DWNERS GROUP

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Working Together to Economically Provide Reliable and Safe Electrical Power

Suite 525 • 1700 Rockville Pike • Rockville, MU 20852 • (301) 230-2100

January 11, 1988 OG-062

Mr. Jose A. Calvo, Director Project Directorate - IV U. S. Nuclear Regulatory Commission Washington, D. C. 20555

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References:

- Letter from Jose A. Calvo to R. P. Rogers November 24, 1987, Regarding Requests for Additional Information (RAI)
- 2) Letter from R. P Rogers to Jose A. Calvo December 22, 1987, OG-050, Regarding B&WOG Responses to NRC's RAI

Dear Mr. Calvo:

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PDR

Enclosed is the B&WOG response to Question 4 of your request for additional information (Reference 1) regarding the Safety and Performance Improvement Program, ICS/NNI Evaluation, BAW-1919, Appendix R. Responses to the other questions in the RAI were transmitted to you in December (Reference 2).

The enclosed response addresses items from a table entitled "Previously Identified Concerns" which was provided in your RAI as a supplement to Question 4. Our response covers the 63 items from the original table provided in your RAI letter as well as the 14 additional items which were received on January 5, 1988.

After review of the table and discussions with NRC Staff, the B&WOG is providing a response to each item for which a generic response can be developed. A number of the items clearly involve plant specific actions, in some cases dating back over the course of the past 10 years. For many of these concerns, the Utilities responded directly to the NRC. Per discussion with NRC Staff, we therefore refer these items to the NRC for retrieval and review of the appropriate plant specific documentation.

Goob Add: R. Kendell Hilms 11 J. Colvo

The attachment provides our response in three categories: A) Responses to items within the scope of the ICS/NNI Evaluation; B) Responses to items outside the scope of the ICS/NNI Evaluation and C) Plant specific items.

If you have questions, please call me.

Sincerely yours,

Rice Ryn

R. P. Rogers Chairman B&W Owners Group Trip Reduction/Transient Response Improvement Program

4. Subsequent to the meetings between the B&WOG and the NRC staff on April 29, 1986 and May 21, 1986, the staff prepared a feedback letter to the B&WOG dated June 24, 1986. In that letter, we stated that: "As discussed with you previously, a prime goal of the reassessment program should be to once and for all resolve all concerns identified from the staff's previous investigations of B&W reactor transients involving the NNI/ICS." In the staff's second feedback letter, dated September 12, 1986, we reiterated this point with emphasis.

The staff review of Section m, "Responses to NRC Questions Involving the NNI/ICS Evaluation," of Appendix R to BAW-1919 was not successful in finding a B&WOG response to this point.

The staff has prepared a table specifically identifying each of the previous NNI/ICS concerns, and identifying the corresponding BAW-1919 specific recommendations which address the original concern. A copy of this table is attached.

When the staff attempted to complete the table by entering the BAW-1919 recommendations, it became obvious that the assistance of the B&WOG would be helpful to assure appropriate correlation of the recommendations. Please review the staff table for proper entries in the "BAW-1919 Recommended Actions" and "References" columns of the table, and suggest appropriate changes. This action is desirable so that when the table is used to determine whether each of the previous concerns has been resolved, there will be agreement between the B&WOG and the staff with regard to which B&WOG actions address which concerns.

