

June 15, 2001

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

FROM: August K. Spector, Communication Task Lead */RA/*  
Inspection Program Branch  
Division of Inspection Program Management  
Office of Nuclear Reactor Regulation

SUBJECT: NRC/INDUSTRY WORKING GROUP MEETING ON SAFETY  
SYSTEM UNAVAILABILITY, MAY 16, 2001

On May 16, 2001, a public meeting was held at the NRC Headquarters, Two White Flint North, Rockville, MD, to discuss and review the Safety System Unavailability Performance Indicator. An agenda, attendance list, and information exchanged at the meeting are attached.

Attachments: 1. Attendance List  
2. Agenda  
3. NEI/Industry Strawman for Unavailability Definition  
4. NRC/Industry Working Group Meeting Minutes of May 16, 2001

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NUCLEAR REGULATORY COMMISSION  
PUBLIC MEETING  
MAY 16, 2001

ATTENDANCE LIST

<b>Name</b>	<b>Affiliation</b>
Don Hickman	NRC
Wade Warren	Southern Nuclear
Steve Alexander	NRC
David Hembree	INPO
Robin Ritzman	PSEG
Deann Raleigh	US Sciencetech
Jenny Weil	McGraw-Hill
Mike Strait	Exelon
Mark Burzynski	TVA
Tom Boyce	NRC
Hossein Hamzehee	NRC
Patrick Baranowsky	NRC
Patricia Loftus	Exelon Generation
Michael Johnson	NRC
Tom Houghton	NEI
Ralph Goode	TVA/INPO
Tony Pietrangelo	NEI
Alan Madison	NRC

NRC/INDUSTRY WORKING GROUP MEETING  
ON SAFETY SYSTEM UNAVAILABILITY  
MAY 16, 2001

MEETING MINUTES

On May 16, 2001, Mike Johnson, Chief of IIPB, and Don Hickman of IIPB hosted an all-day public meeting of the Safety System Unavailability (SSU) Task Force (SSUTF) held at NRC headquarters. Steve Alexander, IQPB, represented maintenance rule (MR) interests. Hossein Hamazehee and Pat Baranowski represented RES/DRAA/OERAB. Tony Petrangelo and Tom Houghton represented the Nuclear Energy Institute (NEI). Other principal participants included representatives from INPO, Exelon, Southern Nuclear, Duke Power, and the industry group that is working on the consolidated data collection project. Reporters from McGraw-Hill and Sciencetech observed. The main topic was finding a common definition (including data to be collected and method of calculation) of SSU that would remain meaningful for the ROP (the SSU PIs), the MR, the PRA, and for INPO/WANO reporting. The group reviewed and discussed a "strawman" proposal by NEI in detail and several associated issues as delineated on the attached agenda.

The following comprise the principal results of the meeting:

1. The group agreed to the work towards development of a standard definition for unavailability (UA).
2. The group proposed that the risk/safety-significant functions to be tracked for unavailability be defined as:

"those functions needed to be performed to satisfy the PRA success criteria, as defined for high-safety-significant (HSS) structures, systems and components (SSCs), per the industry guidance for 10 CFR 50.65, the Maintenance Rule, NUMARC 93-01, Revision 3."

All participants/interested parties were to present this definition to their respective organizations and report back at the July 12th meeting of the SSUTF.

3. The group discussed whether the UA definition should include UA while critical and UA while shutdown. As a result of concerns regarding differences in risk significance associated with shutdown and critical states, the group proposed to include only UA while critical. As an action, all participants will consider the ramifications of not counting HSS UA during shutdown, as one possible measure in normalizing the UA calculation. for all users, including MR, PRA, ROP, and INPO/ WANO. Representatives are to report their organizations' positions on this proposition at the July 13 meeting.
4. The group considered the following question: If T/2 (default estimate of unknown fault exposure time) were not to be included among unavailable hours (i.e., the numerator of the SSU fraction), what other tools might be available and usable to meet PRA, ROP, and INPO/WANO needs (note that MR does not use T/2)?

