



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

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MEMORANDUM FOR: Thomas E. Murley, Director, NRR
Thomas T. Martin, Regional Administrator, RI
Edward L. Jordan, Director, AEOD ←
Eric S. Beckjord, Director, RES

FROM: James M. Taylor
Executive Director for Operations

SUBJECT: STAFF ACTIONS RESULTING FROM THE INVESTIGATION OF THE
AUGUST 13, 1991, INCIDENT AT NINE MILE POINT UNIT 2
(NUREG-1455)

An advance copy of the subject report was transmitted to you by memorandum dated October 11, 1991, from the Nine Mile Point IIT team leader, Jack Rosenthal. The report documents the team's efforts in identifying the circumstances and causes of the August 13, 1991 incident, together with findings and conclusions which form the bases for followup actions.

The purpose of this memorandum is to identify and assign responsibility for generic and plant-specific actions resulting from the investigation of the Nine Mile Point incident as documented in NUREG-1455. In this regard, you are requested to review the enclosure which specifies staff actions resulting from the investigation of the Nine Mile Point incident. You are requested to determine the actions necessary to resolve each of the issues in your area of responsibility and, where appropriate, identify additional staff actions or revisions as our review and understanding of this event are refined.

Although not identified as a specific problem during the Nine Mile Point Unit 2 event, the IIT identified a vulnerability of electronic components to ground faults and electromagnetic emissions generated by a transformer fault. I have not indicated any staff actions in the enclosure for this vulnerability because of staff actions already underway. The Office of Nuclear Reactor Regulation previously identified to the Office of Regulatory Research the need to develop a regulatory guide that addresses acceptance criteria for electromagnetic interference, surge withstand capability, and radio frequency interference in digital systems.

I intend to monitor the resolution of each action item. Within 30 days of the date of this memorandum, please provide a written summary of the plans, schedule, status, and point of contact for each item within your area of responsibility listed in the enclosure. In addition, I request that you prepare a written status report on the disposition of your items (and anticipated actions for uncompleted items) within six months.

The resolution of the plant-specific actions is to be documented in a single report and each generic action item will be individually tracked via the EDO's work item tracking system (WITS). Overall lead responsibility for the preparation of the staff's single report on plant-specific actions rests with


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Enclosure

Region I. Other offices involved in plant-specific actions are to coordinate their efforts with Region I. The Director, AEOD, will prepare a closeout report which identifies the resolution or disposition of each IIT finding and conclusion. Thus, the Director, AEOD, should also be kept informed as to the resolution or disposition of each action item assigned. In accordance with the revised NRC Manual Chapter 0513, "Incident Investigation Program," the resolution of each IIT finding and conclusion is subject to independent assessment as to its adequacy and completeness and further action may be taken at a later date. Where a significant policy question may be involved in the resolution of an action item, it is requested that I be notified so that the need for review by the Commission may be evaluated. Additionally, you should determine whether any corrective action deemed necessary or appropriate will result in plant-specific or generic backfitting and, if so, ensure that the procedures in NRC Manual Chapter 0514 and the CRGR Charter are followed.

The enclosure is based on the Nine Mile Point IIT's findings and conclusions contained in NUREG-1455. Accordingly, it does not include all licensee actions, or cover all NRC staff activities associated with normal event follow-up such as facility inspections or possible enforcement actions. These items are expected to be defined and implemented in a routine manner.



James M. Taylor
Executive Director for Operations

Enclosure: Staff Actions Resulting
From the August 13, 1991,
Event at Nine Mile Point,
Unit 2

cc w/enclosure:
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STAFF ACTIONS RESULTING FROM THE INVESTIGATION
OF THE AUGUST 13, 1991, INCIDENT AT NINE MILE POINT
UNIT 2 (REFERENCE: NUREG-1455)

1. Issue: Adequacy of Uninterruptible Power Supply Installations
(Reference: Sections 1, 3.2, 4.3.4, 4.3.5, 4.3.6, and 8.4)

At Nine Mile Point 2 the nonsafety-related UPS that were lost obtained control logic power from an ac maintenance power source within the plant but external to the UPS itself and hence, subject to the electrical perturbation due to the fault of the main transformer. The preferred source would be internal to the UPS or a stable dc source not susceptible to similar electrical perturbations. All five UPS were identical and hence, all subject to the same design problem. A similar arrangement may exist in other installations, including safety-related installations, at other plants where an UPS or discrete inverter is used to power instrumentation and control loads.

At Nine Mile Point 2, the nonsafety-related UPS that were lost contained internal batteries that could have maintained logic functions when the logic power ac input was lost. However, the batteries had not been replaced for several years and were, therefore, dead when called upon to function. Testing and periodic replacement of the control logic power supply batteries was not part of the preventative maintenance program. In addition, the technical manual was not clear on the purpose of the batteries. The manual indicated that the batteries needed periodic replacement every 4 years. However, this time was too long given internal environmental temperatures. A comprehensive consolidated list of maintenance requirements was not provided. A similar lack of maintenance or maintenance weaknesses may exist with other UPS installations, including safety-related installations, at other facilities.