Table for Question Number 4

PREVIOUSLY IDENTIFIED CONCERNS

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FREVIOUS INSTRUMENTATION AND CONTROL SYSTEM RECOMMENDATIONS

AND BLUCS (BAN-1919) RECOMMENDED ACTIONS

(01(CPN	SOURCE	PECONMENDATION	BENDE (BAN-1919) RECOMMENCED ACTION	PEFEFE
FREVENTION OR NITISATION OF EFF	ECTS OF MNI/LCS	LOSSES:		
Sourious actuations of Power Monitor module trip	SMUD Letter to NPC Mar 1978	Increase overvoltage setpoint from 27 to 29 Vdc	No action identified	Not Applicitie (NA)
Avoid overcooling transients like "light bulb" event	SMUD report Jun 1978	Design should include cap/plug for lighted push-buttons	No action identified	XA
Loss of control room instrumentation	SMUD report Jun 1378	Design should include senarate Power Monitor module for selector switches and other loads on main control board	Recommendation being developed: Failure of interface signals with computer, indicators, and recorders shall not degrade NMI or ICS; buffers or isolators shall be provided	Draft System Requits Item 1.3.7 Nov 1396
Adequacy of power distribution system	SMUD report Jun 1978	Fuse all loads on Nhi-I and NNI-Y	Early BAW-1913 Recommendation: 5. CR-3 should provide fuses for all external power leaving MNI/ICS cabinets	Neetirg vith MPC Dec 1336
Adequacy of power distribution system	SMUD report Jun 1978	Determine possibility of using lover size fuses	No action identified	**
Adequacy of power distribution system	SMUD report Jun 1978	Perform tests to determine if coordination of overcurrent protection scheme is adequate and performing properly	No action identified	XA
DC pover distribution scheme	SMUD report Jun 1978	Determine possibility of improving present configuration	No action identified	XA
AFW contributes to overcooling	SMUG report Jun 1978	Auto initiation of AFW haspers operator's ability to prevent an escessively rapid cooldown rate	No action identified	NA
Failure of controls could initiate transient or inhibit mitigation of transient	NURE6-0560 p.8-2 May 1979	Reevaluate control systems and their significance to safety	BLHOG Safety Performance Improvement Program (SPIP)	BAW-1119
Loss of single NNI cabinet can cause "dryout" of both OIS6s	NURE6-0360 0.8-2 Nay 1979	Study how to eliminate signal conversions for both "startup" level channels being in single cabinet	Wo action identified	KA

	THI-2 related safety	NRC Order	Provide a Failure Modes and	BLUDE CONTRACTOR ALL ALL	
//	significance	(to SMUD) May 1979	Effects Analysis (FREA) of ICS	perform FMEA; led to BAW-1564	844-1544 Aug 1979
12	Auto-initiation of AFW	NURE6-0578 Item 2.1.7.a Jul 1373	Provide auto-initiation of AFW	B&W and licensees proposed new Emergency Feedwater Initiation and Control system (EFIC)	Meetie; vith xFC Sep 1950
/3	Unreliable pover supply system	BAW-1564 Sec.3.1.a Aug 1979	Review NN1/ICS power supply reliability for possible changes to enhance reliability and safety	Recommendation being developed: Design shall include quality redundant power sources such that the loss or degradation of one will not cause NMI or ICS to challenge safety systems	Draft System Requits Item 1.3.2.a Nov 1986
. 14	Unreliability of input signals	BAW-1564 Sec.3.1.5 Aug 1979	Review input signals from the MI/RPS system to the ICS, specifically, the RC flow signal, for possible changes to enhance reliability and safety	Recommendation being developed: Single analog input signal failures shall not result in spurious control action that causes trip or challenge of safety system; design shall auto select valid indications and inputs for ICS	Drait System Requits Items 1.3.4, 1.3.3.7 Nov 1986
15	Systea stability	8AW-1564 Sec.3.1.c Aug 1373	Review the ICS/BOP system tuning, particularly feedwater condensate systems and the ICS controls, for possible changes to enhance reliability and safety	Recommendation being developed: Plant control should respond without instability and with proper responses to avoid initiation of upsets or transients; system should be tuned every other refueling outage	Drait System Requits Item 3.4 Mov 1986
16	Loss of both main feedwater pumps due to ICS failure	BAN-1564 Sec.3.2.a Aug 1379	Review for possible changes to enhance reliability and safety by preventing or mitigating the consequences of loss of oil pressure when the ICS drives the pump back to minimum speed stop	No action identified	*4
17	Steam generator overfill and overcooling due to ICS failure	BAW-1564 Sec.3.2.5 Aug 1979	Review for possible changes to enhance reliability and safety by preventing or mitigating the consequences of inadvertently opened feedwater startup valve	Recommendation being developed: Upon loss of all NNI/ICS power the systems shall position actuated equipment to minimize potential for overheating or overcooling the primary system	Draft System Requits Item 1.3.3.a Nov 1786
18	Overcooling due to ICS failure	8AW-1564 Sec.3.2.c Aug 1379	Review for possible changes to enhance reliability and safety by providing means to prevent or mitigate the consequences of open turbine bypass valve	Recommendation being developed: Upon loss of all NNI/ICS power the systems shall position actuated equipment to minimize potential for overheating of overcooling the primary system	Draft System Requits Item 1.3.3.a

