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

November 20, 1995

LICENSEES: TEXAS UTILITIES ELECTRIC COMPANY (COMANCHE PEAK STEAM ELECTRIC STATION, UNITS 1 AND 2) AND ARIZONA PUBLIC SERVICE COMPANY (PALO VERDE NUCLEAR GENERATING STATION UNITS 1, 2, AND 3) DOCKET NOS. 50-445 AND 50-446 AND STN 50-528, STN 50-529 AND STN 50-530

SUBJECT: SUMMARY OF MEETING WITH TEXAS UTILITIES ELECTRIC COMPANY AND ARIZONA PUBLIC SERVICE COMPANY TO DISCUSS PROPOSED RISK-BASED INSERVICE TESTING SUBMITTALS

On November 1, 1995, staff from the U.S. Nuclear Regulatory Commission (NRC) had a public meeting with representatives from Texas Utilities Electric Company (the Comanche Peak Steam Electric Station, Units 1 and 2 licensee), Arizona Public Service Company (the Palo Verde Nuclear Generating Station Units 1, 2, and 3 licensee) and the nuclear industry in Bethesda, Maryland, for the purpose of discussing the licensees' proposed submittals related to risk-based inservice testing (IST). A list of attendees is included as Attachment 1. The vu-graphs used by the industry representatives during the meeting are included as Attachment 2.

Each licensee summarized their approach for risk-ranking components into two categories (i.e., more and less safety significant components). In general, both licensees propose to test the more safety significant components in accordance with the current ASME Code and to extend the test interval for the less safety significant components (e.g., from quarterly to as much as once every 6 years). Neither licensee proposed to develop more focused or effective test strategies for the more safety significant components. Nevertheless, because some of the components categorized as more safety significant are not required to be tested by the current ASME Code, the licensees contend that overall safety will be improved if these components get tested commensurate with their safety significance (i.e., where testing commensurate with their safety significance may or may not include testing in accordance with the current ASME Code).

The staff provided the licensees with a list of "Important Factors in PRA Analysis" (Attachment 3) and comments on their draft submittals. Many of the comments were similar to comments provided to Nuclear Energy Institute (NEI) on October 24, 1995, in a summary of the staff's September 29, 1995, meeting with NEI to discuss their Draft Risk-Based IST Guidelines. The staff's comments on the draft NEI Risk-Based IST Guidelines were handed out at the meeting (Attachments 4 and 5). Examples of topics discussed at the meeting include:

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9511270410 951120
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Central Files

- The adequacy of guidance provided to the expert panel (i.e., in terms of compensating for the limitations associated with the PRA models and in terms of addressing faults/condition not modeled).

- The adequacy of the technical basis for extending the test interval for less safety significant components from quarterly to as much as once every 6-years (i.e., based on two successful quarterly tests). Consideration of performance-based step increases in the test intervals with periodic performance-based feedback or adjustments to the test intervals.

- The need for clearer discussion of how deterministic factors were integrated with the PRA insights in determining the appropriate test interval for components.

- How to address components that were previously granted relief from Code testing requirements that now are identified as more safety significant components. Similarly, how to address components that are the subject of other regulatory commitments (e.g., technical specifications) that are now identified as less safety significant.

Both licensees plan on submitting exemption requests to the NRC as the proposed regulatory vehicle for permitting the implementation of the pilot risk-based IST programs, by November 20, 1995, and proposed that the staff complete its review of these submittals by May 1996. The staff informed the licensees and NEI that rulemaking may be required before implementing risk-based IST programs at other plants (i.e., including the other 7 pilot plants identified by Electric Power Research Institute: Point Beach, Wolf Creek, South Texas, Seabrook, St. Lucie, Three Mile Island, and Peach Bottom)).

