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

July 20, 1977

MEMORANDUM FOR: A. Schwencer, Chief, Operating Reactors Branch #1  
D. Davis, Acting Chief, Operating Reactors Branch #2  
G. Lear, Chief, Operating Reactors Branch #3  
R. Reid, Chief, Operating Reactors Branch #4

FROM: Karl R. Goller, Assistant Director for Operating Reactors

SUBJECT: BWR RELIEF VALVES AND BWR SAFETY-RELIEF VALVES

Over the past several years, there have been a significant number of reported instances of failure of BWR relief and safety-relief valves. Some of the most recent of these occurrences involved the following:

- a. Quad Cities 1 and 2 - 2 of 4 Electromatic relief valves at each unit failed to open (11/1/76); 1 of 4 Electromatic relief valves at each unit failed to open (3/21/77, 3/23/77).
- b. Hatch 1 - 1 of 11 Target Rock safety-relief valves failed in the open position (1/9/77, 2/1/77); 2 of 11 Target Rock safety-relief valves failed open (2/4/77).
- c. Peach Bottom 2 - 1 of 11 Target Rock safety-relief valves failed in the open position (1/6/77).
- d. Duane Arnold - 4 of 6 Dresser safety-relief valves failed to lift at the required setpoint pressure (3/29/77).
- e. Browns Ferry 1 - 1 of 4 Target Rock safety-relief valves failed to reseal following operation (4/21/77).

The typical testing requirements contained in facility technical specifications for BWR relief and safety-relief valves require that each valve be manually opened at some specified system pressure and positive verification be obtained that the valve is fully open. (See my memo of December 20, 1976 concerning verification of valve position). This test is normally performed each fuel cycle (i.e., each 18 months) as part of the Automatic Depressurization System (ADS) surveillance testing program. However, not all safety-relief valves installed on the main steam lines are assigned to the ADS system. These non-ADS safety-relief valves are inspected as safety valves for the Reactor Coolant System each fuel cycle. The power operated relief valve function of these non-ADS valves may not be tested.

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July 20, 1977

As a result of these continuing failures, we have determined that more frequent testing of these valves is warranted. We have developed a long range program for this purpose with the following major elements:

1. Each remotely operated relief valve and safety-relief valve in the Reactor Coolant System and Automatic Depressurization System will be tested on a variable frequency schedule related to demonstrated reliability and operability. The testing interval is based on the number of valve failures during the required test interval. Facilities with reliable valves will progress to a longer test interval while those with valve failures will progress to a shorter test interval. This concept should result in the maintenance of a more uniform level of reliability for this equipment than previously obtained.
2. The increased surveillance program will become effective on March 1, 1979. No increase in valve testing is required before that date. The initial testing interval of the increased surveillance program will be based on the number of remotely operated relief valves and safety-relief valves found inoperable in the previous 18 months (September 1, 1977 to March 1, 1979). This lead time will permit the resolution of the Mark I Safety-Relief Valve Loads and Structural Capability generic concern. Additionally, this lead time is sufficient to permit the development and implementation of improved safety and safety-relief valve maintenance procedures and other corrective actions prior to implementing the test program.
3. The relief and/or safety-relief valve line restraints in the torus will be examined prior to initiating the test program and at least once each fuel cycle (i.e., each 18 months) to verify continued structural integrity.

Each ORPM with a BWR facility should determine which relief valves and safety-relief valves in the ADS and Reactor Coolant System are power operated. All relief valves and safety-relief valves that are power operated shall be included in the revised surveillance program. The contents of the sample letter and enclosed model technical specifications and bases should be sent to those affected licensees within one week. Note that both the letter and technical specifications will require revisions to reflect the specific design of the facility.

Multiple Addressees

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July 20, 1977

If you have any questions, you may contact Jack Wetmore, who is the OR Lead Engineer in this generic effort. TACS No. 06629 has been assigned to this task.

*Karl R. Goller*

Karl R. Goller, Assistant Director  
for Operating Reactors  
Division of Operating Reactors

Enclosure:  
Sample Letter w/Technical  
Specifications

cc w/enclosure:

V. Stello  
D. Eisenhut  
D. Vassallo  
W. Butler  
F. Clemenson  
P. O'Connor  
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R. Baer  
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UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

Docket No. 50-

Addressee

Gentlemen:

RE: (Plant Name)

In the past several years, a significant number of relief valves and safety-relief valves were found to be inoperable at BWR reactor facilities. These valves were installed in the Reactor Coolant System and/or Automatic Depressurization System. Several programs have been developed to reduce the incidence of these valve failures; however, additional failures continue to occur.