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19	Loss of power to controls and to control rocs instrumentation	1E Bulletin 79-27 Action 1.b Nov 1979	Review buses supplying power to ILC systems that could affect the ability to achieve cold shutdown; identify ILC loads and evaluate loss of power to these loads; describe proposed design modifications	Recommendation being developed: Upon itss of any one external (ac) or do pover source, the NNI or ICS will not cause an unnecessary challenge to RPS or safety systems	Draft System Regoits Itens 1.3.2.4, 1.3.2.5 Nov 1386
20	Weatnesses in BLWOS FMEA (BAN-1564, Aug 1973)	ORML review of BAN-1564 Sec.6.2.1 Jan 1980	A fault tree for loss of freedwater should be developed based on equipment diagrams rather than functional blocks	No action identified	NA
21	Weaknesses in BLWOG FMEA	ORML review of BAN-1564 Sec.5.2.2 Jan 1980	The FMEA should have included other systems with which the ICS interacts, such as PMI and power sources	No action identified	**
22	Weaknesses in BANDS FMEA	ORML review of BAN-1564 Sec.6.2.3 Jan 1980	Power supply failures should be evaluated in detail and specific recommendations developed	No action identified	XA
23	Weaknesses in BLWOG FMEA	ORML review of BAN-1564 Sec.5.2.4 Jan 1380	Simulatica tools used were deficient in their dynamic range and component details	No action identified	RA
24	Weaknesses in BLWOG FREA	ORML review of BAW-1564 Sec.6.3.1.1 Jan 1980	Improvement is needed in areas of NMI/ICS system arrangement, channeling, and selection of input signals	No action identified	KA
25	Weaknesses in BLWOG FMEA	ORML review of BAW-1564 Sec.6.3.1.3 Jan 1380	Since there is a tight coupling between the secondary system which is controlled by the ICS and the primary system, dynamic performance should be studied, including effects of control limitations on plant stability	BLWDG SPIP Independent Sensitivity Study	BAN-1913 Sec. V Aug 1985
26	Consequences of loss of MIE pover	MEC Seneric Letter Mar 1980	Address each CR-3 proposed corrective action in terms of applicability to your plant	Various plant-specific actions	XA
27	Consequences of loss of KNI power	NRC Generic Letter Mar 1980	Expand review under IE Bulletin 79-27 to include implications of CR-3 event Lof Feb 26, 19801	Various plant-specific actions	XA.
2.8	Loss of power supply	Industry review of CR-3 event NSAC-3 INFO-1 Rec 111.A.1 Mar 1980	Investigate and take corrective action regarding need for backup or bus transfer capabilities	Reconsendation being developed: For ac power leaving NMI/ICS, system shall have automatic transfer to redundant source	Jralt System Requits Item 1.3.2.4 Nov 1996

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29	Close electrical couplings	NSAC-3 R+c.111.A.2 Mar 1980	Investigate and tate corrective action regarding coupling of indication, control, and computer input signals	Recommendation being <u>considered</u> : Upon loss of NNI or ICS power, the affected control function shall take appropriate defensive action or go to sefe state; possible paths to solution are given	Drait Paths to Solution: Probles 2 Aug 1986
30	Spurious control system actions	NSAC-3 Rec.111.A.3 Mar 1980	Investigate and take corrective action regarding PORV opening and its failure modes due to voltage variations	Various plant-specific actions	NA
5/	Spurious control system actions	NSAC-3 Rec.III.A.4 Mar 1980	Investigate and take corrective action regarding the susceptibility of control systems to incorrect information caused by electrical faults, e.g. choking off feedwater	Early BAW-1919 Recommendation: 4. Redundant dc pover supplies should be installed for NNI-Y at ANO-1 7. Incorporate auto selection of valid input signals for indication and control.	Meeting with MPC Dec 1985
32	Electrical cross-contamination of instruments channels and also of controls	NSAC-3 Rec.111.A.5 Mar 1980	Investigate and take corrective action regarding use of selector switches; where practical conduct field tests	No action identified	RA
33	Loss of auto-start of AFW	NSAC-3 Rec.III.A.6 Mar 1980	Investigate and take corrective action regarding "mid-scale" instrument failures that can cause, for example, loss of auto-start of AFW due to steam generator level indication appearing to be higher than act: i	Recommendation being developed: Back to committee for additional details	Meeting with MCC Dec 1985
34	Effects of loss of single bus	NSAC-3 Rec.111.A.7 Mar 1980	Investigate and take corrective action regarding assignment of instruments to specific buses to assure as much redundancy as possible	No action identified	XA
35	Spurious loss of heat sint	NSAC-3 Rec.111.C Mar 1980	Investigate and take corrective action regarding isolation of steam generators spuriously by the Steam Generator Rupture Matrix or equivalent systems	Recommendation being considered: Provide filters on input OISG level signals that can cause spurious actuations	BAH-1919 App. H Action 10 p.3-31 Aug 1985
14	Effects of loss of instrumentation power	NRC Orders (CR-3 event) Apr 1380	Determine effects of various combinations of loss of instrumentation and control functions by design review analysis and verification by test	No action identified	¥4

