



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
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OWNERS' GROUP: GENERAL ELECTRIC OPERATING PLANTS OWNERS' GROUP  
NSSS VENDOR: GENERAL ELECTRIC COMPANY  
SUBJECT: SUMMARY OF B&OTF AUDITS OF SMALL BREAK LOCA  
EMERGENCY PROCEDURES AND OPERATOR RETRAINING AT  
SELECTED GENERAL ELECTRIC BWR OPERATING PLANTS

On December 10-13, 1979, representatives of the Bulletins and Orders Task Force (B&OTF), accompanied by the cognizant Division of Operating Reactors Project Manager and Office of Inspection and Enforcement Regional/Resident Inspector(s) conducted audits of the emergency procedures and operator retraining associated with small break loss-of-coolant accidents (LOCAs) at the Nine Mile Point 1, FitzPatrick, and Dresden 2/3 plants. A number of NRC representatives also visited General Electric Company's Boiling Water Reactor Simulator at Morris, Illinois to observe its responses to a small break LOCA. A summary of the plant audits and simulator visit is enclosed.

A handwritten signature in cursive script, appearing to read "Cecil O. Thomas".

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Enclosure:  
As stated

cc: See attached lists

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## ENCLOSURE

### SUMMARY OF B&OTF AUDITS OF SMALL BREAK LOCA EMERGENCY PROCEDURES AND OPERATOR RETRAINING AT SELECTED GENERAL ELECTRIC BWR OPERATING PLANTS

On December 10-13, 1979, representatives of the Bulletins and Orders Task Force (B&OTF), accompanied by the cognizant Division of Operating Reactors Project Manager and Office of Inspection and Enforcement Regional/Resident Inspector(s) conducted audits of the emergency procedures and operator retraining associated with small break loss-of-coolant accidents (LOCAs) at the Nine Mile Point 1, FitzPatrick, and Dresden 2/3 plants. A number of NRC representatives also visited General Electric Company's Boiling Water Reactor Simulator at Morris, Illinois to observe its responses to a small break LOCA. A list of those individuals who attended each of the plant audits is enclosed.

#### BACKGROUND

The purpose of the B&OTF audits was to review selected licensees' emergency procedures, operator retraining, operator awareness of the emergency procedures and their bases and systems considerations associated with small break LOCAs. The Nine Mile Point 1, FitzPatrick and Dresden 2/3 plants were selected for the B&OTF audits based on their representation of different BWR classes and licensees and on the limited time available to conduct the audits. Audits of the remaining General Electric Company boiling water reactor operating plants will be conducted by the Office of Inspection and Enforcement.

The licensees' small break LOCA emergency procedures and operator retraining were based on operator guidelines developed by the General Electric Operating Plant Owners' Group which, as documented in its letter to the Owners Group dated October 26, 1979, have been approved by the B&OTF. As set forth on Page 5 of Enclosure 6 to Darrell G. Eisenhut's letter to all operating plants dated September 13, 1979, the small break LOCA emergency procedures and operator retraining are to be implemented by December 31, 1979.

#### PLANT AUDITS

The following matters were considered at each of the plant audits:

##### Emergency Procedures

The licensee's small break LOCA emergency procedures were compared to the approved operator guidelines. The clarity of the procedures in terms of individual operator actions and cautions and the flow of the procedures with respect to the timely initiation of operator actions were considered.

##### Operator Retraining

The retraining that the operators received with respect to the small break LOCA emergency procedures was reviewed. Informal training, formal classroom study and walk-throughs of the emergency procedures with their shift supervisors or training coordinators were considered.

### Operator Awareness of the Emergency Procedures and their Bases

The operators' understanding of small break LOCAs, the differences between small break LOCAs and other depressurization events and the bases for the approved guidelines and their familiarity with the small break LOCA emergency procedures were reviewed. The effectiveness with which the emergency procedures can be carried out was considered.

### Systems Considerations

Systems-related aspects of the emergency procedures were reviewed to assure that the necessary operator actions can be performed.

## FINDINGS

The most significant findings resulting from the plant audits are summarized below:

### Emergency Procedures

For the most part, each of the licensees' emergency procedures reflected all of the essential elements of the approved operator guidelines. In fact, at one plant, the emergency procedures were little more than the guidelines themselves. Consequently, they differed significantly in both format and content from the plant's other emergency procedures. Several of the licensees' emergency procedures appeared to be somewhat too detailed, especially in the automatic actions, and immediate operator actions sections.

In several instances, caution statements were placed in the immediate operator actions sections of the emergency procedures. It was generally felt, however, that this practice should be either minimized or eliminated. There was considerable discussion concerning the most appropriate sections of the emergency procedures to place the caution statements. One licensee expressed concern that the placement of caution statements in the discussion section of the emergency procedures could result in their being overlooked. There appeared to be no consensus, however, concerning the best placement of the caution statements in the emergency procedures. In one plant's emergency procedures, the caution statement concerning the effects of drywell temperature on reactor vessel level measurement was omitted. The licensee maintained that this matter can be addressed best during operator retraining.