The group proposed two principal candidates for replacement of T/2:

- 4.a Reliability ROP performance indicators (PIs) for monitored systems in terms of numbers of functional failures per so many valid demands during a specified period. OERAB was to present a conceptual description of such PIs at the July 12th meeting. (Longterm fix) Also, NEI requested that OERAB give a few examples from the Phase I RBPI Report at the May 31 meeting.
- 4.b Some sort of significance determination process (SDP) for SSU to supplement planned and unplanned unavailable hours and provide some alternative reliability insight. (possible near-term measure).
- 4.c To validate the proposed measure of eliminating T/2 in UA calculations, OERAB was to review significant T/2 events (i.e., T/2 longer than 336 hours) and compare results with SDP results of the same events. NRR was to provide the example events to OERAB for their comparison. Status report due at May 31 mtg.
5. Handling of support system unavailability and its impact on SSU was discussed. The group proposed that unavailability PIs be developed for the two most HSS support systems, i.e., component cooling water (CCW) and service water (SW) systems or their equivalents (in addition to standby/ emergency electric power systems). One or two other HSS support systems may be added to the list if any should be identified. (Longterm)
  - 5.a Until Action No. 4 above is completed, licensees should continue to cascade unavailability of proximate support systems onto SSU of their supported, front-line monitored systems.
  - 5.b (Longterm) When CCW and SW PIs are implemented, cascading would be discontinued entirely for purposes of ROP and INPO/WANO reporting. MR does not typically cascade (except possibly for ROP PI systems) and PRA must cascade interdependencies.
  - 5.c NRC to consider, for the near term, cascading unavailability of CCW and SW only. Status by the July 13 meeting of the SSU focus group.
6. The group considered crediting operator recovery actions (ORAs) in reducing SSU charged in various situations. Note that these are general principles. Circumstances that do not exactly correspond to those described below will be dispositioned on a case-by-case basis.
  - 6.a For testing, the group proposed to adopt (reaffirm) the treatment proposed by NEI in its strawman and as expressed in NEI 99-02, Page 28, and also NUMARC 93-01 language.
  - 6.b For maintenance activities other than testing, specifically maintenance that may disable an automatic function (e.g., standby/auto-start), certain ORAs may be credited when manual operation is available (*and/or in use*).
  - 6.c ORAs may be credited in such situations provided that the manual operation and the ORAs meet all the criteria for ORAs creditable for testing.
  - 6.d Treatment of ORAs for support systems and auto start failures with manual operation available will require further discussion.

7. The group discussed the treatment of design deficiencies. As a preliminary step, it was resolved to have the equipment reliability staff provide input based on industry operating experience. They are to evaluate counting certain design deficiencies against SSU and SS reliability versus use of an SDP. Cognizant parties are to have a strawman proposal on this issue reviewed by their organizations to present to the July 13 meeting.
8. Conceptual proposals on thresholds and implementation/phase-in are to be developed by all stakeholders and discussed at the July 13 meeting.
9. NEI requested RES to make a brief presentation of the reliability indicators developed in the draft Phase-1 RBPI development report at the May 31 meeting.

**UPDATE: As of the May 31 meeting, RES was not prepared to present examples of reliability performance indicators from the Phase-1 RBPI Report. Also, as of May 31, RES had not yet received the selected T/2>336hrs PI events from NRR for their comparison to results of SDP evaluation of those events.**

## NEI/INDUSTRY STRAWMAN FOR UNAVAILABILITY DEFINITION

### Background

Unavailability data is being collected for PRA input, conformance to Maintenance Rule performance criteria, reporting data for the Reactor Oversight Process and for WANO SSPIs. Differences in definitions and rules for each application overly complicate the data record keeping requirements. NEI has formed a task force to develop a common definition and a set of rules that would simplify data gathering requirements and achieve consistency. The task force recommends that the definition be consistent with the needs of the PRA because (1) the PRA forms the defensible regulatory technical basis, and (2) the WANO and ROP indicators can be modified or adapted with minor modifications.