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37	Spurious c:-trol system actions	NPC Orders Apr 1380	Correct electrical deficiencies which may allow the PORV and pressurizer spray valve to open on NNI power failures (3##30)	Various plant-specific actions	NA
35	ICS control of AFM	NURE6-0667 Pec.2.2.2 Ray 1980	AFW should be automatically initiated and controlled (OISS level) by a safety-grade system independent of NNI, ICS, and other non-safety system	RLW and licensees proposed new Emergency Feedwater Initiation and Control system (EFIC)	Meeting with KEC Sep 1983
39	Electrical cross-contamination within power distribution, signal paths, and ICS itself	MURE6-0667 Rec. 5.a May 1980	Pover buses for NMI and signal paths of NMI should be separated and channelized	No action identified	NA
40	Undesirable failure modes of power source, signal source, and ICS itself	MURES-0667 Rec. 5.d May 1980	ICS should have provisions for detecting gross failures and taking appropriate defensive action	Early BAW-1919 Recommendation: 1. Assure that plant will go to safe state without operator action upon loss of NMI/ICS power	Meeting with RPC Dec 1986
4 1	leplementation of existing recommendations	NUREG -0667 Rec. 5.f May 1980	Prompt followup action should be taken on BAM-1564 recommendations	Early BAM-1319 Recommendations 3. Remove from HNI/ICS any initiation and control functions for AFW or atmospheric dump valves 10. System tuning shall be performed every other refueling outage	Meeting with MPC Dec 1986
42	Implementation of existing recommendations	MURE6-0667 Rec. 5.g May 1380	Evaluate NSAC-3/INPO-1	See entries above	KA
43	Implementation of existing recommendations	MURE6-0667 Rec. 5.h May 1980	Prompt followup action should spo be taken on IE Bulletin 79-27	See entries above	NA
44	Numerous and complicated operator actions necessary	MUREG-0667 Rec. 11 May 1980	Modifications should be made to reduce manual immediate actions	Early BAN-1919 Recommendation: 1. Assure that plant will go to safe state without operator action upon loss of NHI/ICS power	Meeting with MPC Dec 1995
45	Reliable initiation of AFW	MURE6-0737 11.E.1.2 Nov 1380	Install auto-initiation of AFW independent of ICS	See entry above	XA
44	Salety-grade auto-initiation of AFW	MRC Order (to SMUD) Mar 1983	Install safety-grade auto- initiation of AFW during the 1983 refueling outage	Plant-specific actions	XA

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47	Unreliable power sources	IE Info Notice 81-80 Nov 1394	Consider installation of automatic bus transfer switch between ac buses	Recommendation being developed: WNI and ICS shall be designed that a: power leaving the system shall have an auto transfer	Draft System Peqe'ta Item 1.3.2.d Nov 1981
48	Complex operator actions necessary	IE Info Notice 84-80 Nov 1984	Consider providing single manual action that would place computer points (backup info source) on analog trend	No action identified	NA
49	Avoiding unnecessary failure mechanisms	IE Info Notice 84-80 Nov 1984	Consider scheduling of calibration of MNI and ICS dc pover supply alars and trip setpoints every refueling outage	Recommendation being developed: System calibration shall be performed every other refueling outage	Oralt System Requits Item 3.3 Mov 1386
50	Avoiding unnecessary failure mechanisms	IE Info Notice 84-80 Nov 1984	Consider modification to eliminate mounting of electrical contacts on doors of WNI/ICS cabinet doors	No action identified	KA.
57	Acceptability of systems that isolate the steam generators	NURES-1154 Frinc.Con- clusion. 6 July 1985	SFRCS at Davis-Besse does not neet single failure criterion	No action identified	XA