Original Signed by:
R. H. Wessman
For
David C. Fischer
Component and Testing Section
Mechanical Engineering Branch
Division of Engineering
Office of Nuclear Reactor Regulation

Attachments:
1. Attendees
2. Vu-graphs
3. Important Factors in PRA Analysis
4. General Comments on Draft NEI IST Guidelines
5. Detailed Comments on Draft NEI IST Guidelines

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Docket Files 50-445, 50-446, 50-528, 50-529, and 50-530
PDR (LL-6)
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AThadani	(O-12G18)
BSheron	
GLainas	
GHolahan	(O-8E2)
JStrosnider	
JTsao	
TMcLellan	
SBlack	(O-10A19)
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MMayfield	(O-10E10)
MCunningham	(T-10E50)
ARamey-Smith	(T-10-E50)
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WHardin	(T-10F13)
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RBaer	(T-8F5)
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EBrown	(T-4A9)
JMurphy	(T-10F12)
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KHall	(INEL)
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CThomas	(O-10D24)
KJohnston	(REGION IV)
AGody, Jr.	(REGION IV)
TPGwynn	(REGION IV)
MSarram	(NEI)

- The adequacy of guidance provided to the expert panel (i.e., in terms of compensating for the limitations associated with the PRA models and in terms of addressing faults/condition not modeled).

- The adequacy of the technical basis for extending the test interval for less safety significant components from quarterly to as much as once every 6-years (i.e., based on two successful quarterly tests). Consideration of performance-based step increases in the test intervals with periodic performance-based feedback or adjustments to the test intervals.

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Attachment 1

LIST OF ATTENDEES
NRC/PILOT PLANT MEETING
RISK-BASED INSERVICE TESTING
November 1, 1995, 1:00 p.m. to 4:00 p.m.

NAME	NRC	NAME	INDUSTRY
Dick Wessman	NRR/DE/EMEB	Tom Cannon	APS/Palo Verde
Ed Butcher	NRR/DSSA/SPSB	Roy Linthicum	APS/Palo Verde
Dave Fischer	NRR/DE/EMEB	A.K. Krainik	APS/Palo Verde
Mike Cheok	NRR/DSSA/SPSB	Brian Lindenlaub	APS/Palo Verde
Mark Rubin	NRR/DSSA/SPSB	Saragrace Knauf	APS/Palo Verde
Anthony Hsia	NRR/DSSA/SPSB	Carl B. Corbin	TU Electric
John Schiffgens	NRR/DSSA/SPSB	Ben Mays	TU Electric
Gene Imbro	NRR/CBLA	Hossein Hamzehee	TU Electric
Tim Polich	NRR/PDIV-1	Roger Walker	TU Electric
Charles Thomas	NRR/PDIV-2	Wes Rowley	TWC/ASME
Joe Colaccino	NRR/DE/EMEB	Frank Rahn	EPRI
Brad Hardin	RES/PRAB	Steve Floyd	NEI
Roy Woods	RES/PRAB	Mehdi Sarram	NEI
		Mike Schoppman	FP&L
		Lynn Connor	STS, Inc.
		Theresa Sutter	Bechtel

Agenda

1. Introduction and Overview - Tom Cannon
2. TU Project Summary - Hosse[illegible] Hamzehee (TU)
3. APS Project Summary - Roy Linthicum (APS)
4. Schedule and Expectations - Tom Cannon
5. Open Discussion - Questions / Answers

Attachment 2

Overview

- **Current IST Program**
  - All IST components tested to the same code criteria, regardless of their safety significance
  - Some MSSCs not tested under the IST Program
- **Risk-Based IST Program**
  - IST components tested at a frequency commensurate with their safety significance
  - Non-IST MSSCs identified and tested commensurate with their safety significance

Overview (Continued)

- **Responsible Use of Risk**
  - No components removed from IST Program
  - MSSC test methods and frequencies continued as specified by the Code
  - Non-IST components reviewed to ensure testing commensurate with safety significance

Comanche Peak Steam Electric Station

Risk-Based IST Program

Presentation of Submittal Overview & Preliminary Results

Hossein G. Hamzehee
(817) 897-8674

November 1, 1995

CPSES

Risk-Based IST Program

Presentation Outline

- Scope & Objectives
- Methodology Overview
- Completeness Issues
- Expert Panel Process
- Preliminary Results

