

FEB 09 1993

NOTE TO: Ebe McCabe, Region I
Ken Barr, Region II
Jim McCormick-Barger, Region III
Blaine Murray, Region IV
Bob Pate, Region V

FROM: *JX* Falk Kantor, PEPB/DRSS/NRR

SUBJECT: LOSS OF ANNUNCIATORS

Enclosed for your information is a recent memorandum from Tom Murley and Ed Jordan to the Deputy EDO on the subject of the current classification for loss of annunciators. The conclusion is that the current guidance in NUREG-0654 and NUMARC/NESP-007 for classifying loss of annunciator events in EAL schemes is adequate.

Enclosure:
As stated



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

February 4, 1993

MEMORANDUM FOR: James H. Sniezek
Deputy Executive Director
for Nuclear Reactor Regulation
Regional Operations and Research
Office of the Executive Director
for Operations

FROM: Thomas E. Murley, Director
Office of Nuclear Reactor Regulation

Edward L. Jordan, Director
Office for Analysis and Evaluation
of Operational Data

SUBJECT: DECLARATION OF ALERT FOR LOSS OF ANNUNCIATORS

In your memorandum of December 28, 1992, you requested NRR and AEOD to evaluate the current classification for loss of annunciators and to revise the emergency classification and emergency action levels as needed.

As you know, emergency classification and emergency action level (EAL) schemes are required by 10 CFR 50.47(b)(4) and Appendix E of 10 CFR Part 50, which refers to NUREG-0654, "Criteria for Preparation and Evaluation of Radiological Emergency Response Procedures," for definition and discussion of "emergency classes." That information is contained in Appendix 1, "Emergency Action Level Guidelines," of NUREG-0654, which lists the following four classes of EALs: (1) Notification of Unusual Event, (2) Alert, (3) Site Area Emergency, and (4) General Emergency. The following statement appears immediately after this list in NUREG-0654:

The rationale for the notification and alert classes is to provide early and prompt notification of minor events which could lead to more serious consequences given operator error or equipment failure or which might be indicative of more serious conditions which are not yet fully realized. A gradation is provided to assure fuller response preparations for more serious indicators.

Appendix 1 of NUREG-0654 also contains examples of initiating conditions for each class "to form the basis for establishment by each licensee of the specific plant instrumentation readings (as applicable) which, if exceeded, will initiate the emergency class." (Pages 1-3). Those pertaining directly to loss of annunciators are as follows:

Notification of Unusual Event

Indications or alarms on process or effluent parameters not functional in control room to an extent requiring plant shutdown

9304070114 XA 899

or other significant loss of assessment or communication capability (e.g., plant computer, Safety Parameter Display System, all meteorological instrumentation).

Alert

Most or all alarms (annunciators) lost.

Although NUREG-0654 does not amplify this last example of an initiating condition, in keeping with the concept of "gradation," Alert connotes a more serious condition than does Notification of Unusual Event. This "gradation" should also be reflected in the details of plant-specific EAL schemes prepared by licensees based upon NUREG-0654. This "gradation" may not always hold true, however, where a licensee simply and unconditionally incorporates into its plant-specific scheme an example of an initiating condition exactly as written in NUREG-0654.

The concept of "gradation" is evident in the following descriptions of the unusual event and alert classes found in NUREG-0654.

NOTIFICATION OF UNUSUAL EVENT	ALERT
<p><u>Class Description</u></p> <p>Unusual events are in process or have occurred which indicate a potential degradation of the level of safety of the plant. No releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of safety systems occurs.</p>	<p><u>Class Description</u></p> <p>Events are in process or have occurred which involve an actual or potential substantial degradation of the level of safety of the plant. Any releases expected to be limited to small fractions of the EPA Protective Action Guideline exposure levels.</p>
<p><u>Purpose</u></p> <p>Purpose of offsite notification is to (1) assure that the first step in any response later found to be necessary has been carried out, (2) bring the operating staff to a state of readiness, and (3) provide systematic handling of unusual events information and decision-making.</p>	<p><u>Purpose</u></p> <p>Purpose of offsite alert is to (1) assure that emergency personnel are readily available to respond if situation becomes more serious or to perform confirmatory radiation monitoring if required, and (2) provide offsite authorities current status information.</p>

Guidance Recently Issued by the NRC

In August 1992, the NRC issued Revision 3 to Regulatory Guide 1.101, "Emergency Planning and Preparedness for Nuclear Power Reactors," in which it endorsed guidance in NUMARC/NESP-007 (Revision 2, January 1992), "Methodology for Development of Emergency Action Levels" as an acceptable alternative method to that described in Appendix 1 to NUREG-0654. As stated in that document: "Licensees may use either NUREG-0654/FEMA-REP-1 or NUMARC/NESP-007 in developing their site-specific EAL scheme but may not use portions of both methodologies." Nevertheless, regardless of which method a licensee uses to prepare a site-specific EAL scheme, much of the general discussion and guidance in NESP-007 applies to that in NUREG-0654 and augments it. NESP-007 includes the following discussion of the difference between a Notification of Unusual Event and an Alert:

