January 28, 2003

MEMORANDUM TO: Mark A. Satorius, Chief
Performance Assessment Section
Inspection Program Branch
Division of Inspection Program Management
Office of Nuclear Reactor Regulation

FROM: John W. Thompson, Senior Reactor Operations Engineer ***/RA/***
Inspection Program Branch
Division of Inspection Program Management
Office of Nuclear Reactor Regulation

SUBJECT: PUBLIC MEETING SUMMARY ON THE MITIGATING SYSTEMS PERFORMANCE INDEX AND ROP MONTHLY MEETINGS HELD ON JANUARY 21 AND 23, 2003

On January 21, and 23, 2003, a combined public meeting was held at the Two White Flint North Auditorium (Mitigating Systems Performance Index (MSPI) pilot meeting) and One White Flint North, Room 09B4 (Revised Oversight Process (ROP) meeting). The January 21 MSPI meeting discussed questions and issues identified at the mid-way point in the MSPI pilot implementation, and licensee-specific issues. The January 23 meeting discussed proposed changes to the inspection manual chapters and inspection procedures, changes to significance determination process (SDP) manual chapter appendices, and open and new Frequently Asked Questions (FAQs) on the performance indicators (PIs). Attachments 1 and 2 contain the attendance lists for the combined MSPI/ROP public meeting.

The MSPI pilot workshop discussed questions and concerns regarding MSPI guidance and implementation at the mid-way point during data collection, as well as identifying a number of open issues needing resolution prior to the staff's decision on whether to proceed with full MSPI implementation. Part of the workshop was devoted to a breakout session by vendor plant type to identify common threads involving high/low Fussell-Vessly values, invalid and/or insensitive performance indicators.

ROP discussions included a summary of staff activities on a draft Steam Generator Tube Integrity and Maintenance Rule SDP, and a draft Shutdown SDP. The industry also provided an update to activities conducted by the industry. Industry's next goal is to work with the external stakeholders and provide a detailed working level guidance document for the self-assessment program.

The staff of NRR and the Office of Research provided a status update of the Industry Trends Program. The staff plans to inform the Commission of the status of the program and benchmarking results.

A list of meeting participants and information exchanged at the meeting are attached. The next combined meetings of the MSPI and ROP Working Groups is scheduled for January 21 and 23, 2003, respectively.

Attachments:
1. MSPI Workshop Attendance List
2. ROP Monthly Meeting Attendance List
3. MSPI Workshop Outline
4. FAQ list
5. Unplanned Scrams W/Loss of Normal Heat Removal Charts

A list of meeting participants and information exchanged at the meeting are attached. The next combined meetings of the MSPI and ROP Working Groups is scheduled for January 21 and 23, 2003, respectively.

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ATTENDANCE LIST
INDUSTRY/STAFF MSPI PUBLIC WORKSHOP MEETING
January 21, 2003

NAME	AFFILIATION
John Thompson	NRC
Glenn Meyer	NRC
Donald Dube	NRC
Steve Ray	NRC
Bennett Brady	NRC
Anne Passarelli	NRC
Glenn Meyer	NRC
Marc S. Ferdas	NRC
Randy Musser	NRC
Walt Rogers	NRC
Blake Welling	NRC
Nancy Salgado	NRC
Paul Cataldo	NRC
Patrick Baranowsky	NRC
Donald Hickman	NRC
Dave Wrona	NRC
Victor McCree	NRC
Linda Smith	NRC
Gareth Parry	NRC
Anthony P. Ronstadt	Exelon/Braidwood
Roy Linthicom	Exelon/Braidwood
Ed Purdy	Exelon
Victor Warren	Exelon
Robert Buell	INEEL
Thomas C. Houghton	NEI
John Giddens	Southern Nuclear
S.H. Chien	SONGS
Kent Sutton	NPPD
Loys Bedell	Entergy
Anees Farruk	SNC
Andrew Howe	Progress Energy
Greg Gibson	SoCal Edison
Robin Ritzman	PSEG
Duane Kanitz	APS
Gerry Sours	APS
Yu Shen	NMC
Kenneth M. Heffner	Progress Energy
Michael Scarpello	AEP
Rick Thomas	Entergy
Paul Athenson	Dominion

Attachment 1

ATTENDANCE LIST (continued)
INDUSTRY/STAFF MSPI PUBLIC WORKSHOP MEETING
January 21, 2003