<u>ACTION</u>	<u>RESPONSIBLE OFFICE</u>	<u>CATEGORY</u>
a. Evaluate the need to review the adequacy of design for safety and nonsafety-related UPS with regard to similar vulnerabilities. Specifically include consideration of the normal source of logic power, other dependencies external to the UPS, and the potential use of the Exide UPSs that failed at NMP-2 in safety-related applications.	NRR	LWR Generic

<u>ACTION</u>	<u>RESPONSIBLE OFFICE</u>	<u>CATEGORY</u>
b. Evaluate the actions taken by the licensee at NMP-2 to address design and maintenance issues for the UPS.	Region I/ NRR	Plant-Specific
2. Issue: Adequacy of Instrumentation and Emergency Operating Procedure Integration (Reference: Sections 1, 3.3, 4.5, 5.3, 5.4, 5.5, 5.6, 8.2 and 8.5)		

At Nine Mile Point 2 loss of the control rod position indication required operators to enter their procedures for ATWS. This complicated the recovery actions by imposing additional tasks and constraining operator actions with regard to level and pressure. In addition, loss of front panel neutron monitoring indication and other display unnecessarily compounded the operators' tasks. For Nine Mile Point 2, other BWR's, and some PWR's rod position indication is powered from a single source, typically a nonsafety-related instrument bus. (Note: BWR 6 have dual control rod reed switches). Failure of that bus may cause a reactor scram due to loss of BOP instrumentation and control. Under such circumstances, operators are challenged by a transient with loss of rod position and front panel neutron flux indications. This may place an undue burden and reliance on the plant operators to sort through misleading indicators during a high stress and confusing event.

A minimum complement of instrumentation to safely shut down a plant has been previously provided within the normal licensing process and following IE Bulletin 79-27. Subsequent actions such as the "detailed control room design reviews" and development of symptom based FOPs should have provided a reasonable degree of integration of procedures, potentially ambiguous indication, human factors considerations, and operator workload. However, when the integrated picture is reviewed in response to this event, there appears to be undue burden and reliance on operators for loss of some instrument buses. The IIT was not able to provide specific bases to generalize the concern to other events and other plants. However, NRC staff reviews in these areas have not been fully integrated. Thus, there is concern that the problem may be a broad one.

<u>ACTION</u>	<u>RESPONSIBLE OFFICE</u>	<u>CATEGORY</u>
a. Audit EPGs for instrumentation associated with manual operator actions for the following four (4) critical safety functions:	NRR	LWR Generic
1. Reactor Pressure Vessel (RPV) Control - Level and Pressure		
2. Primary Containment Control		
3. Secondary Containment Control		
4. Radioactivity Release Control		

<u>ACTION</u>	<u>RESPONSIBLE OFFICE</u>	<u>CATEGORY</u>
b. Review the loss of power vulnerability of these instruments.	NRR	LWR Generic
c. Evaluate the need for alternate RPI or providing safety-grade power.	NRR	BWR Generic
3. Issue: Adequacy of Emergency Operating Procedures and Associated Training (Reference: Sections 1, 3.3, 5.3, 5.4, 5.5, 5.6, 8.2, 8.7 and 8.8)		

Generally, the emergency operating procedures (EOPs) and associated training were helpful to the operators in coping with the event. However, some shortcomings were noted by the IIT. The EOPs are based on the assumption that control of key parameters, such as reactor power, pressure, and level, are of equal importance and are to be addressed with equal priority. They are taught that actions to control one parameter affect other parameters. At Nine Mile Point, operators were directed to restore reactor water level using the reactor core isolation cooling system (RCIC) which in conjunction with unisolated plant steam loads caused a significant pressure reduction. They were also directed to stabilize pressure until they determined that the plant would remain shutdown. They had no direction as to which parameter took priority and had not received training in how to control decreasing pressure while increasing level simultaneously.

The procedures provide a useful roadmap, but by design contain few directed actions, or equipment oriented anticipatory actions. The Nine Mile Point post-scrum procedure was not integrated and complementary to the EOPs.

During the event, the operators had to cope with a reactor trip with loss of annunciators, as well as other instrumentation and control issues. They had not been trained on loss of all annunciators alone, nor in conjunction with a plant scram. Loss of annunciator training had been planned. Loss of an instrument bus can cause a plant scram due to loss of BOP instrumentation and control, and loss of many annunciators.