There was considerable discussion concerning whether certain operator actions, such as verification of the automatic transfer of high pressure coolant injection system suction from the condensate storage tank to the suppression chamber and verification of automatic containment isolation by independent means should be placed in the immediate operator actions section or the subsequent operator actions section of the emergency procedures. Again, there appeared to be no consensus concerning the best placement of such operator actions in the emergency procedures.

Finally, one licensee expressed concern that the NRC was becoming too prescriptive in the writing of emergency procedures.

The emergency procedures had been approved for use at all three plants but had actually been implemented at only one plant at the time of the audits. At the plant at which the emergency procedures had been implemented, however, not all the operators had completed their retraining or, for that matter, had even been required to read the emergency procedures. For this plant, the existing LOCA emergency procedures were revised to incorporate the essential elements of the approved guidelines, hence, no separate small break LOCA emergency procedures existed per se. The licensee maintained that the revisions to its existing LOCA emergency procedures were minor and, therefore, the revised emergency procedures could be implemented prior to the completion of operator retraining. Nevertheless, the potential existed for an operator to be called upon to utilize an emergency procedure that he had never seen before.

#### Operator Retraining

At the time of the audits, none of the licensees' operators had completed all of their retraining associated with the small break LOCA emergency procedures. Two of the licensees had instructed their operators to review the emergency procedures on their own, however, only approximately one-half of these operators had completed their reviews at the time of the audits. Two of the licensees planned formal classroom training sessions for their operators (the other licensee planned either a brief formal classroom session or walk-throughs of the emergency procedures with their shift supervisors or training coordinators), however, only a few of these operators had attended the training sessions at the time of the audits. Two of the licensees planned walk-throughs of the emergency procedures for their operators with their shift supervisors or training coordinators. The other licensee did not plan such walk-throughs, on the basis of the similarity of its small break LOCA emergency procedures to its present LOCA procedures. Only one of the licensees indicated that it intended to utilize a simulator as part of its operator retraining.

#### Operator Awareness of the Emergency Procedures and Their Bases

The operators of two of the licensees exhibited a reasonably good understanding of the emergency procedures and their bases. These operators also appeared to be capable of effectively carrying out the emergency procedures. However, the operators of the other licensee exhibited a less-than-desirable understanding of the emergency procedures and their bases. The capabilities of these operators to effectively carry out the emergency procedures also appeared to be less than desirable.

Nearly all of the operators exhibited a less-than-desirable understanding of the reactor vessel level instrumentation. Notably deficient was the operators' understanding of temperature effects on the vessel level instrumentation, how temperature compensation is achieved and the vessel locations from which the levels are being measured. A few of the operators did not know such things as the means by which safety/reliefvalve position indication is derived, the location of the isolation condenser isolation indicators and the purpose of the isolation condenser bypass controls. In addition, substantially different answers were received on how to verify that containment isolation had occurred.

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While describing how the emergency procedures would be carried out in the control rooms, a significant number of the operators overlooked several vital operator actions, such as the verification of reactor scram. For those cases in which one emergency procedure, such as the small-break LOCA procedure, refers to another procedure, such as the reactor scram procedure, it was not clear to the operators which procedure takes precedence; e.g., does the operator complete the referenced procedure before proceeding on to the next action statement of the parent procedure?

#### Systems Considerations

For the most part, the instrumentation and controls associated with those systems required to mitigate the consequences of small break LOCAs were such that the necessary operator actions can be performed without undue difficulty. With the exception of the instrumentation required to verify Phase 2 containment isolation of a limited number of small lines, all instrumentation and controls were located in the control rooms on cabinet panels facing and in immediate proximity to the operators. The instrumentation required to verify Phase 2 containment isolation of a limited number of small lines was also located in the control rooms but on cabinet panels behind the main control complex.

Two licensees' operators pointed out that the separation of the instrumentation and controls necessary to mitigate the consequences of small break LOCAs contributed some difficulty to the operators in performing their necessary actions, especially in those situations in which only a single operator is available. An example of this is the separation of the reactor vessel level instrumentation from the controls used to manually actuate the automatic depressurization system. The availability of at least two operators, as was the case in one of the plants, substantially compensated for this separation.

One licensee's operator suggested that the addition of a timer which could be used in conjunction with the manual initiation of the automatic depressurization system would be helpful. Another licensee's operator, noting that the zero indications of the various reactor vessel level instrumentation often refer to different reactor vessel levels, suggested that the potential for operator error would be substantially reduced if all the reactor vessel level instrumentation were referenced to the same reactor vessel level.