Deann Raleigh	LIS Scientech
John Lai	PSEG Nuclear
Shahin Seyedhosseini	PSEG Nuclear
Michael Small	Dominion/Surry
John Caivano	Dominion
Daniel Stillwell	STP
W.E. Mookhoek	STP
Jim Sumpter	NPPD
Tom Hook	Dominion
Chet Lehmann	PPL
Sonia Burgess	NRC
Carey W. Fleming	Winston & Strawn
Steve Eide	INEEL
Mike Strait	Exelon
Dale Ambler	Exelon
Cory Atwood	Statwood Consulting
Gregory Kent	Duke Energy
Phil Tarpinian	Exelon-Limerick

ATTENDANCE LIST
INDUSTRY/STAFF ROP PUBLIC MEETING
January 23, 2003
OWFN 9B4

NAME	AFFILIATION
John Thompson	NRC
Donald Dube	NRC
Donald Hickman	NRC
Dave Wrona	NRC
Mark Satorius	NRC
Paul Harris	NRC
Dale Rasumson	NRC
Robert Kahler	NRC
Kevin Williams	NRC
Doug Coe	NRC
Alan Nelson	NEI
Paul Sullivan	NMC-Duane Arnold
Tim Blake	NMC-Palisades
Lenny Sueper	NMC
Thomas C. Houghton	NEI
John Giddens	Southern Nuclear
Greg Gibson	SoCal Edison
Robin Ritzman	PSEG
Duane Kanitz	APS
Gary Gilbert	Duke Energy
Kenneth M. Heffner	Progress Energy
Michael Scarpello	AEP
Rick Thomas	Entergy
Paul Athenson	Dominion
Jim Sumpter	NPPD
Carey W. Fleming	Winston & Strawn
Dale Ambler	Exelon

Attachment 2

MSPI Workshop Outline
TWFN Auditorium
January 21, 2003

Purpose of the Workshop:

- **To discuss the significance of the MSPI benchmarking results, and to understand its impact on the data accuracy and pilot objectives.**

  To discuss and understand the differences in data collected from similar plant groups and where significant differences are noted, try to understand the reasons for the differences.

  To discuss and identify all MSPI technical and implementation issues that impact the ability of pilot participants to accurately report data in accordance with the written pilot guidance.

Attachment 3

MSPI WORKSHOP AGENDA

January 21, 2003

8:00-8:30 a.m. Introductions (J. Thompson, NRR, P. Baranowsky, RES, S. Floyd,NEI)

8:30-9:00 a.m. High Level Staff Overview (Donald Dube, RES)

See Attachment 1: Status of benchmarking, General issues related to all plants (handling of running/standby pumps, PMT demands, failure rate topics, active components)

9:00-9:15 a.m. High Level Industry Overview (Steve Floyd, NEI)

Topics to be supplied

9:15-9:30 a.m. High Level Regional Overview (Glenn Meyer, NRC)

Topics to be supplied

9:30-9:45 a.m. Break

9:45-11:15 a.m. Top 5 Issues (Donald Dube, RES)

System boundary issues
Should common cause failures be incorporated in the MSPI model?
Significance of very low F-V values for trains
Support system initiators and their impact on F-V values
Invalid indicators - significance of the false positive and false negative issues

11:15-12:00 p.m. Breakout Sessions (All, split into groups of "like plants" Group discussion will be led by an NRC facilitator. Facilitators will summarize issues for reactor group presentation at 3:15 p.m. plenary session)

Breakout groups to discuss, document, and understand the issues involving:

FV comparisons - SPAR model vs. Plant PRA (for all 6 systems)
Implementation guidance/interpretation issues
Invalid indicators - false positive and false negative issue
Significant differences between like plants
Identify remaining significant, unique plant issues

CE Plants	Westinghouse Plants	BWRs
Millstone 2	Braidwood 1,2	Hope Creek
Palo Verde 1,2,3	Millstone 3	Limerick 1,2
San Onofre 2,3	Prairie Island 1,2	
	Salem 1,2	
	South Texas 1,2	
	Surry 1,2	

12:00 - 1:00 p.m. Lunch

1:00 - 2:45 p.m. Continue Breakout Session

2:45 - 3:00 p.m. Break

3:00 - 3:45 p.m. Breakout Session Reports (NRC & Consultants)

3:45 - 4:30 p.m. Improved Guidance / Action Items (All)

- Identify areas/issues to look out for
- Top items to focus future resources
- Activities and schedules for remaining 6 months

Some MSPI Questions and Answers

What MSPI specific documentation should be compiled by the licensee for purposes of this pilot?

