 or constitute a sufficient basis for a potential intervenor to request a hearing prior to fuel load under 10 CFR 52.103.

In performing its inspections of quality program related activities under the Readiness Review Program, the NRC Staff would continue to have recourse to its full range of enforcement activities under Part 50. Thus, for any identified deficiencies, the NRC Staff could take enforcement action, including (as appropriate) issuing notices of violation, proposed civil penalties, or show cause orders stopping the activity in question or prohibiting operation.

**B. Part 52-ITAAC-(Sign-As-You-Go)**

Under 10 CFR 52.99, the NRC Staff would conduct periodic inspections of ITAAC activities. Upon an NRC Staff determination that an ITAAC has been successfully completed, the NRC Staff would publish a Federal Register notice of successful completion. To enable the NRC Staff to fulfill its obligations under this process and to provide for the full benefit of the process (namely, to reduce the uncertainty associated with the NRC Staff's inspection process), it is essential that the COL licensee and the NRC Staff plan, schedule, and coordinate their respective ITAAC-related activities.

In this regard, the COL licensee and NRC should perform the following steps:

- (1) The licensee would provide the NRC Staff with schedules which, for each type of licensee ITAAC activity, identifies the schedule of licensee activities for each ITAAC. These schedules would be provided sufficiently in advance of the activity to enable NRC Staff to properly plan and implement its inspections in parallel with the licensee's activities.

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- (2) The licensee would conduct and document inspections and periodic evaluations of ITAAC and inform the NRC of the licensee's determination of compliance and readiness for NRC signoff.
- (3) The NRC Staff would plan and perform its inspections during and/or shortly after the performance of the ITAAC activity.
- (4) The NRC Staff would promptly inform the licensee of any concerns or deficiencies identified during its inspections. The licensee would promptly evaluate and take any corrective actions that may be necessary for the concerns or deficiencies. The licensee would also inform the NRC Staff of the results of its evaluations and any corrective actions. The NRC Staff would perform any necessary follow-up inspections or reviews to determine the acceptability of the evaluations and any corrective actions.
- (5) Upon an NRC Staff determination that this ITAAC activity in question has been successfully completed, NRC Staff would issue a Federal Register notice of successful completion.
- (6) Following issuance of the NRC Staff Federal Register notice, the licensee would not make any change in those parts of the as-built plant subject to the ITAAC in question, unless the NRC Staff is notified of the change and provided with an opportunity to inspect the change for conformance with the ITAAC. If the proposed change invalidates or establishes new criteria that are outside of the acceptance criteria established in the COL, then either an exemption or amendment to the certification and/or COL would have to be approved by the NRC. Such a change could be the subject of a public hearing at the time of the change. Additionally, any change from the provisions in the FSAR would be reviewed under a process similar to 10 CFR 10.59.
- (7) Following issuance of the NRC Staff Federal Register notice, the NRC Staff would not reconsider compliance of the activity, unless new information provides reasonable cause to believe that the ITAAC acceptance criteria have not been satisfied.

C. Relationship Between the Part 50 and 52 Processes

Conceptually, the activities conducted under Part 50 and described in section A above are separate from the ITAAC related activities described in section B. In reality, the ITAAC related activities would be a subset of the entire QRA, and the NRC Staff inspections under 10 CFR 52.99 would be a subset of its inspection activities under Part 50. Thus, the steps outlined in section B above would be performed in conjunction with the steps outlined in section A as a part of the total NRC Staff program for Periodic Validation of Compliance, as depicted in figure 1.

The QRA would be divided into specific modules, as in the case of the Vogtle Readiness Review which consisted of more than 20 modules including procurement, testing and concrete, etc. The readiness review program, (section A program) would be conducted for each module and might be a predicate or conjunct for a specific Sign-As-You-Go element (ITAAC). By definition, activities evaluated in a particular module would only be conducted during a finite period of construction. Additional modules would cover construction activities through to a later milestone in the construction process. Thus the plant specific readiness review program would be implemented in a phased manner complementing construction, with the outputs from some of these modules or sub-sections of these modules forming the input assumptions to the Sign-As-You-Go (ITAAC) program. The formal documentation and NRC Staff acceptance at each point in time will be important to addressing any NRC Staff concerns in a continuous manner and any allegations or petitions that may arise at a later date. However, not all readiness review modules will have an associated ITAAC or Sign-As-You-Go modules.

In the ideal world, there would be no discrepancies or deficiencies associated with any program. In the real world, these occur and need to be dispositioned. A deficiency associated with a readiness review module, when resolved, would not be material to the satisfaction of an ITAAC Sign-As-You-Go program. A readiness review deficiency would be material to the satisfaction of an ITAAC only to the extent that the deficiency precludes a determination that the acceptance criteria in the ITAAC have been satisfied. In short, there may be some deficiencies which do not relate to satisfaction of an ITAAC. Ideally, the assessment of whether a readiness review deficiency is material to a Sign-As-You-Go module (ITAAC) should be undertaken at the time of, or prior to, the performance of the ITAAC specified in the Sign-As-You-Go program.