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ADEQUACT OF REMAINING/BACKUP INSTRUMENTATION AVAILABLE TO THE REACTOR OPERATOR:

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52	Availability of control room info on RCS loops	SMUD report Jun 1978	Study the practicality of providing indication for both RCS loops even though MNI-I or NNI-Y power is inoperative	No action identified	XA
53	Availability of minimum indicators for safe shutdown	IE Bulletin 79-05A Apr 1373 /	Assure that indications for the minimum set of plant variables needed for safe shutdown will be available	No action identified	XA
54	Operator information	NRC Orders (to SMUD) May 1979	Provide for timely operator notification of auto initiation of AFM	No action identified	NA
55	Operator information	NRC Orders (to SMUD) May 1979	Provide timely verification to operator of AFW flow to 0158	No action identified	XA
56	Valve position indication	NURE6-0578 Item 2.1.3.a Jul 1979	Provide positive valve position instrumentation for PORVs and safety valves	Various plant-specific actions	XA

57	Loss of indication of main feedwater flice	PAW-1564 S+c.3.2.a Aug 1979	Review for possible changes to enhance reliability and safety regarding ICS failures that can result in driving the main feedwater pumps to minimum speed stop	No action identified	NA
R	Alars on 1:13 of 12C bus pover	1E Bulletin 79-27 Action 1.a Nov 1979	Review buses supplying power to 14C systems that could affect ability to reach cold shutdown; identify and review for each the alarm/indications provided in the control room to alert operators to the loss of power to the bus; describe any proposed design modifications	Recommendation being developed: Alarms in main control room shall allow operator to determine specifically which power source has failed, for MNI and ICS power; ac and dc sources are alarced separately	Drait System Requits Item 1.3.3.c Nov 1986
57	Loss of control room indications	NRC Beneric Letter Mar 1980	Address information available to the operator including how the operator determines which information is reliable and including identifying what information is needed to bring the plant to cold shutdown	Recommendation being developed: When KNI/ICS fails, status of instrumentation in control room is readily recognizable by the operator	Draft System Requits Item 1.3.3.5 Mov 1986
60	Verification of adequacy of control roce indications	NRC Generic Letter Mar 1980	Address the feasibility of performing a test to verify that reliable information will remain	No action identified	KA
61	Malperformance of alarms; loss of information	NSAC-3 Pec.111.8.1 Mar 1980	Investigate and take corrective action regarding instances of alarms conditions returning to normal without any prior indication of having reached an alare state; including loss of computer info due to overload and loss of computer data on in-core temperatures below 700 degrees f.	No action identified	KA
62	Loss of bactup info from plant computer	KSAC-3 Rec.111.8.2 Mar 1980	Investigate and take corrective action regarding loss of transient monitoring and recording due to lack of recording of plant parameters independent of the plant computer	No action identified	XA
63	Indications of lost control functions	NRC Orders Apr 1980	Mate changes in equipment and control systems to give clear indications of functions which are lost or unreliable	No action identified	NA

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64 confusing or sisleading indications to operator	MURES-066 Rec.3.5 May 1980	7 Power supply arrangements should be reconsidered to eliminate "mid-scale" failures as a preferred failure mode fo instrumentation	Recommendation being developed Back to committee for additional detail	: Meeting vith NR Dec 1988
65 Parkup instrumentation	NURES-0667 Rec.3.c Nay 1980	Multiple instrument failures should be unambiguously indicated to guide operator selection of alternate instrumentation	Recommendation being developed When NNI/ICS fails, status of instrumentation in control room is readily recognizable by the operator	Draft System Requits Item 1.3.3.b Nov 1986
44 Availability of control room info on RCS loops	MURE8~0667 Rec.5.e Nay 1980	Study the practicality of providing indications for both loops; one channel could be on NNI-I, the other on NNI-Y, instead of loop "A" being powered by NNI-I and loop "B" being powered by NNI-Y	No action identified	NA .
67 Adequacy of remaining or backu instrumentation	B MUREB-0667 Rec.6 May 1980	Establish the minimum set of parameters needed (recommended list included); instrumentation for these should be reliable, redundant, meet safety system standards; at least one channel for each parameter shall be recorded for trending etc	No action identified	ĸ
C 8 Redundancy of core temperature instrumentation	MURE8-0667 Rec.7 May 1980	Plant designs should include flexibility to substitute combinations of in-core thermocouples for hot-leg loop RT/s as input to subcooling instrumentation; in-core thermocouples should be continuous or on a trending lisplay	Various plant-specific actions	
69 Backup indications for transients/accidents	MRC Reg P Guide 1.97 y Bec 1982 cu	rescribes a minimum number of ariables to be monitored in ontrol room	Various plant-specific actions A	
O Adequacy of operator aids	IE Info Co Notice MR 84-80 in Nov 1984	maider revising plaques on I panels to more correctly dicate system functions	No action identified No	