Answer: Pilot licensees should have separately compiled and available for inspection: (1) simplified P&ID drawings of the monitored systems where the active components have been identified, (2) risk significant functions of those systems, (3) if the train/system success criteria differ from the plant's design/licensing basis, the PRA success criteria and related parameters should be listed, (4) for each active component a listing of the maximum F-V/UR value, the F-V and the UR value, and (5) for each train, the maximum F-V/UA value, the F-V and the UA value. In addition, a copy of this information should be sent to Donald Dube, RES.

Additionally, licensees should also note where they have taken exception to the NEI 99-02 Appendix F guidance. For example, some active components that meet the MSPI definition of an active component may not be modeled in the PRA or included in the MSPI calculation. Licensee should explain in writing why this exception was taken and the reason for the exclusion or omission.

By way of example, RES has found that the documentation compiled by Arizona Power for Palo Verde substantially meets the intent.

2. Do all of the success criteria for all active components need to be pre-identified in a data sheet format or do the success criteria only have to be pre-identified if it is a departure from the design basis? Also, what kind of justification for the success criteria is required?

Answer: All pilot participant licensees need to state in writing the systems' risk significant functions. If the licensee desires to use the design/licensing basis for success criteria, it must so state. A separate listing of design/licensing success criteria need not be included. If success criteria from the PRA are used, the specific success criteria must be stated in writing. Justification for the PRA success criteria will not be included in the MSPI documentation. (Note however, that justification should be available in the licensee's PRA documentation).

3. Is a statement in the IPEEE (PRA) adequate basis to determine that a component is not active for MSPI? For example, the IPEEE states that HPCI is able to perform its safety function if the min flow valve fails to close. Is that sufficient documentation to conclude that the min flow valve is not active?

Answer: The PRA should provide justification for its assumptions. It is not the purpose of the MSPI TI inspection to review the PRA. However, inspectors' questions about PRA assumptions should continue to be documented and forwarded to NRR/RES for review.

4. Is it a requirement to assemble all assumption, back-up material, and validation (e.g., all of the Fussell-Vesely values for every basic event, calculations?) Is that what "readily available for inspection" means?

Answer: No. However, readily available means having the documentation described in Question 1 and 2 in a concise format and together and is easily accessible by inspectors. For purposes of how to document functional success criteria and other assumptions, it is adequate to state that the assumptions used by the licensee is the PRA or the design/licensing basis. All exceptions must be documented.

Should all of the "sub-components" in a "super-component" be pre-identified by component number and have pre-identified success criteria?

Answer: The staff expects that major active components be identified on the simplified P&ID drawings. Licensees should explain where the boundaries are for the critical sub-components (e.g., the last relay or circuit breaker, or interfacing system valve that is included in the system boundary). In general, the licensee should use its Maintenance Rule boundaries.

Are historical EPIX estimates an adequate source of MSPI estimates, or does there have to be a written justification for the EPIX estimates?

Answer: Yes, estimates are acceptable, without written justification, as long as they are conducted within established rules and PRA protocol. See NEI 99-02, Appendix F, page F-3 for specific guidance. For full implementation of the MSPI, current estimates (as opposed to historic data) will require justification.

How should EPIX estimates be converted to numbers to be placed on the MSPI spreadsheet? For example, if the EPIX estimates is for a valve to be stroked 15 times in 18 months, 15 strokes divided by 6 quarters equals 2.5 demands per quarter. Is 2.5 demands per quarter a legitimate entry since there is no such thing as a half demand?

Answer: Fractional values are ok.

What do you do with active components that are not modeled in the PRA? Are they required to be added to the model? By when?

Answer: Depends. If a licensee chooses not to model an active component that meets the MSPI definition of an active component, and they explain why it was not included, it may be acceptable to not include the component. In these cases, all exceptions must be documented along with the basis for doing so. However, if the active component has a significant risk contribution, and whether or not it was modeled in the PRA, it generally should be included in the MSPI calculation. Reasons for not including the component should be discussed with the NRC regional SRA and RES. These instances will be dealt with on a case-by-case basis. Licensees will not be required to change their PRA during the pilot.

Guidance in NEI 99-02 says to include unit x-tie components as active components to be monitored if modeled in the PRA. No industry priors for electrical breakers were listed in Appendix F, Table 2, and breakers were not listed as a component type in the Excel spreadsheet, so they could not be added as active components.

Answer: RES will recommend a revision to Table 2 to include a generic failure rate for circuit breakers. Licensees should identify other components that may be missing from Table 2, and bring them to RES's attention.