Rather than discussing the distinguishing features of "potential degradation" and "potential substantial degradation," a comparative approach would be to determine whether increased monitoring of plant functions is warranted at the Alert level as a result of safety system degradation. This addresses the operations staff's need for help, independent of whether an actual decrease in plant safety is determined. This increased monitoring can then be used to better determine the actual plant safety state, whether escalation to a higher emergency class is warranted, or whether de-escalation or termination of the emergency class declaration is warranted. Dose consequences from these events are small fractions of the EPA PAG plume exposure levels, i.e., about 10 millirem to 100 millirem.

NESP-007 lists the following emergency action level as an example to amplify that given in NUREG-0654 for loss of annunciators as an initiating condition for an Alert:

EXAMPLE EMERGENCY ACTION LEVEL:

1. The following conditions exist:

- a. Loss of most or all (site-specific) annunciators associated with safety systems for greater than 15 minutes.

AND

- b. In the opinion of the Shift Supervisor, the loss of annunciators or indicators requires increased surveillance to safely operate the unit(s).

AND

- c. Annunciator or Indicator loss does not result from planned action

AND

- d. Either of the following:

- 1. A significant plant transient is in progress.

OR

- 2. Compensatory non-alarming indications are unavailable.

Consistent with the "gradation" concept, NESP-007 also lists the following example of an emergency action level corresponding to Site Area Emergency:

EXAMPLE EMERGENCY ACTION LEVEL:

- 1. The following conditions exist:

- a. Loss of (site-specific) annunciators associated with safety systems.

AND

- b. Compensatory non-alarming indications are unavailable

AND

- c. Indications needed to monitor (site-specific) safety functions are unavailable

AND

- d. Transient in progress.

Conclusion

The current guidance for treating loss-of-annunciator events in EAL schemes is adequate. In publishing Revision 3 to Regulatory Guide 1.101 endorsing NESP-007, the NRC issued the licensed power reactor community more information of value to all licensees regardless of the method they use to devise their emergency action level schemes. The admonition in Regulatory Guide 1.101 that licensees may use either NUREG-0654 or NUMARC/NESP-007 in preparing EAL schemes (but not portions of both) does not negate information and guidance that pertains to both.

February 4, 1993

Licensees may revise their emergency plans and associated EAL schemes to conform with that guidance if desired.

Original signed by
Thomas E. Murley

Thomas E. Murley, Director
Office of Nuclear Reactor Regulation

Original Signed By

Edward L. Jordan, Director
Office for Analysis and Evaluation
of Operational Data

DISTRIBUTION

Central Files
PEPB R/F
TMurley
FMiraglia
WRussell
JPartlow
FCongel
EButcher
PMcKee
LJCunningham

RErickson
FKantor
REmch
AMohseni
EJordan
RSpessard
KBrockman
NRR Mailroom (YT0920301)
MGCrutchley (YT0920301)

* SEE PREVIOUS CONCURRENCES

OFC	EPS:PEPB:NRR	SCE:PEPB:NRR	C:PEPB:NRR	TECH EDITOR	D:DRSS:NRR
NAME	AMohseni	FKantor	RAErickson	JMain	FJCongel
DATE	01/25/93*	01/25/93*	01/25/93*	01/26/93*	01/27/93*
OFC	C:IRB:AEOD	D:DOA:AEOD	D:AEOD	ADT:NRR	DD:NRR
NAME	KBrockman	RSpessard	EJordan	WRussell	FJMiraglia
DATE	1/29/93	1/29/93	2/2/93	2/4/93	2/4/93
OFC	D:NRR			2/2/93	
NAME	TMurley				
DATE	2/4/93				

OFFICIAL RECORD COPY
DRIVE/DOCUMENT NAME: G:\0920301.YT

Preliminary Sequence of Events
April 11, 1994

- Pre-transient initial conditions: Unit power at 75%, rods in manual
(All times are approximate.)