-71 Adequacy of control room instrumentation

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Princ. Conclusion 18 Jul 1985

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NURES-1154 Normal instrumentation available in control room was not adequate to clearly inform operator that criteria for MU/HP1 cooling had been reached; the alternative SPDS was not available and not required to be available

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No action identified

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PROCEDURES FOR OPERATOR RESPONSE TO WNI/ICS LOSSES:

72 Adequacy of Safe shutdown capability	SMUD report Jun 1978	Procedures should be developed for safe shutdown upon total loss of MMI-X or WMI-Y power	Recompendation being considered: Procedures should be developed which direct operators on appropriats action to be taken on loss of system and motive power	Draft Paths to Solution Problem 3.1.a Aug 198
73 Loss of power to 14C bus	IE Bulletin 79-27 Action 2 Wov 1979	Prepare emergency procedures to achieve cold shutdown upon loss of power to each bus supplying power to I&C systems; include: a) alarms and indicators of the loss; b) use of alternate instruments/controls powered by other buses; c) restoration of power to bus; describe any design modifications or admin controls necessary to implement such procedures	See entry above	NA.
74 Avoiding transients lite 78-3 of 2/26/80	NURE6-0667 Rec.13 May 1990	Lectures should be developed and promptly given to all operators regarding CK-3 event and own plant-specific analysis of loss of NNI power; evaluate this training	Various plant-specific actions	KA
75 Implementation of existing recommendations	RURES-0667 Rec.14 Nay 1980	Develop and promptly implement plant-specific emergency procedures for loss of NMI or ICS pover; BbW development of ATDG endorsed; full utility support for ATDG recommended	Various plant-specific actions	NA.
74 Lack of training	NURE8-0667 Rec.15 May 1980	Provide simulator training on overcooling, undercooling events et al.	Various plant-specific actions	**

77 Adequacy of operator aids

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IE Info Consider revising operating Notice procedure MMI drawings to more 84-80 correctly indicate system Nov 1984 functions; revise plant training menual

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No action identified

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Responses to Table Items

A. ITEMS WITHIN THE SCOPE OF THE ICS/NNI EVALUATION

- Recommendation TR-038-ICS resulted from the B&W Owners Group 1. ICS/NNI Evaluation and provides for the development and implementation of a preventive maintenance program for the The ICS/NNI Evaluation final report, BAW-1919, ICS/NNI. App. R, program document "o" defines a recommended preventive maintenance program. This program includes the power supply monitor and one of its specific intents is to minimize the likelihood of spurious actuations of the 820 system power monitor modules. Appropriate preventive maintenance measures are considered by the B&WOG as more effective in accomplishing this objective than setpoint changes of the type suggested here. In addition, TR-039-ICS also addresses the underlying issue of spurious power supply monitor trips by wiring directly to the output bus, in accordance with the original design intent.
- 2. Prompted by events such as the Ranche Seco "light bulb" event of 1978, the implementation of proper fusing for ICS and NNI system loads was one of the earliest areas of reliability improvement addressed by B&WOG Utilities. Modifications at each plant to incorporate such fusing had been complete at most plants long before the inception of the B&WOG SPI Program. These modifications were among those described in detail to the NRC by the B&WOG I&C Committee during a series of meetings in 1984. However, system fusing was <u>again</u> re-examined under the SPIP ICS/NNI Evaluation. Recommendation TR-103-ICS addresses the fusing of external power leaving the ICS/NNI and is being expanded to include all plants and proper fuse coordination.
- 3. The underlying concern for this item is that failures of interfacing signals not degrade ICS or NNI performance. This concern was considered in the B&WOG ICS/NNI Evaluation, and resulting recommendation TR-194-ICS, which is being revised to include all B&WOG plants, addresses this concern.
- 4. See response to item 2 in this document.
- 5. See response to item 2 in this document.
- Recommendation TR-188-ICS answers this concern by addressing tests of the ICS and NNI power supplies to insure they will perform properly.
- 7. Another major area of reliability improvement undertaken by the B&WOG utilities before the B&WOG SPI Program was improved power distribution to the ICS/NNI systems. These improvements, which were also described to the NRC in 1934, included the installation of redundant AC feeds, the incorporation of Automatic Bus Transfer (ABT) devices for AC