CPSES

Scope & Objectives

- **Application of risk-based technology to IST components in ASME code classes 1, 2 & 3.**
  - **Pumps & valves**
  - **Test frequency extension**
  - **No removal of components from existing IST Program**
- **Enhance/maintain plant safety**
  - **Commensurate with their Safety Significance**
  - **Greater attention/resources to high risk components**
  - **Reduction of unnecessary burdens**

CPSES

Methodology Overview

Major issues to be addressed for Risk-Based IST Project:

- **Adequacy of IPE Study**
- **Risk ranking based on "Static IPE Models"**
- **Risk ranking based on "Dynamic risk Profile"**
- **IPE updates (feedback loop)**

CPSES

Methodology Overview (Cont'd)

- **Apply blended approach**
  - **Use of IPE results & models**
  - **Use of expert panel for deterministic approach**

- **Risk-based approach**
  - **NUMARC 93-01 & 93-05 were considered**
  - **Use of F-V importance measure**
  - **Use of RAW importance measure**

- **Risk category definitions**
  - **High:** F-V $\geq$ 0.001
  - **Potentially High:** F-V < 0.001 & RAW $\geq$ 2
  - **Low:** F-V < 0.001 & RAW < 2

Methodology Overview (Cont'd)

- **Components in potentially high - risk category were reviewed by expert panel.**
  - **Compensatory measures always identified or placed in high-risk category.**
  - **Final risk categories verified/adjusted by expert panel.**

CPSES

Completeness Issues:

- **IST components identified in back-end IPE.**
  - **Containment spray system**
  - **Containment isolation**
  - **Interfacing systems, LOCA**
  - **Components important to large, early releases**

- **Components important to IPEEE.**
  - **Fires**
  - **Tornadoes**
  - **Seismic**

- **Components important to outage mode.**
  - **Unique system configurations during outage**

CPSES

Completeness Issues (Cont'd):

- **Various sensitivity runs were made to evaluate impact/importance of different contributors on total plant risk.**
  - **Initiating events**
  - **CCF**
  - **Human actions**
  - **Simultaneous failure of 2 or more components**
    - * **2 - component combinations**
    - * **Selected number of 3 - component combinations (later)**
  - **Truncation limits**
  - **Increased failure rates based on test interval extensions**
  - **Risk rankings based on dynamic risk profile (later)**

CPSES

Expert Panel Process

- Extensive deterministic evaluation was performed

  - Use of expert panel similar to Maintenance Rule
    * IST engineers
    * Operations (SROs)
    * Maintenance Engineer
    * Systems engineer
    * PSA engineer
    * Design engineer

- Extensive preparatory work completed prior to expert panel meeting.

  - Simplified system flow diagrams

  - Risk importance measures for each component on diagrams

  - Design-basis functions

  - Comparison of IPE functions versus IST functions

  - IST test & frequency requirements

- A number of expert panel meetings held during evaluation process.

CPSES

Expert Panel Process Cont'd)

- Every single component within IST Program was reviewed by expert panel.

  - Approximately 652 components

  - High-risk components in IPE but not in IST were also reviewed by expert panel

CPSES

Preliminary Results

- IPE components were mapped to those in IST.

  - Total components in IPE (Unit 1): 1123
  - Total components in IST (Unit 1): 652
  - Total components in IST & IPE (Unit 1): 387
  - Total components in IST only (Unit 1): 265
    * 236 of 265 were ranked less safety significant
    * 29 of 265 were ranked more safety significant

- 652 components in IST.

  - 619 valves: 151 (≈ 25%) more safety significant
  - 33 pumps: 23 (≈ 70%) more safety significant

APS Approach

- Methodology
- Expert Panel Process
- Living Process

Methodology

- Risk Ranking
- Sensitivity Studies
- Expert Panel
- Performance

Risk Ranking

- CDF F-V
- CDF RAW
- LERF RAW
- CCF RAW
- Qualitative Insights
  - External Events
  - Shutdown Risk
  - Initiating Events