**CONCLUSION**

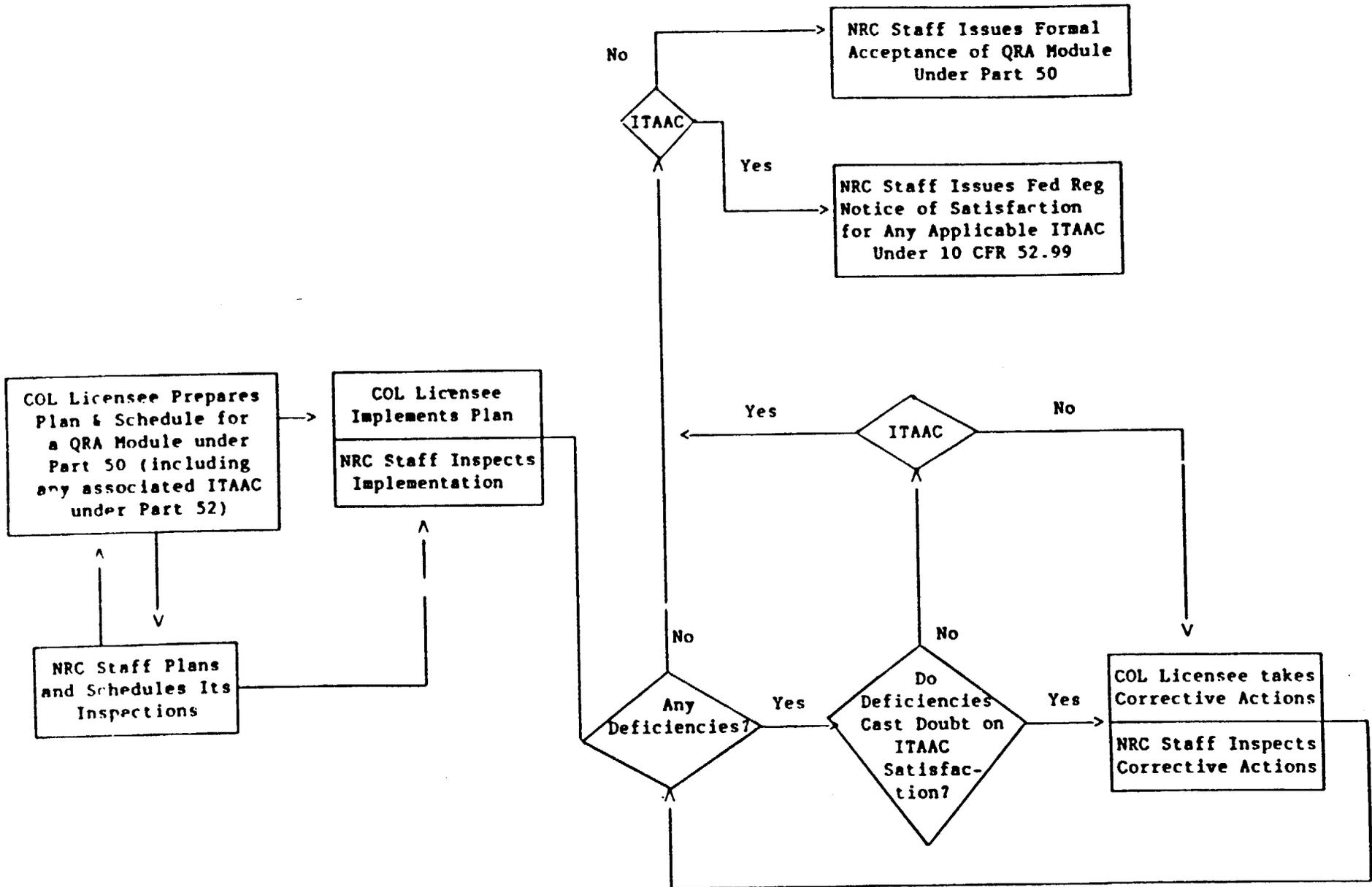
An NRC Staff Periodic Validation of Compliance Program, similar in structure to the Vogtle Readiness Review Program, would provide the assurance that quality program related activities have been conducted in a safe and efficient manner under Part 50 and that the ITAAC have been successfully completed under Part 52.

FIGURE 1

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NRC Staff Program for Periodic Validation of Compliance

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NUCLEAR ENERGY INSTITUTE

October 7, 1994

Ron Simard  
DIRECTOR,  
ADVANCED REACTORS PROGRAMS

Mr. Dennis Crutchfield  
Associate Director for Advanced Reactors  
and License Renewal  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555

Dear Mr. Crutchfield:

This letter provides industry comments on the draft Commission paper, "Construction Inspection and ITAAC Verification Under 10 CFR Part 52," that the staff made available earlier this year as a vehicle for public discussion. In preparing these comments, we benefited from discussing the key principles in the paper, and underlying NRC staff intent, during a public meeting on September 14, 1994.

The NRC staff's draft paper and these comments have been thoroughly reviewed and discussed by NEI's ALWR Regulation Working Group (ARWG), whose membership includes industry personnel familiar both with Part 52 and with issues relating to construction inspection. Based on these discussions, we have identified several important conflicts between the construction inspection process outlined by the staff's draft paper and understandings reached through prior extensive NRC/industry interactions on design certification issues.

**Discussion**

Over the past few years, the NRC staff and industry have put considerable resources into understanding the ITAAC concept within Part 52 and defining the set of ITAAC for particular standard designs. Much emphasis has been placed on assuring that ITAAC contribute to predictability and stability and minimize uncertainty in the Part 52 licensing process. Until recently, less attention has been given to the process for actually *implementing* ITAAC; the draft Commission paper represents an important early step in this regard. As the industry and NRC staff begin to define the process for construction inspection under Part 52, particularly as it relates to ITAAC implementation, priority focus must be maintained on assuring certainty in the Part 52 process and predictability in meeting established plant construction schedules. We believe the industry and NRC have a common interest in the development of an efficient, effective construction inspection process, free of undue delays that were all too common in the past.

It is in this respect - - the vital need to assure predictability, stability and certainty in all phases of the Part 52 process - - that the industry has significant concerns with the draft paper. In general, the draft paper is at odds with understandings achieved through great efforts on the part of both the industry and NRC staff on concepts such as Tier 1, ITAAC, and the role of the quality assurance program, that are fundamental to the workability of the Part 52 process. Our major concerns are outlined below and are discussed in greater detail in the enclosure to this letter.

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