Some licensees are unclear about whether to include the service water supplies to the auxiliary feedwater (AFW) pumps as active components. Some did and some did not. Plants have enough water in the condensate storage tanks (CST) to reach a stable cooled down condition, but might not have enough for the 24-hour mission time assumed in the PRA. Some assumed that the CST could be refilled but might not have the refill modeled beyond assuming that it would be 100% successful.

Answer: Sound engineering judgment could be used to exclude items such as alternate make-up to the CST. The probability of failing to make up to the CST drops significantly with time, especially as the licensee's Emergency Response Organization becomes fully staffed. For example, it would be reasonable to assume that if the time to begin refilling the CST were say 20 hours, and the required make-up rate were 200 GPM, and there were multiple paths available to provide alternate water, then this would be justification to exclude valve connections from the PRA model and the MSPI. However, a different conclusion would be reached regarding refilling the RWST in one hour following a large-break LOCA.

Some plants had several active components being monitored under MSPI that were not modeled in their PRAs. There was no guidance regarding how to assign appropriate F-V valves to those components. The licensees were unable/unwilling to make major revisions to their PRA models just to support the MSPI pilot. For some of the components, licensees entered a zero F-V (which made monitoring component unavailability and unreliability a waste of time) and for some they made up what they thought would be a conservative F-V value.

Answer: An arbitrarily assigned F-V of zero is not acceptable. A conservatively assigned F-V **as an interim measure** would be acceptable provided there were adequate justification and documentation for the like. It is expected that at the next opportunity to update/revise the PRA model, that these active components would be included.

Most Westinghouse plant Emergency Operating Procedures have a step to close the safety injection accumulator isolation valves before depressurization and going on containment sump recirculation in order to prevent injection of nitrogen into the reactor cooling system and potentially impeding reactor cooling. Further research needs to be done regarding whether failure to close the valves could result in failure to meet success criteria for core cooling.

Answer: The closing of the safety injection accumulator isolation valves is a good practice recommended by Westinghouse but is not absolutely necessary to the successful mitigation of a LOCA. The presence of nitrogen retards condensation processes, but in and of itself would not result in core damage. The fact that a) the valves would not be closed in time to affect the accident progression during the most critical short-term (minutes) phase of a rapid large-break LOCA (and are not credited in the design basis LOCA analyses), and b) are not single-failure proof, are evidence that closing of the valves is not part of the system success criteria to prevent core damage.

There was no clear guidance on truncation limits for active components. If active components have a very low contribution to core damage frequency, they are not worth monitoring.

Answer: A truncation value of 1E-11/yr or less is recommended.

For systems with one pump normally running and one or more other pumps in standby (such as component cooling for many plants), guidance is needed to describe how to account for unavailability time.

Answer: Guidance will be provided for the January 21, 2003 workshop. It is safe to say that regardless of which approach is used, one must be sure to preserve a) the total CDF, b) the FV/UA for each train, especially if there are non-symmetric contributions to total CDF such as can arise when the AC and/or DC support systems are not symmetric. For example, one DC bus may provide control power for one steam-driven and one motor-driven pump, while the other DC bus powers just one motor-driven pump. In such cases, the F-V for the two motor-driven pumps will be very different owing to the relative contributions to the CDF.

Potential problem with following the 8 steps at the end of Appendix F for calculating planned unavailability in the baseline data: In Steps 2 and 3, fault exposure and unplanned unavailability hours are subtracted from the total unavailable hours. In Step 7, cascaded hours are subtracted. If some of the fault exposure and unplanned unavailability hours were from cascaded support systems, they could be subtracted twice.

Answer: Good point. Licensees should be made aware of this.

Some plants reported start demands and run times for several pumps and stroke demands for many valves that were estimated based on normal surveillance schedules and typical surveillance completion times. Verification of the data by the inspectors found several cases where the estimated data was not the same as actual demands and run times. I believe the guidance should be clarified to state that actual data is required unless it is not obtainable.

Answer: The intent is to allow for reasonable means of approximating demands to the extent possible. Differences of up to 25% between estimate and actual are recognized as being possible and would, in general, not be a reason for concern. Factors of two or more between actual and estimates would be a concern. One possible way of estimating demands is by sampling and extrapolation. For example, assume thorough counting of demands for a population of six valves in a particular system was made over a 12-month period. And assume there were no unusual changes in operation (extended outages) and no significant changes to surveillance test procedures in that time frame. Extrapolating to 24-months by doubling the number of demands for this population of valves would be reasonable.