Completeness Issues/Sensitivity Studies

- Truncation
- Recovery Actions
- Dynamic Risk

Expert Panel

- Makeup
- Qualifications
- Process

Expert Panel Minimum Requirements

Discipline	Qualifications	
Maintenance	6 years experience (2 Maintenance)	
Operations	6 years experience and valid SRO	
Scheduling	6 years experience (4 Scheduling)	
Safety Analysis	B.S. in Engineering & 6 years experience (Safety Analysis)	
Engineering	B.S. in Engineering & 6 years experience (System/Design Engineering)	
PRA	B.S. in Engineering & 6 years experience (PRA)	
ACTUAL	102 Years	3 SRO's

Expert Panel Makeup

- Operations (SRO)
- Maintenance
- Safety Analysis
- Scheduling
- Engineering
- PRA
- Application Specific Expertise (e.g., IST)

Expert Panel Process

- System Level Screening
  - Low Risk Systems
  - Components Not Modeled in PRA
- Deterministic Evaluation
  - Impact on System Safety Function
  - Performance

Expert Panel Process (Continued)

- Initiating Events
  - Directly Cause Initiators
  - Complexity of Operator Response
  - Expected Operator Actions
- External Events
  - Significant Mitigation Function
  - Likelihood of Event

Expert Panel Quantitative Criteria

Indicator	Criteria	Risk Indication
CDF F-V	>=0.01	High
CDF F-V	>=0.001	Medium
CDF F-V	<0.001	Low
CDF RAW	>=10	High
CDF RAW	>=2	Medium
CDF RAW	<2	Low
LERF RAW	>=10	High
LERF RAW	>=2	Medium
LERF RAW	<2	Low
Common Cause RAW	<5	Low
Common Cause RAW	>=5	Medium
Common Cause RAW	>=10	High

Expert Panel
Deterministic vs. Probabilistic

Deterministic	Probabilistic	Conclusion
Low	Low	Low
High	Low/Medium/High	High
Low	Medium	~~Medium~~ High unless panel documents justification for Low
Low	High	High unless Low validated by Sensitivity Study

Living Program

- PRA Updates
  - Review 18 months
  - Update Failure Probabilities
  - Design Changes
  - Procedure Changes
- Risk Ranking
  - Updated when PRA Updated

Cumulative Effects

- Assess Simultaneous Change in Low Risk Component Test Frequencies
- No Credit for Additional Testing of High Risk Components

APS Conclusions

- Rigorous Approach
  - Spectrum of risk sources
  - Multiple risk measures
  - Diverse importance measures
  - Sensitivity studies
  - PRA and design basis manuals
  - Expert panel

APS Conclusions (Continued)

- Risk Neutral Result
  - Low Calculated Risk Increase
  - Qualitative Factors
    - Focus Resources
    - Additional Testing of High Risk Components

Program Comparison CPSES and PVNGS

- Scope
- PRA Model
- PRA Adequacy
- Risk Indicators
- Sensitivity Studies
- Expert Panel

Scope of Submittal

- **CPSES**
  - Pumps
  - Valve
- **PVNGS**
  - Valves

PRA Model

- CPSES
  - Internal Events
    - Level 1 & 2
    - Flooding
  - Data
    - Generic

- PVNGS
  - Internal Event
    - Level 1, 2 &3
    - Flood Screening
  - Data
    - Generic
    - Limited Plant Specific Data

PRA Adequacy

- CPSES
  - Documented Calculations w/ Independent Review
  - Internal Peer Review
  - External Peer Review
- PVNGS
  - Documented Calculations w/ Independent Review
  - Internal Peer Review
  - External Peer Review

Risk Indicators

- CPSES
  - Quantitative Shutdown Risk
  - Quantitative Fire Analysis
  - Quantitative Tornado Analysis
  - CCF Included in Base Results
- PVNGS
  - Qualitative Shutdown Risk
  - Qualitative Fire Analysis (FIVE)
  - Qualitative Flood Analyses
  - CCF Analyzed Separately

Sensitivity Studies

- CPSES
  - Initiating Event (CCW, SW, Chilled Water)
  - Multiple Component Failure (2 & 3)
- PVNGS
  - Truncation
    - 1E-10
    - 1E-11