Consequently, we have concluded that changes to the surveillance requirements for all BWR's are needed to provide additional assurance of relief valve and safety-relief valve operability and reliability. Therefore, we request that you modify your surveillance testing program through the adoption of the program contained in the model technical specifications we have prepared. The elements of this program include:

1. Each remotely operated relief valve and safety-relief valve in the Reactor Coolant System and Automatic Depressurization System will be tested on a variable frequency schedule related to demonstrated reliability and operability. The testing interval is based on the number of valve failures during the required test interval. Facilities with reliable valves will progress to a longer test interval while those with valve failures will progress to a shorter test interval. This concept should result in the maintenance of a more uniform level of reliability for this equipment than previously obtained.
2. The increased surveillance program will become effective on March 1, 1979. No increase in valve testing is required before that date. The initial testing interval of the increased surveillance program will be based on the number of remotely operated relief valves and safety-relief valves found inoperable in the previous 18 months (September 1, 1977 to March 1, 1979). This lead time will permit the resolution of the Mark I Safety-Relief Valve Loads and Structural Capability generic concern. Additionally, this lead

## REACTOR COOLANT SYSTEM

### 3/4.4.2 SAFETY VALVES

#### LIMITING CONDITION FOR OPERATION

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3.4.2 At least the following reactor coolant system code safety valves and safety-relief valves shall be operable with lift settings within  $\pm 1\%$  of the indicated pressures.

- (2)\* Safety valves @ (1240) psig
- (3) Safety-relief valves @ (1100) psig
- (3) Safety-relief valves @ (1090) psig
- (3) Safety-relief valves @ (1080) psig

APPLICABILITY: With Average Coolant Temperature  $> 212^{\circ}\text{F}$  or the Mode Switch in Run, or Startup/Hot Standby.

#### ACTION:

With one or more reactor coolant system code safety valve(s) or a safety-relief valve(s) inoperable either restore the valve(s) to operable status within 15 minutes or be shutdown within 12 hours and reduce Average Coolant Temperature to  $\leq 212^{\circ}\text{F}$  within the next 24 hours.

#### SURVEILLANCE REQUIREMENTS

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4.4.2.1 Each safety-relief valve shall be demonstrated operable:

- a. At least once per 24 hours, by verifying bellows integrity through instrument indication.
- b. Until March 1, 1979, at least once per 18 months by:
  - 1. Manually opening each remotely operated safety-relief valve with the reactor at or below 5% rated power and at nominal operating pressure, and verifying that either:
    - a. The turbine bypass valve(s) indicate a compensating valve movement, or
    - b. The reactor coolant system pressure decreases by an amount equivalent to the valve pressure relieving capacity for the test conditions.

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\*Does not include installed spare safety valves.

time is sufficient to permit the development and implementation of improved safety and safety-relief valve maintenance procedures and other corrective actions prior to implementing the test program.

3. The relief and/or safety-relief valve line restraints in the torus will be examined prior to initiating the test program and at least once each fuel cycle (i.e., each 18 months) to verify continued structural integrity.

We request that you submit within 30 days from your receipt of this letter, an application for amendment to your license that will change your technical specifications to be in conformance with the requirements of the enclosed model technical specifications and associated bases. In the event you should desire further discussion of this matter, please contact us.

Sincerely,

, Chief  
Operating Reactors Branch #  
Division of Operating Reactors

Enclosure:  
Model Technical  
Specifications

REACTOR COOLANT SYSTEM

SURVEILLANCE REQUIREMENTS (Continued)

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2. Conducting a visual inspection of the safety-relief valve line restraints in the torus to verify structural integrity for continued operation.
- c. After March 1, 1979, by performance of the following test program:
  1. Manually opening each remotely operated safety-relief valve in accordance with the test schedule of Table 4.4-10 with the reactor at or below 5% rated power and at nominal operating pressure and verifying that either:
    - a. The turbine bypass valve(s) indicate a compensating valve movement, or
    - b. The reactor coolant system pressure decreases by an amount equivalent to the valve pressure relieving capacity for the test conditions.
  2. The initial Next Required Test Interval of Table 4.4-10 shall be determined by the number of remotely operated relief and safety-relief valves found inoperable from September 1, 1977 to March 1, 1979.
  3. The initial valve tests of Table 4.4-10 shall be completed by, the earlier of;
    - a. The completion of the next refueling outage occurring after March 1, 1979, or
    - b. The time period defined by March 1, 1979 plus the initial test interval, determined above.
  4. At least once per 18 months, by conducting a visual inspection of the safety-relief valve line restraints in the torus to verify structural integrity for continued operation.

4.4.2.2 Each safety valve and the safety valve function of each safety-relief valve shall be demonstrated operable per the requirements of the ASME Boiler and Pressure Vessel Code ( ) Edition and Addenda through ( ).

TABLE 4.4-10

REMOTELY OPERATED RELIEF AND SAFETY-RELIEF VALVE TEST SCHEDULE

NUMBER OF REMOTELY OPERATED RELIEF AND SAFETY-RELIEF VALVES  
FOUND INOPERABLE DURING TESTING OR TEST INTERVAL

NEXT REQUIRED  
TEST INTERVAL \*

0  
1  
2  
> 3

18 months + 25%  
184 days + 25%  
92 days + 25%  
31 days + 25%

\*The required test interval shall not be lengthened more than one step at a time.