loads and the installation of redundant DC power supplies for the 820 plants. During the ICS/NNI Evaluation, this area was again examined. The objective of this reexamination was to develop recommendations, where necessary, to assure that the improvements had been implemented at all B&WOG plants. This review resulted in several recommendation including TR-013-ICS, which provides for installation of equipment necessary to prevent loss of the \pm 24 VDC power supplies due to the loss of a single AC source and TR-102-ICS which recommended installation of redundant DC power supplies for NNI-Y at ANO-1.

- 9. The NRC response referencing the B&WOG Safety Performance Improvement Program (SPIP) is appropriate.
- 10. Recommendation TR-104-ICS, provides for automatic selection of valid input signals, will provide input signals to the ICS so that a loss of NNI-X or -Y, individually, will not cause a unwanted control actions resulting in a dryout of both OTSG's. Also, recommendation TR-097-EFW separates AFW/EFW initiation and control from ICS/NNI which prevents loss of NNI-X or -Y from causing steam generator dryout. In addition, see response to item 17 in this document.
- 11. Under the SPI Program ICS/NNI Evaluation, the B&WOG I&C Committee performed detailed plant specific FMEA's of the ICS/NNI for each operating plant except Oconee, which was covered by a recent similar FMEA performed under contract to the NRC. The FMEA's, which were based on detailed modeling of a reference plant and plant-by-plant analysis by exception for other plants, included power supply failures, input failures, NNI failures (for appropriate selector switch configurations) and output failures. Additionally, the B&WOG included in the scope of the FMEA effort a study of the plant response of the B&W-designed plant to the effects of failures within ICS/NNI postulated during the plant specific FMEAs. This effort therefore resulted in a complete and detailed examination of ICS/NNI failures and their consequences.
- 13. See response to item 7 in this document.
- Recommendation TR-104-ICS provides for automatic selection of valid inputs for the ICS/NNI and will greatly reduce the likelihood of unreliable input signals.
- 15. The principal focus of the B&WOG on system stability has been on improvements in tuning. Recommendation TR-107-ICS addresses system and subsystem tuning and required that such tuning be performed at a frequency of at least every other refueling outage. Additionally there have been other recommendations developed which affect stability, such as

TR-010-JCS and TR-C11-ICS, involving system hardware modifications to improve stable performance.

- 17. Recommendation TR-178-ICS was developed to assure that each plant will go to a "known safe state" upon losses of ICS or NNI power. A heat balance should be maintained by either automatic control and/or operator actions, which implies the prevention of overcooling or overheating.
- 18. See response to item 17 in this document.
- 19. See response to item 7 in this document.
- 20. See response to item 11 in this document.
- 21. See response to item 11 in this document.
- 22. See response to item 11 in this document.
- 23. See response to item 11 in this document.
- 24. See response to item 11 in this document.
- 25. See response to item 11 in this document.
- 28. See response to item 7 in this document.
- 29. See response to item 17 in this document.
- 31. See response to item 14 in this document.
- 32. Recommend cion TR-104-ICS provides for implementation of an automatic selector device for acquisition of valid input signals for control and indication. BAW-1919, App. R, program document "f" addresses the concern of electrical cross-contamination between instrumentation channels "X" and "Y" as it exists <u>before</u> implementation of TR-104-ICS. Implicit in the recommendation, however, is that redundant, "non-cross contaminated" signals must be supplied to the selector device in order for it to accomplish its intended purpose. Thus implementation of TR-104-ICS will address the underlying concern about cross contamination.
- 33. Sevaration of AFW control from the ICS/NNI was accomplished a' most B&WOG plants long before the SPI program. This action is addressed by recommendation TR-097-EFW and has now been completed at all plants.