Expert Panel

- CPSES
  - 7 Members
    - Includes IST
  - Criteria
    - F-V >0.001
    - RAW >2
- PVNGS
  - 6 Members
    - Includes Safety Analysis & Scheduling
    - IST Advisor, as appropriate
  - Criteria
    - F-V > 1E-3 to 1E-2
    - RAW > 2 - 10

IST Component
Modeling and Risk Ranking Summary

	Comanche Peak	Palo Verde
• Components Modeled by PRA		
– MSSCs	22%	16%
– LSSCs	37%	17%
Total	59%	33%
• Components Not Modeled by PRA		
– MSSCs	5%	15%
– LSSCs	36%	52%
Total	41%	67%
GRAND TOTAL	100% (652 Components)	100% (501 Components)

Schedule and Expectations

- Target Submittal Date: November 20, 1995
- Target Approval Date: May 1996
- Submittal Contents:
  - Cover Letter
  - Enclosure with Proposed Alternative
  - Enclosure with Summary of Process
- NRC review TU and APS submittals together
- Other pilot plants will incorporate lessons learned and submit similar requests

Schedule and Expectations (Continued)

- Communications
  - This meeting to begin dialogue between TU, APS, and the NRC
  - Licensee points of contact for future communications:
    - Carl Corbin, TU Licensing Department
    - Glenn Michael, APS Licensing Department

IMPORTANT FACTORS IN PRA ANALYSIS

- **Scope Of PRA Analysis**
  Internal Events, External Events, Shutdown, Levels 1,2,3

- **Level Of Detail**
  Components, Trains, Systems, Balance Of Plant

- **Numerical Decision Criteria**
  Core Damage Frequency, Importance Measures, Safety Goals, Containment Performance, Dose, etc.

- **PRA Quality**
  Data, Assumptions, Methodology, Consistency, Reasons For Differences

- **Process For Reviewing Quality**
  Industry Peer Review, Staff Review, etc.

Attachment 3

IMPORTANT FACTORS IN PRA ANALYSIS (CONTINUED)

- **Role Of Expert Panel**
  Well Defined Process, Systematic, Scrutable

- **Deterministic Considerations**
  Defense-In-Depth Philosophy, Design Basis, Sound Engineering Analysis, General Design Criteria, etc.

- **Integration Of Risk Insights With Deterministic Considerations**
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NRC'S GENERAL COMMENTS ON THE DRAFT NEI RISK-BASED IST GUIDELINES DATED SEPTEMBER 20, 1995

1. The draft NEI Risk-Based IST Guidelines states that the Electric Power Research Institute (EPRI) PSA Applications Guide should be used to evaluate the aggregate effects of increasing test intervals for the less safety significant components. Specifically, "If the permanent change screening criteria from the EPRI PSA Applications Guide are exceeded, or dominant contributors have significantly changed, licensees should redefine the test intervals (as needed) to address these issues". As stated in the staff's March 27, 1995, letter to NEI on revision H of the draft EPRI PSA Application Guide, "it is premature at this time for us to endorse the methodological details or numerical decision criteria espoused by the guide for determining risk significance or issue acceptability." The staff expects to comment more directly on the proposed criteria and methodologies as pilot applications proceed.

2. The expert panel "Process Considerations" (p. 9-10) should be significantly expanded. There should also be guidance for the expert panel on how to dispose of components not modeled or not in the current IST program. In addition, the expert panel needs to be told to look for systemic problems or effects that could influence the risk ranking. Detailed guidance should be provided to the expert panel on external event scenarios. In general, this section of the guide should be expanded so that expert panels deal with issues (e.g., PRA shortcomings, events or modes of operation that were not modeled) in a thorough and consistent manner. Also, the staff recommends that an IST Engineer be on the expert panel when IST issues are discussed.

   Because expert opinion is an integral part of the ranking procedure, lack of specifics leaves too much room for inconsistency in the overall approach. It is crucial that detailed guidance and a strategy be developed and provided to the expert panels to help focus their mission and enhance their effectiveness.

