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R. Kendall (19)

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

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22 Oct 85

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MEMORANDUM FOR: Faust Rosa, Chief
Instrumentation and Control Systems Branch
Division of Systems Integration

FROM: Gary Holahan, Chief
Operating Reactors Assessment Branch
Division of Licensing

SUBJECT: B&W OWNERS GROUP RESPONSE TO NNI QUESTIONS

By letter dated January 11, 1985, the B&W Owners Group responded to staff questions issued September 4, 1984, regarding the Non-Nuclear Instrumentation Systems (NNI). The longer term review of this matter is aimed at a decision as to whether any further regulatory initiative is required to resolve the B&W NNI-related issues. While ICSB has the lead responsibility to develop the SER on this matter, TACS 56841 assigns ORAB responsibility to provide input for your consideration.

PLANTS TO BE EVALUATED AGAINST A SET OF CRITERIA

We believe that the question of adequacy of the various NNI systems at the B&W plants is best addressed by evaluating each plant's system against a set of criteria. We believe that this approach is the only way to resolve this issue once and for all. If all the NNI systems comply with the criteria, no regulatory initiative is warranted. To assist in this effort, we have developed the criteria in enclosure #1, which reflect the lessons learned from various actual reactor operating events, established regulatory guidance, industry standards, and previous efforts on NNI (e.g. NUREG-0667). We recommend strongly that these criteria be considered the minimum standards that should be satisfied in order to resolve the safety issues.

In addition, we analyzed the B&W responses to each of the questions. We developed a matrix of: the questions vs. plant-specific answers. Each answer was rated: good, fair, or poor. While this type of analysis is obviously subjective, it can be useful for general observations. Enclosure #2 contains the conclusions from this analysis as well as a copy of the matrix. A few of those conclusions are particularly noteworthy:

1. The newer B&W plants (which have safety-related Essential Controls and Instrumentation systems) appear to be significantly better than either of the older B&W designs.

2. Among the plants with the older NNI designs (721 design and 820 design), no plant appears, overall, significantly better than the others.

Contact: J. T. Beard, X27465

HPI INITIATION BY PROCEDURE

3. Two plants have procedures that require the operator to initiate HPCI upon the loss of NNI, whether or not a plant transient has occurred. This procedural approach should be reversed, as stated in our criteria.

When ICSB has drafted the SER, we would appreciate the opportunity to review it and discuss any comments that may arise.

for Gary Holahan, Chief
Operating Reactors Assessment Branch
Division of Licensing

Enclosures: As stated

cc w/enclosure:
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Enclosure 1

CRITERIA FOR NON-CLASS 1E INSTRUMENTATION AND CONTROLS

1. Instrumentation should include redundant and independent channels sufficient to prevent any credible failure mechanism from depriving the reactor operator of immediate access to valid indication of those plant variables that either are important to continued operation of the plant (e.g. pump seal return flow) or are important to knowing the status and performance of safety-related equipment (e.g. HPCI flow).
2. For anticipated failure mechanisms, such as degraded electric power or instrument air, invalid indications should be immediately and obviously distinguishable from valid indications.
3. Where common features (such as a power supply module or instrument air) can affect the proper functioning of instrumentation for multiple plant variables, periodic surveillance should be performed to detect abnormalities prior to the onset of failures.
4. Plant procedures should be provided which specify the operator actions to be taken in the event of losses of instrumentation. The procedures should be such that loss of information regarding plant variables by itself, does not mandate manual initiation of ESF systems. Such initiations should be reserved for: (1) events that involve loss of automatic protection, (2) events that involve a positive indication of values of plant variables for which there is a need for ESF system initiation, and (3) operator discretion.

5. The consequences of losses of instrumentation that provide input signals to plant control systems should be limited.

   (a) For anticipated failure mechanisms such as degraded electric power or instrument air, the consequences of the control system actions should not be greater than those allowable for "anticipated operational occurrences."

   (b) If the consequences of control system actions could be greater than those allowable for an "anticipated operational accurrence", the design should include testable features that will detect invalid signals and will automatically take appropriate preventative action, such as transferring out of automatic control and activating an alarm.

   (c) The design should be such that no credible failure mechanism can cause
79-27 both a plant transient and loss of all immediately accessible valid indications for any plant variable that the operator may need in responding to the transient.

   (d) The remaining valid instrumentation should have sufficient range to track the full course of the event and sufficient time resolution to portray the transient accurately.

COVERED IN ITEM 1

Enclosure 2

ORAB ANALYSIS OF SPECIFIC B&WOG NNI ANSWERS

The owners response was analyzed by developing a matrix of: the questions vs. the plant-specific responses. We rated each answer simply: good, fair, or poor. Then we reviewed the matrix for patterns based upon "poor" marks. While this type analysis is obviously subjective, we believe it has merit if one is careful regarding details. The analysis leads us to the following comments.