17. Some licensees tended to report all pump start demands including, post maintenance test (PMT) starts, because it was easy to determine the number of starts for many pumps, based on charts of breaker position or discharge pressure/flow, but it took extra work to determine the reason for the start. The guidance should be clarified to state whether it is an acceptable option to report all start demands, or do PMTs have to be excluded.

Answer: Guidance will be provided for the January 21, 2003 workshop.

The guidance in Appendix F and other places tells the licensees to include information in the comments field of the spreadsheet for certain things like substantial changes to their maintenance philosophy and corrections to previously reported data. There doesn't appear to be a comments field in the spreadsheet.

Answer: Please look at the "NRC Data" tab in the spreadsheet. This tab presents the data and comment fields for each PI.

At some plants support systems are modeled for their mitigation functions only. In others, the contribution to initiating event frequency (such as reactor trips) is also modeled for the support systems. This results in different F-V values for the same system in similar plants.

Answer: Agree. This remains an open item as far as RES is concerned. Some plant PRA models include detailed initiator fault trees, which would capture the contribution of the components in question to the FV. In other cases, a straight initiator frequency for the loss of the support system is used, and the contribution to FV from the component in question is missing. This topic will be discussed at the January 21, 2003 workshop, but closure of the issue will not occur until later in 2003.

20. The ROP web site does not have a link for submitting comments on the MSPI, nor does it have the specific MSPI comment forms.

Answer: Good point. This needs to be addressed.

Regional Perspectives on MSPI

The Regions want performance indicator(s) for both the reliability and unavailability of important safety equipment. Risk-informed PIs which measure performance effectively and which address site-specific designs would be desirable and would contribute to the Reactor Oversight Program.

Nonetheless, the Regions are skeptical that the MSPI can meet these objectives, given the following concerns.

1. MSPI approach may not be workable.

   False positives - About 25% of systems may be invalid due to only one failure causing a threshold to be crossed.

   False negatives - Some thresholds appear unrealistic (some sites would need 50 EDG failures within 3 years to cross the White threshold).

   Failure rates have been reported much lower than expected (order of magnitude difference between SPAR and plant PRAs).

   Complexity could hamper inspector and public understanding.

2. Implementation problems are numerous thus far in the pilot.

   One pilot plant was unable to provide data for months due to data taking difficulty and errors.

   Some risk significant functions have been missed.

   Success criteria have varied between Technical Specifications, design bases, and PRAs.

   Unclear system and train boundaries may have affected unavailability data.

3. Plant PRAs may not be sufficiently detailed, accurate, or uniform.

   Upgrading of PRAs to a higher level of detail has raised resource issues.

   Considerable SRA review appears to be needed for each site.

   Many PRA quality issues remain to be addressed.

Glenn Meyer
January 16, 2003

MSPI WORKSHOP
BREAKOUT SESSION WORKSHEET
PLANT NAME:_____

COMPARE AND DISCUSS INVALID INDICATORS FOR THE MONITORED COMPONENTS AND SYSTEMS

Things to consider:

What systems have been identified as invalid for purposes of the MSPI?
What active components contribute/cause the system to become invalid?
How was pooling of like components performed and did this contribute to the system becoming invalid?
Are there common threads among vendor or peer group plants? What are they?
For identified invalid systems, what is the relationship between F-V values and the root cause of the invalid indicator?

Notes

COMPARE FV AND FV/UR FOR SIMILAR COMPONENTS

Things to consider:

1) Compare the FV values for each active, like component among the peer group plants.
2) Compare the FV/UR values for each active, like component among the peer group plants.
3) Try to understand the reason for any significant differences in FV and FV/UR
4) Identify possible sources of differences
5) For extreme low FV ratios, does this result in an indicator that becomes less useful? Please be specific.
6) Do unique plant design configurations play a significant role?
7) Do PRA modeling techniques play a significant role?
8) Does plant specific equipment performance play a significant role?
9) Does your site model support system initiating event fault trees or some or equivalent method (yes/no)?
10) Other influences?

Notes

III SUMMARY OF SIGNIFICANT COMMON THREAD FINDINGS AND ISSUES

Things to consider:

- What components/systems most often cause/appear as invalid indicators?
- What are the common thread causes of low FV and FV/UR ratios?
- What important findings/open issues are common to more than one plant?

Notes:

IV COMPARE SYSTEM BOUNDARIES (AS TIME PERMITS)

Some things to consider:

- Flow diversion paths (e.g., min flow lines)
- unit/system Cross-tie components
- Cooling water support system branch line throttle/isolation valves

1) Were some “active components” excluded from inclusion in the system boundary? If so, what was the rationale?