3. The draft NEI Risk-Based IST Guidelines lacks specificity in several other key areas (e.g., specific guidance on how licensees should implement the risk-based IST program, how and when failure rate and cause information should be fed back into the risk ranking process, and corrective action that should be taken as a result of component degradation or failures). During the September 29th meeting with the staff, NEI stated that the Guide was meant to be a high level document designed to provide flexibility for all the industry. The intent was for each utility to have individualized risk-based IST procedures. This approach may be acceptable for the pilot utilities, but it would be very difficult for the NRC to review all subsequent plant specific procedures used in the risk based IST applications. An industry guide should have sufficient details for NRC review and approval and should be suitable for industry application without too many modifications.

4. The draft NEI Risk-Based IST Guidelines (i.e., § 8.2) lists several important performance factors (e.g., past performance, safety significance, design, service environment) that should be considered in determining appropriate test intervals for the less safety significant components. The guide should be more explicit in terms of how these factors (i.e., in conjunction with PRA) should be used to arrive at the test intervals. The inference from reading the draft guide is that the PRA is utilized, failure rates adjusted, and the permanent change criteria considered in computing a test interval that is acceptable to the licensee. The guide does not explain how these other factors are to be utilized. In addition, the guide should describe a step-wise approach for extending the test interval based in part on component performance.

   It also seems that these performance factors are important enough to apply to all components (i.e., not just the LSSC), and therefore should be used by the expert panel as criteria to help determine component ranking. Using the current methodology, only one (safety significance) of the four factors is provided to the expert panel.

5. The draft NEI Risk-Based IST Guidelines (i.e., § 8.3) states that the more risk-significant components "should be tested at a frequency in accordance with the provisions of ASME Section XI in effect at an individual licensee's plant." This presumes that the current ASME Code testing is effective in controlling risk and in identifying failures or degradation. This may or may not be the case. PRAs provide useful information (e.g., failure modes that caused a particular component to be in the more risk significant category) that should be used to help identify an appropriate test strategy for the more safety significant components. The staff believes that the ASME Code committees are the appropriate organizations to define testing strategies for the more and less safety significant components (i.e., similar to methods currently established for ASME Code class 1, 2, and 3 components). The NEI Risk-Based IST Guidelines should be revised so that the testing strategy for the more risk-significant components gets evaluated to ensure that the test can reasonably detect component failure modes and degradation mechanisms of interest.

6. Section 8.3 also states: "Components not in the ASME Section XI IST program identified as more safety significant components should be tested at a frequency commensurate with their level of safety." The staff believes that better guidance needs to be provided to licensees regarding how and when to test more safety significant components that are not currently tested in accordance with the ASME Code (see comment 4 above).

7. The NEI Risk-Based IST Guidelines should contain guidance to licensees on how to adjust their inservice test strategies based on plant-specific component performance data (i.e., both in terms of initial program development and in terms of feedback after the program has been developed).

8. A criteria should be added to the ranking process so that the defence in depth concept is not jeopardized by the reduction in IST frequency. The numerical importance for some systems/components are low because of diversity and redundancy. However, changing the IST requirements for one system can influence the risk importance of other systems performing the same function. Therefore, in the absence of more detailed evaluations, there should be a requirement that there is at least one means of performing every safety function with components that are ranked MSSC.

9. The NEI Risk-Based IST Guidelines should provide guidance to licensees on the structure, basis, and content of submittals to the NRC.

NRC'S DETAILED COMMENTS ON THE DRAFT NEI RISK-BASED IST GUIDELINES DATED SEPTEMBER 20, 1995

1. Purpose and Scope of Proposed Program

   a) In Section 2, three attributes were defined for risk-based IST programs. The second attribute recommends the utilization of a performance based method, and the third recommends the development of a framework to acknowledge good performance. These are good mechanisms for providing feedback for the risk-based IST program, however, only limited discussions on these items are provided in the guidelines. In particular, the development of a methodology for establishing a risk-performance link that justifies safety associated with the IST program modifications is needed.

   b) The risk ranking should be performed on the system level as well as on the component level since there are several advantages to ranking by systems. This guide only discusses component risk ranking.

   c) For clarification of program scope:

      - The first paragraph of page 2 contains a statement "...a method for determining the relative importance to safety of each component within the IST program." This is inconsistent with the next paragraph where the possibility of discovering some component to be MSSC and not in the IST program is discussed. How is this done and will there be a formal process to do it?