See response to question 6 of the NRC's Request for Additional Information (Letter from R.P. Rogers to Jose Calvo, OG-050, dated December 22, 1987).

- 34. The plant specific FMFA's, described above in the response to item 11, addressed this concern. A related result of these FMEA's was ICS/NNI Evaluation recommendation TR-182-ICS which recommends the installation of an ABT for the main feedwater pump controllers to reduce the consequences of a loss of a single bus. Also see response to item 14 in this document.
- 36. See response to item 11 in this document.
- 39. See response to item 32 in this document.
- 40. See response to item 17 in this document.
- 41. See the response to item 33 with regard to separation of AFW control from the ICS/NNI.

In addition to separation of AFW control from ICS/NNI, recommendation TR-097-EFW also recommends removal of the ADV's from the ICS control.

- 44. See response to Question 19 of the NRC's Request for Additional Information (Letter from R.P. Rogers to Jose Calvo, OG-050, dated December 22, 1987)
- 47. All plants now have an Automatic Bus Transfer (ABT) to provide reliable power to system loads. See response to item 7 in this document.
- 49. See response to item 1 in this document.
- 57. See response to items 14 & 17 in this document.
- 58. Recommendation TR-012-ICS provides for proper indication to the operator upon loss of NNI or ICS power.
- 59. Recommendation TR-154-ICS provides for unambiguous indication to the operator on the status of control room indicators or recorders on losses of ICS/NNI power of signal.
- 63. See response to item 59 in this document.
- 64. See response to item 33 in this document.
- 65. See response to item 59 in this document.
- 72. See response to item 17 in this document.
- 77. Recommendation TR-105-ICS calls for each Utility ic perform a field verification of ICS/NNI drawings to assure that they are up to date and are correct. A revision to this

recommendation is being reviewed for approval that will, in addition, call for the drawings to be upgraded for legibility and to indicate NNI output functions, signal input ranges, interlock functions, power supply dependence (NNI-X or -Y), and coordination of references about relay contact locations.

B. ITEMS OUTSIDE THE SCOPE OF THE ICS/NNI EVALUATION

- For a response to this area of concern, please refer to BAW-1919, Appendix Q, pages 1-2, 3-3, 3-4 and 3-8. Also see B&WOG recommendation TR-155-EFW.
- 12. The B&WOG utilities have installed Safety Grade Emergency Feedwater Initiation and Control systems and have separated control of EFW/AFW from the ICS/NNI.
- 16. Recommendation TR-017-MFW addresses the general area of concern involving interactions between the ICS and the feedwater pump turbine control system. This includes actions to eliminate unwanted dependence of turbine control oil pressure on pump speed.
- 35. The B&WOG has responded to this concern with a recommendation for filtering of steam generator lavel signals where required, TR-052-SFI.
- 38. See response to item 12 in this document.
- 45. See response to item 12 in this document. In addition, the B&WOG has developed a recommendation, TR-166-EFW, to monitor EFW/AFW unavailability.
- 46. See response to item 12 in this document.
- 53. For a response to this area of concern, please refer to B&WOG recommendation TR-062-ICS and the report of the "B&WOG review of the June 9, 1985 Davis Besse Loss of Feedwater Transient" by the B&WOG NUREG 1154 Task Force, published in August 1986, page 3-41.
- 54. Please refer to B&WOG Operator Support Committee recommendation TR-158-OPS and to BAW-1919, Appendix S, page 3-5.
- 55. See response to item 54 in this document.

C. PLANT SPECIFIC RESPONSES REQUIRED

Requests for responses to the following items should be addressed to each specific Utility:

26. 27. 30. 37. 42. 43. 48.

- 50. IE Notice 84-80 does not involve a recommendation to "eliminate mounting of electrical contacts on doors of NNI/ICS cabinet[s]..." as is stated in the NRC table. Instead it involves assuring that cabinet doors do not contact power supply wiring. Information about the Utility actions with respect to this IE notice must be obtained directly from each specific B&WOG Utility.
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