At the conclusion of each of the plant audits, each licensee was asked if, in its opinion, the efforts involved in developing the emergency procedures and the retraining of its operators have enhanced the capabilities of its plant and its operators to cope with small break LOCAs and why. The answer given by each licensee was the affirmative. The reasons given included the collective contributions of a larger-than-normal number of individuals representing various interests in the development and approval of the operator guidelines, the increased attention given by the Owners Group and the licensee in the development of the emergency procedures and the additional, specialized operator retraining.

### SIMULATOR

A number of those NRC representatives who participated in the audit of the Dresden 2/3 plant visited General Electric Company's Boiling Water Reactor Simulator to observe its responses to a small break LOCA. The particular scenario represented involved a small break in a main steam line inside containment combined with a total loss of offsite power.

The capability of the simulator to adequately represent a small break LOCA is presently limited, however. In the above scenario, the small break had to be represented by opening a safety/relief valve. A fully-open safety/relief valve, however, represents a somewhat larger break area than is of particular interest in the study of small break LOCAs. In addition, since the safety/relief valves discharge to the suppression chamber, the drywell pressure and temperature do not increase as they would in the event of a small break LOCA inside containment. The increase in drywell pressure and temperature had to be initiated by turning off the drywell coolers. Representatives of the General Electric Company indicated, however, that in the near future, they expect to upgrade the capability of the simulator to more adequately represent small break LOCAs. Additional features presently under consideration include the capabilities to represent various small break sizes at a number of different locations.

### CONCLUSIONS

On the bases of the findings resulting from the B&OTF audits of the Nine Mile Point 1, FitzPatrick and Dresden 2/3 plants, it is concluded that the boiling water reactor plant licensees' emergency procedures and operator retraining associated with small break LOCAs can be implemented by December 31, 1979, as required. It is further concluded that the licensees' emergency procedures and operator retraining associated with small break LOCAs provide added assurance that the boiling water reactor plants and their operators can accommodate a small break LOCA in an acceptable manner.

### RECOMMENDATIONS

As a result of the B&OTF audits of the emergency procedures and operator retraining associated with small break LOCAs at the Nine Mile Point 1, FitzPatrick and Dresden 2/3 plants and visit to General Electric Company's Boiling Water Reactor Simulator at Morris, Illinois, several areas were identified in which the need for improvement is indicated. It is recognized that the need for improvement in at least some of these areas existed prior to the licensees' efforts related to small break LOCAs or as a result of the audits being conducted several weeks before the date that the efforts were required to be completed. The areas in which the need for improvement is indicated and the recommendations for improvement are as follows:

### Emergency Procedures

On the bases of their reflection of the essential elements of the approved operator guidelines and their status of implementation, it is concluded that the licensees' small break LOCA emergency procedures can be implemented by December 31, 1979, as required. However, on the bases of the potential problems associated with the use and placement of caution statements, placement of operator action statements and implementation practices associated with the emergency procedures, it is recommended that the NRC, in collaboration with the nuclear industry, develop guidance, perhaps in the form of a regulatory guide, on the format, content and implementation of emergency procedures.

### Operator Retraining

On the basis of their status of completion, it is concluded that the licensees' operator retraining associated with small break LOCAs can be completed by December 31, 1979, as required. However, on the bases of the substantial disparity in the emphasis the licensees placed on the operator retraining associated with the small break LOCA emergency procedures, it is recommended that the NRC, in collaboration with the nuclear industry, develop guidance, perhaps in the form of a regulatory guide, on the extent of operator retraining appropriate to the implementation of new or revised emergency operating procedures.

### Operator Awareness of the Emergency Procedures and Their Bases

On the bases of a significant number of operators' less-than-desirable understanding of the emergency procedures and, especially, their bases, it is concluded that the licensees' operator retraining is less than desirable. Accordingly, it is recommended that the licensees reassess their operator retraining in order to ensure that their operators thoroughly understand the emergency procedures and their bases.

### Systems Considerations

On the bases of the plants' complements and locations of the instrumentation and controls associated with those systems required to mitigate the consequences of small break LOCAs, it is concluded that the necessary operator actions can be performed without undue difficulty. However, on the bases of the potential problems associated with the zero indications of the various reactor vessel level instrumentation often referring to different reactor vessel levels, it is recommended that both the NRC and the nuclear industry consider the establishment of a requirement that all reactor vessel level instrumentation be referenced to the same reactor vessel level.

### Simulator

On the basis of the present limited capability of the simulator to adequately represent a small break LOCA, it is concluded that the simulator is presently of little value in representing, or retraining operators in plant responses to small break LOCAs. Accordingly, it is recommended that the General Electric Company, in collaboration with the NRC and the nuclear industry, pursue expeditiously upgrading the capability of the simulator to more adequately represent small break LOCAs including the capabilities to represent various small break sizes at a number of different locations.

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Enclosure

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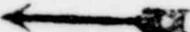
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