<u>ACTION</u>	<u>RESPONSIBLE OFFICE</u>	<u>CATEGORY</u>
a. Evaluate the need to review the adequacy of BWR EPGs with respect to: prioritization of control of critical safety functions and the adequacy of guidance on stabilizing a decreasing reactor pressure.	NRR	LWR Generic

<u>ACTION</u>	<u>RESPONSIBLE OFFICE</u>	<u>CATEGORY</u>
b. Evaluate the need to review the adequacy of training programs and associated emergency procedures with respect to training for loss of annunciators combined with a scram or other combinations of events.	NRR	Generic

4. Issue: Adequacy of regulatory guidance regarding nonsafety-related equipment and instrumentation required for accidents.
(Reference: Sections 1, 7.1 and 8.11)

The IIT team concluded that the NRC has not presented a clear position to the regulated industry concerning control of equipment configuration and treatment of important nonsafety-related equipment such as the UPS that were lost at Nine Mile Point. The maintenance monitoring rule, and its planned implementing regulatory guides may be expected to clarify this issue with respect to basic maintenance practices. Other practices, such as control of drawings and technical manuals might not be covered.

<u>ACTION</u>	<u>RESPONSIBLE OFFICE</u>	<u>CATEGORY</u>
z. Evaluate the need to provide additional regulatory guidance that conveys the staff expectations regarding maintenance on important nonsafety-related equipment.	RES	LWR Generic

5. Issue: Shift Coping (References: Sections 1, 3.3, 5.5 and 8.2)

During the first fifteen minutes of the event at Nine Mile Point Unit 2, the operating crew was exceptionally busy executing their emergency operating procedures, emergency planning procedures, and coping with losses of communications, annunciators, and information systems such as the plant computer and SPDs. They also had to determine what instrumentation and controls, and associated equipment was operable and what was lost, and had to verify indication in the control room using local indicators. While all these aspects needed attention, the assistant station shift supervisor, normally the second in command in the control room, assumed the duties of the shift technical advisor. This put additional burden on the station shift supervisor. Other plants have similar control room organizations and have experienced similar problems during events.

<u>ACTION</u>	<u>RESPONSIBLE OFFICE</u>	<u>CATEGORY</u>
a. Evaluate the need to review the adequacy of control room staffing during simultaneous implementation of EOPs and ERPs by normal shift crew.	NRR	LWR Generic
b. Incorporate into the ongoing review of STA implementation consideration for the integration of the STA function into the shift crew during command changes.	NRR	LWR Generic
c. Evaluate the actions being taken by the licensee at Nine Mile Point to address shift coping issues.	Region I	Plant-Specific

6. Issue: Condensate Booster Pump Injections at BWR 5 design plants
(Reference: Sections 1, 3.4, 5.3, 5.6 and 8.10)

At Nine Mile Point 2, while attempting to restore reactor water level to normal, reactor pressure decreased and an inadvertent condensate booster pump injection occurred. Anticipatory action to close valves in the flow path or trip the running condensate booster were not taken. Inadvertent condensate booster pump injection following plant scram has occurred at Nine Mile Point Unit 2 on two other occasions.

Also industry operating experience indicates that BWR 5 design reactors are more susceptible than other BWR designs to uncontrolled booster pump injections. BWR 6 design reactors have booster pump trips on high reactor vessel level, and the RCIC design in applicable older reactors is less effective in reducing reactor vessel pressure, resulting in fewer condensate booster pump injections.

<u>ACTION</u>	<u>RESPONSIBLE OFFICE</u>	<u>CATEGORY</u>
a. Consider the need for actions by the licensee at NMP-2 to address condensate booster pump injections including consideration of the need for automated booster pump trip, anticipatory procedural guidance, and mass and heat balance calculations.	Region I/ NRR	Plant-Specific

7. Issue: Adequacy of Plant-Specific Operating and Recovery Procedures
(References: Sections 1, 3.3, 3.4, 3.5, 3.6, 5.3, 5.6, 8.8 and 8.9)

At Nine Mile Point, the scram procedure did not complement the emergency operating procedures for ATWS conditions. For example, it did not support the operators by specifying the priority (immediate) actions to be used in conjunction with EOPs for all scrams. In addition, operators were unnecessarily challenged by a lack of certain recovery procedures. Operators relied on experience based knowledge to restore power to UPS loads because no procedure had been written for recovery from a loss of UPS. Operators closed feedwater pump suction valves prior to restarting a condensate booster pump in accordance with the normal startup procedure because there was no other guidance.

<u>ACTION</u>	<u>RESPONSIBLE OFFICE</u>	<u>CATEGORY</u>
a. Evaluate licensee corrective actions with respect to the procedures discussed above. Include consideration of the need for the scram procedure to segregate and make a distinction between immediate actions and supplemental actions in accordance with ANSI/ANS-3.2, 1982 as discussed in Section 5.6.1 of the IIT report.	Region I	Plant-Specific