- 1016 13B circ. water pump emergency trip on travelling screen Delta P
- 1032 Power reduction initiated from ~ 650 MWe @ 1% per minute initially. Subsequently, operators increased the reduction rate to as high as 8% per minute.
- 1039 P-8 permissive reset @ 36% reactor power.
- 1043 P-10 permissive reset @ 10% reactor power.
- 1044
 - Low-low Tave bistables trip; turbine load @ 80 MWe, RCS temperature 531 degrees F,
 - Low-low Tave bistable setpoint TS allowable value ≥ 541 degrees F, trip setpoint ≥ 543 degrees F
 - Operator pulls rods to restore RCS temperature - rods pulled ~ 30/45 steps. (This occurred because during the power reduction the operator reducing reactor power was faster than the operator reducing turbine power.)
- 1047 Reactor power increases from 7% to 25% - reactor trips @ 25% setpoint - NI "power range" low setpoint (This is a "reactor startup" nuclear instrument trip.)
- 1047 Automatic safety injection on high steam flow coincident with low-low Tave.
- No first-out overhead annunciator - SI signal received on "A" channel only (The low Tave was present due to the difficulties encountered during the power reduction. The high steam flow signal cause is unknown; however, the coincident logic was satisfied twice for durations of about 10 to 20 milliseconds, and on one occasion was of sufficient duration for the "A" channel of SSPS to actuate.)
- 1058 Manually initiated main steam isolation. (Only 2 of 4 MSIVs closed at the time of the auto-initiation of SI.)
- 1100 EOP Trip-1 entered; UE declared based on Manual or Auto ECCS actuation with discharge to vessel
- 1105 EOP exit - step 36 directs SI reset; operator noticed SI Logic Channel "B" was already reset, (indicates that "B" channel had not auto-initiated) flashing light on RP4 panel indicated SI logic channel disagreement
 - Pressurizer PORVs (PR-1 + PR-2) auto open on high pressurizer pressure (indicates pressurizer was solid or nearly solid)
 - During recovery, No. 11 steam generator safety valve opened for several minutes causing RCS cooldown (by this time Tave had increased to about 552 degrees F)
- 1126 Second actual automatic safety injection - initiated by low pressurizer pressure (Low pressurizer pressure trip setpoint = ≥ 1765 psig, allowable = ≥ 1755 psig);
 - low pressurizer pressure due to RCS cooldown (due to safety valve open)

UE
poor S/C
into NRC
to NRC

S/C
Set
open
PR, PR2

SI
#2

K/22

- second auto SI received on SSPS Logic Channel "B" only
- operators initiated a manual SI just after auto SI in response to the rapidly decreasing RCS pressure

- 1141 While resetting the second SI, operator noticed that RP4 panel lights indicate SI logic channels in agreement (i.e. light no longer flashing) *Channel 1 Agreement*
- TSAS entered due to two blocked auto SI trains
- 1149 Pressurizer relief tank (PRT) rupture disk ruptures (pressurizer was either solid or nearly solid after the first auto-initiated SI at 10:47. The second auto-initiated SI resulted in sufficient relief of RCS to the PRT to raise level and pressure until rupture disk blew.) *PRT rupture disk*
- 1316 Alert declared. (This was done to ensure proper technical staff was available, licensee staff recognized that TSAS could not be met. Non-essential staff from Salem and Hope Creek were evacuated.) *ALER. EVACUATION*
- 1630 Pressurizer bubble restored, pressurizer level restored to 50%, control returned to auto *BUBBLE*
- 1715 EOPs exited, IOP-6 (Hot Standby to Cold Shutdown procedure) entered - cooldown initiated
- 2020 Alert terminated *7 HRS*
- 0106 Mode 4 entered (Hot Shutdown)
- 1124 Mode 5 entered (Cold Shutdown)

● **Abnormal conditions experienced during event:**

- Only 2 out of 4 main steam isolation valves closed on initial reactor trip/SI (13 + 14 MS 167 went closed, 11 + 12 MS 167 did not) *2/4 MSIVS CLOSED*
- Steam generator main feed pumps (2) did not trip on initial reactor trip/SI *SGFWP do not trip*
- Main feedwater isolation valves (11-14 BF 13) did not close on initial reactor trip/SI *FW did not isolate*
- Various SSPS Logic Channel "B" valves were out of position following initial reactor trip/SI; however, all ECCS pumps started and flow paths were established. *SOME SI VALVES do NOT shift*
- Initial auto SI was only detected/initiated by Logic Channel "A", with no "first out" indication.
- A second auto SI occurred on Low RCS Pressure initiated by Logic Channel "B"
- The Intermediate Range Rod Blocks and 25% equivalent reactor trip signals did not actuate
- During initial power reduction the operator placed the Rod Control in Auto (with S 3 permission) and it didn't work. *rods did not work in manual*
- An SI signal (for high steam flow coincident with low Tave) occurred for about 10-20 millisecond duration and nothing happened - is this okay? *1st Hys 4 str slow did NOT trip*

Bill Lane 4/12/94 12:45 PM

Bubble in Head at 97% per RVL5, Solen Unit 1
Cold 5/10

RT discovered RVL5 @ 93%.

Both Channels confirm

Have Head Vent,

Charlie Marshall 0645 Walkdown of CR

Both WR + NR front panel & back panel (diff channel) show 93%
Informed CRO

Core quite ~~173~~ ¹⁷³ °F, T_{sat} ≈ 265°F at 22 psig, T_{ave} ≈ 167°F

Level ind ≈ 18" void if true

All RPs currently secured

5357 How soon steady @ 93% for at least 24 hours

4/23