### 3/4.4 REACTOR COOLANT SYSTEM

#### BASES

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#### 3/4.4.2 SAFETY VALVES

The reactor coolant system safety valves operate to reactor coolant system from being pressurized above the of \_\_\_\_\_ psig. Each safety valve is designed to relieve \_\_\_\_\_ hour at the valve set point. The system is designed to Boiler and Pressure Vessel Code requirements that the nuclear relief valves shall function to prevent opening of the safety valves. Although the safety valve function is not expected to be required for the most limiting transient, an inoperable valve requires shutdown in order to comply with ASME Code requirements.

The testing frequency applicable to the relief valve function of the safety-relief valves is provided to ensure operability and demonstrate reliability of the valves. The required testing interval varies with observed valve failures. The number of inoperable valves found during both operation and testing of these valves determines the time interval for the next required test of these valves. Early testing may be performed before the presently required time interval has elapsed (nominal time less 25%). These early tests may be used as a new reference point for tests of the same time interval. Early tests may not be used to lengthen the required testing interval.

Demonstration of the safety valves' lift settings will occur only during shutdown and will be performed in accordance with the provisions of Section XI of the ASME Boiler and Pressure Vessel Code.

EMERGENCY CORE COOLING SYSTEMS

AUTOMATIC DEPRESSURIZATION SYSTEM

LIMITING CONDITION FOR OPERATION

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3.5.2 The Automatic Depressurization System (ADS) shall be OPERABLE with at least (6)\* OPERABLE ADS valves.

APPLICABILITY: With Average Coolant Temperature > 212°F or the Mode Switch in Run, or Startup/Hot Standby.

ACTION:

- a. With one of the above required ADS valves inoperable, operation may continue provided the actuation logic of the remaining ADS valves is operable and the CSS and LPCI systems are operable, and the HPCI system is demonstrated operable within 4 hours; restore the inoperable ADS valve to operable status within 14 days or be shutdown within 12 hours and reduce the Average Coolant Temperature to  $\leq 212^{\circ}\text{F}$  within the following 24 hours.
- b. With two or more of the above required ADS valves inoperable, be shutdown within 12 hours and reduce the Average Coolant Temperature to  $\leq 212^{\circ}\text{F}$  within the following 24 hours.

SURVEILLANCE REQUIREMENTS

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4.5.2 The ADS shall be demonstrated operable:

- a. At least once per 18 months by performance of a system functional test which includes simulated automatic actuation through the automatic depressurization sequence, but excluding valve actuation.
- b. Until March 1, 1979, at least once per 18 months by:
  1. Manually opening each ADS valve with the reactor at or below 5% rated power and at nominal operating pressure and verifying that either:
    - a. The turbine bypass valve(s) indicate a compensating valve movement, or
    - b. The reactor coolant system pressure decreases by an amount equivalent to the valve pressure relieving capacity for the test conditions.

\*Number of ADS valves to be consistent with ECCS analysis.

EMERGENCY CORE COOLING SYSTEMS

AUTOMATIC DEPRESSURIZATION SYSTEM

SURVEILLANCE REQUIREMENTS (Continued)

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2. Conducting a visual inspection of the safety-relief and relief valve line restraints in the torus to verify structural integrity for continued operation.
- c. After March 1, 1979, by performance of the following test program:
  1. Manually opening each ADS valve in accordance with the test schedule of Table 4.4-10 with the reactor at or below 5% rated power and at nominal operating pressure and verifying that either:
    - a. The turbine bypass valve(s) indicate a compensating valve movement, or
    - b. The reactor coolant system pressure decreases by an amount equivalent to the valve pressure relieving capacity for the test conditions.
  2. The initial Next Required Test Interval of Table 4.4-10 shall be determined by the number of remotely operated relief and safety-relief valves found inoperable from September 1, 1977 to March 1, 1979.
  3. The initial valve tests of Table 4.4-10 shall be completed by, the earlier of:
    - a. The completion of the next refueling outage occurring after March 1, 1979, or
    - b. The time period defined by March 1, 1979 plus the initial test interval, determined above.
  4. At least once per 18 months by conducting a visual inspection of the safety-relief and relief valve line restraints in the torus to verify structural integrity for continued operation.

### 3/4.5 EMERGENCY CORE COOLING SYSTEM

#### BASES

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#### 3/4.5.2 AUTOMATIC DEPRESSURIZATION SYSTEM (ADS)

Upon failure of the HPCIS to function properly after a small break loss-of-coolant accident, the ADS automatically causes the safety-relief valves to open, depressurizing the reactor so that flow from the low pressure cooling systems can enter the core in time to limit fuel cladding temperature to less than 2200°F. ADS is conservatively required to be operable whenever reactor vessel pressure exceeds (150) psig even though low pressure cooling systems provide adequate core cooling up to (350) psig.

ADS automatically controls (7) safety-relief valves although the safety analysis only takes credit for (6). Therefore it is appropriate to permit (one) valve to be out-of-service without materially reducing system reliability.

The testing frequency applicable to ADS valves is provided to ensure operability and demonstrate reliability of the valves. The required testing interval varies with observed valve failures. The number of inoperable valves found during both operation and testing of these valves determines the time interval for the next required test of these valves. Early testing may be performed before the presently required time interval has elapsed (nominal time less 25%). These early tests may be used as a new reference point for tests of the same time interval. Early tests may not be used to lengthen the required testing interval.