      - The next statement in the same paragraph reads "If any component is identified as a MSSC but is not in the IST program, it should be tested commensurate with its level of safety significance." Does this mean that the component will be included in the IST program?

   d) In Appendix A, it is stated that "A similar study will be performed to demonstrate the effect of test interval changes on large, early releases." When does NEI plan to perform this study? Will the study be addressed in future revisions of the guide or will supplemental guidance be issued?

2. Quality of the PRA, and PRA Limitations

   a) In Section 7 the technical consistency of the PRA is discussed and reference is made to Appendix B of the PSA Applications Guide for a consistency check. This, by itself, is not good enough to show the quality of the PRA. Before the staff will allow a licensee's PRA to be used for a specific application (e.g., risk-based IST), a process needs to be established to show that the models, results, and conclusions are robust and are representative of the plant. The review process could also be used to high-light any potential PRA model limitations or improvements in terms of IST risk ranking.

b) Section 7.1.2 states that changes to the PRA model are not expected for the IST application (without providing a basis for the statement). The staff does not agree with this assumption and recommends providing guidance on how to proceed in cases where changes to the PRA models are needed in support of the IST program. Potential areas for changes include the use of plant specific data, especially for the modeled IST components, and the re-quantification of initiating event frequencies for support systems like the service water systems, the component cooling water systems or even BOP systems like the feedwater system (This re-quantification could include the use of detailed system models in place of the "super components" or basic event representation of these initiators).

c) Section 7.1.4 contains the statement "...a periodic PSA update program is useful to ensure that the PSA effectively models the current plant design...." A PSA update is more than useful, it is necessary. This update should be required on a periodic basis to ensure that the component ranking done for IST has not been invalidated by updated plant configurations, procedures or operating practices.

3. Risk Ranking Methodology and Acceptance Criteria

a) In Section 7.1, the document developed a framework for ranking which comprises three phases, namely application planning, technical analysis, and results application. The staff recommends that the first phase (planning) should address the information needed for the other two phases.

b) The definition given to RAW (page 6) needs to be modified to read: "RAW is used to identify those components whose failure to perform their safety function has a significant impact on CDF."

c) Table 1 on page 8 presents a set of risk significance criteria which is based on the EPRI PSA Applications Guide.

- How important is the choice of these values to the implementation of the program?
- How is the choice of truncation value used in the PRA model going to affect the list of ranked components and how will this effect be compensated for?
- What is the impact of model uncertainty on ranking?

The staff recommends that sensitivity studies be done by each licensee to address the above questions. In addition, the guide should address (perhaps, in the form of sensitivity studies) the effects of the following on risk ranking:

- Common cause failures and multiple component failures, including the dependency for similar components performing redundant functions across systems.

- Operator recovery actions (some of which might mask the importance of certain components).

- Dynamic versus static ranking.

d) Was the Birnbaum Importance measure considered as a figure of merit, and if so, what are the reasons for exclusion? This measure is usually useful in determining the sensitivity of CDF to system perturbations.

e) Figure 7.1 should be described in more detail in the text. In the initial risk significance determination using F-V, there should be three categories, (1) "risk-significant", (2) "low-risk significant", which includes truncated SSCs, and (3) "not modeled" SSCs. Each of these lists will be the input to the expert panel process, along with guidance on how to consider the information.

4. Use of Expert Panel

a) The guide should provide more details in the structure, scope, process and criteria to be used by the expert panel. A list of suggestions for the expert panel is not sufficient guidance.

b) In Section 7.1.1, the scope assessment allows for PRAs that do not model external events, shutdown scenarios or containment systems. For these cases, expert panel judgement is recommended.

- In place of PRA insights, what kind of information is the expert panel going to use?

- What is going to be the basis and criteria for component ranking? (Note: In Section 7.1.3 under the heading of "Qualitative Criteria", no criteria is actually discussed. This section merely provides a list of potential PRA limitations.)

c) In Section 7.2, under the heading "Process Considerations", a list of considerations is provided for expert panel use. This section still does not discuss how system/component importance is going to be determined.