Based on task force input, the basic data needed for each application is summarized below:

1. For the PRA, the number of hours a train is unavailable during power (critical) operations and while shutdown.
2. For the Maintenance Rule, the number of hours in a period that a train is unavailable when required to be available.
3. For the Reactor Oversight Process, the percent of time that a system (based on averaged trains) is unavailable when required to be available.
4. For WANO, the percent of time that a system (based on averaged trains) is unavailable when required to be available.

The task force developed the following definition of unavailability that would provide the necessary data for each application.

UNAVAILABILITY is defined as:

$$\frac{(\text{unavailable hours at power}) + (\text{unavailable hours during shutdown})}{(\text{required hours})}$$

## DEFINITION of TERMS

### Unavailable hours at power

1. The hours a train is taken out of service for any reason when the equipment is required to be in service per all non-shutdown technical specification modes.
2. Includes elapsed time between the time of failure (if known) and the time of discovery for an equipment failure or human error that makes the equipment unavailable.

### Unavailable Hours During Shutdown

Includes:

1. The hours a train is taken out of service for any reason when the equipment is credited as the primary or first backup equipment for performing a safety function credited in the shutdown management plan.
2. Includes elapsed time between the time of failure (if known) and the time of discovery for an equipment failure or human error that makes the equipment unavailable.

### Required hours:

Use the following default values:

1. Critical Hours for systems that are required to be operable when the reactor is critical or for short periods during startup or shutdown. (e.g., HPSI, HPCI, HPCS, RCIC, AFW)
2. Calendar Hours for the reporting period for all other systems.

## CLARIFYING NOTES

### Unavailable Hours

Unavailable hours are hours that a train is not available for service for an activity when otherwise required to be. Causes of unavailable hours include, but are not limited to, the following:

- preventive maintenance and corrective maintenance, or inspection requiring equipment to be mechanically and/or electrically removed from service
- testing, unless the test configuration is automatically overridden by a valid starting signal, or the function can be promptly restored either by an operator in the control room or by a dedicated operator stationed locally for that purpose. Restoration actions must be contained in a written procedure, must be uncomplicated (*a single action or a few simple actions*), and must not require diagnosis or repair. Credit for a dedicated local operator can be taken only if (s)he is positioned at the proper location throughout the duration of the test for the purpose of restoration of the train should a valid demand occur. The intent of this paragraph is to allow licensees to take credit for restoration actions that



- are virtually certain to be successful (i.e., probability nearly equal to 1) during accident conditions.
- any modification that requires the train to be mechanically and/or electrically removed from service.
- corrective maintenance time following detection of a failed component that prevented the train from performing its intended safety function.
- fault exposure time where the failure's time of occurrence and its time of discovery are known. In instances where the time of failure is indeterminate, unavailable hours are counted from the time of discovery and a demand failure is assumed.
- for WANO indicators, fault exposure time where the failure's time of occurrence is unknown, half the time since the last successful test or demand is assumed as unavailable time.

## OPEN ISSUES

### Treatment of Support System Unavailability

The PRA and the Maintenance Rule separately track support system unavailability and do not cascade support system unavailability to the "front line" system. The current NRC ROP and WANO programs do cascade support system unavailability. Following industry review, the following course is recommended:

For the WANO and ROP programs (four systems), continue to cascade support system unavailability to the front line system if the unavailability of the support system impacts the ability of the front line system to perform its required functions.

### Operator Recovery Actions

The maintenance rule, NRC ROP and WANO have specific and restrictive rules for crediting operator recovery actions. The PRA typically applies a term that estimates the probability of successful operator recovery of a train based on the complexity of the evolution and the time available (by analysis) for completing the actions. Following industry review, the following course is recommended:

Using operator recovery percentages credited in the PRA improves consistency with PRA results but would overly- complicate recordkeeping. Therefore, do not change the current rules for any of the applications. Deal with plant-specific circumstances as special exceptions to the rules.