1. The number of "poor" marks received by the current 820 type NNI plants, as a class, is not different from the number received by the older 721 type plants (i.e. each got 8-10 "poor's" out of 27 Q's).
2. The newer plants with Essential Controls and Instrumentation (ECI) systems, as a class, get substantially fewer poor marks (i.e. 1-2 compared to 8-10).
3. All the 820 type plants got poor marks on NNI losses causing spurious operation of the steam bypasses (or atmospheric dumps) and on NNI losses leading toward RCS overcooling due to excess feedwater flow. The better plants trip the MFW pumps either automatically or as a required immediate operator action. This may be a specific question area ripe for improvements.
4. No single plant is significantly better or worse than the average.
5. The overall flavor of the responses to the series of questions on surveillance (F-Questions) is that this is a general and significant weakness for those plants where the important instruments are a mixture of safety-related and non-safety-related. This may be a specific question area ripe for improvements.

6. Certain of the questions resulted in poor marks from a significant number of the plants (i.e. 4 of 8). First, are redundant NNI indicators provided (Q:C-5). As we expected, there are single indicators with selectable inputs, with the notable exception of Crystal River-3. Second, does the control system receive false/erroneous input signals upon the loss of NNI power (Q:E-1). Yes, they all do. Third, regarding surveillance performed on instrumentation relied on for plant status, plant control and safe shutdown (Q's:F-4,-5). Unfortunately, the answer is that surveillance is performed only if formally designated as "safety-related" and required by the Technical Specifications. None of these answers is surprising.

7. Two plants (Oconee and Ranch Seco) have procedures which require the operator to initiate HPCI immediately upon loss of NNI, regardless of whether or not a plant transient exists. We believe this should be stopped.

J.T. Beard
2/24/85

		DPCO	GPUN	FPC	APSL	SMUD	TECO	TVA	SS	
A.1		GOOD	GOOD	GOOD	GOOD	POOR	FAIR	GOOD	GOOD	
A.2.		FAIR	FAIR	FAIR	FAIR	FAIR	FAIR	GOOD	FAIR	
A.3.		FAIR	FAIR	GOOD	POOR	FAIR	GOOD	GOOD	GOOD	
B1.		FAIR	FAIR	GOOD	FAIR	FAIR	FAIR	GOOD	GOOD	
B2.		POOR	GOOD	GOOD	GOOD	POOR	GOOD	GOOD	GOOD	
B3.		GOOD	GOOD	GOOD	GOOD	GOOD	GOOD	GOOD	GOOD	
B4.		FAIR	N/A	FAIR	N/A	FAIR	N/A	N/A	N/A	RG 1.97
C1.		GOOD	POOR	POOR	FAIR	GOOD	FAIR	GOOD	GOOD	FUSES.
C2.		GOOD	POOR	FAIR	POOR	GOOD	GOOD	GOOD	GOOD	ANAL. OF FUSE SIZES
C3.	(3.)	POOR	POOR	GOOD	GOOD	GOOD	GOOD	POOR	GOOD	79-27 REVIEWS.
C4.		GOOD	GOOD	POOR	POOR	FAIR	FAIR	N/A	N/A	VERIFY PRIOR TO SWITCHING SOURCES.
C5	(6.)	POOR	POOR	POOR	POOR	POOR	POOR	GOOD	GOOD	REDUNDANT INDICATORS
C6.	(3.)	POOR	POOR	FAIR	POOR	FAIR	FAIR	N/A	N/A	EX INDEPENDENCE
D1.	(*)	POOR	GOOD	GOOD	GOOD	POOR	GOOD	N/A	N/A	NPSC INITIATION REQ'D.
D2.		GOOD	GOOD	GOOD	GOOD	?	GOOD	GOOD	GOOD	DECISION TIME
D3.		GOOD	FAIR	GOOD	GOOD	FAIR	POOR	N/A	N/A	MODES
E1	(8.)	POOR	POOR	POOR	POOR	POOR	POOR	POOR	POOR	FALSE ICS INPUTS
E2.		FAIR	FAIR	FAIR	FAIR	FAIR	FAIR	FAIR	FAIR	NEED FOR NPSI
E3.	(4.)	GOOD	GOOD	POOR	POOR	POOR	POOR	GOOD	GOOD	STM BYPASS, DUMP
E4.	(4.)	GOOD	FAIR	POOR	POOR	POOR	POOR	GOOD	GOOD	EX. FW FLOW
E5.		GOOD	GOOD	GOOD	GOOD	GOOD	POOR	N/A	N/A	TO NON-ICS CONTROL
F1		FAIR	~~POOR~~ FAIR	GOOD	FAIR	FAIR	FAIR	N/A	N/A	NNI SURV.
F2		FAIR	FAIR	FAIR	FAIR	FAIR	FAIR	N/A	N/A	T.S. SURV. NOW
F3	(6.)	POOR	POOR	POOR	POOR	POOR	POOR	N/A	N/A	SURV. CONTROL, S/G
F4	(6.)	POOR	POOR	POOR	POOR	POOR	POOR	N/A	N/A	T.S SURV. CONTROL, S/G
F5		GOOD	GOOD	GOOD	GOOD	GOOD	GOOD	GOOD	GOOD	VALUE OF T.S. SURV.
G1		POOR	GOOD	GOOD	GOOD	GOOD	GOOD	GOOD	GOOD	RELIANCE ON COMPUTER
NL	27	(9)	(9)	(8)	(10)	(9)	(8)	(2)	(1)	