A detailed discussion of each item on the list should be provided for clarification. In addition, a well structured process and/or strategy to define when and how each item on the list will be addressed has to be developed. Finally, for each item on the list, a decision criteria for augmenting or modifying the MSSC and LSSC lists should be documented.

d) The expert panel should include an IST engineer.

e) Contrary to the text in Section 7.2, we could not find discussions in NUMARC 93-01 and NUMARC 93-02 regarding expert panel makeup.

5. Establishing a Cause Effect Relationship (Section 7.1.2)

The use of Table 3-2 of the EPRI Applications Guide is recommended to help establish a cause effect relationship. However, for IST (and also for ISI), a potentially important cause-effect is from internal flooding which is not addressed in the Applications Guide.

Adopting the above concept will also minimize the potential for inter-system common cause failures which might be introduced by the increase in test frequency for groups of similar components.

6. Use of Constant Failure Rates in the Sensitivity Study

a) In Appendix A, an equation was used to determine the component unavailability as a function of test interval and failure rate. In the sensitivity study, the test interval was varied, however, the failure rate was left constant. Given the fact that the study increased test intervals by factors of up to a hundred, it is very hard to imagine that the failure rate would stay constant. [Note: Many PRA practitioners feel that we do not currently have sufficient data on running failure rates and that any data that we do have is based on the current test intervals, i.e. 3 months, 1 year, or maybe 18 months. Therefore, to apply the current failure rates for extended test intervals may not make engineering sense.]

In any case, Appendix A presents analyses and discussion in support of increasing the test interval of LSSC components by as much as a factor of 40 times the present test intervals. The staff has concerns about such large increases including degradation of performance due to aging effects. It seems premature to make changes in intervals of this magnitude without having the benefit of experience at intervals between that required by the current Code and that proposed in the draft NEI Guidelines. This area should be evaluated further and should include an inspection of available operational and experimental data for similar types of valves and other components.

In summary, the staff does not have confidence that constant failure rates would be valid for the large test intervals proposed in the guide, i.e., failure rates cannot be treated as time independent for the large test intervals. It would be logical to assume that after a certain time period the effects of aging, corrosion, material deposition etc. will result in an increase in component failure rates. Consequently, a step-wise approach to increasing test intervals seems appropriate.

b) The staff does not feel that the analysis assumptions presented in Appendix A are as conservative as stated in the guide. Most of these assumptions will only have minimal effects on the conclusions. For example:

- The assumption that an increase in test interval will simultaneously impact the reliability of all LSSC is more realistic than conservative. Large increases in test intervals could result in common cause failures or failures of multiple similar components across systems (e.g., solenoid valves) resulting in loss of entire systems or functions.

- We believe that, in general, wear out due to frequent testing <u>is</u> in most cases negligible, and the notable exceptions like diesel generators are not expected to be ranked as LSSC.

- The change in component unavailability due to testing is negligible when compared to the other contributors to unavailability.

In summary, the staff does not believe that the Appendix A analysis is a conservative analysis. When we take into account the use of a constant failure rate (see item (a) above), the analysis may not be conservative.

7. Editorial Comments

a) In the last paragraph of page 5 where it is stated that external events and shutdown risk could be addressed by the expert panel, we believe that the word "could" should be replaced with "should".

b) On page 11, Section 8.2, it is recommended that a wording change be made to indicate that vendor recommendations should be a factor in determining test interval (rather than "could" be a factor). This does not require that the vendor recommendations be adopted, just that they be considered.

c) On page 12, Section 8.4.1, for technical correctness, the words "component failure rates" should be changed to say "component unavailabilities".

d) In Figure 7.1, the term "non-risk significant" was used for components with a F-V importance of less than 0.005. The staff would prefer the use of a more relative term, such as "less risk significant" or something similar.

e) The heading for Section 6.0 "Requirements of 10 CFR 50.55" should read "10 CFR 50.55a"

f) In Section 7.1.2 under "Evaluation of Technical Consistency", the sentence "Assumptions and limitations that have the most significant potential for influencing the results would also be considered" should be modified so that the word "would" is changed to "should".