Attachment 2

TECHNICAL EVALUATION REPORT

PRIMARY COOLANT SYSTEM PRESSURE ISOLATION VALVES

ROCHESTER GAS & ELECTRIC CORPORATION
ROBERT E. GINNA UNIT 1

NRC DOCKET NO. 50-244

NRC TAC NO. 12915

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FRC PROJECT C5257

FRC TASK 248

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1.0 INTRODUCTION

The NRC has determined that certain isolation valve configurations in systems connecting the high-pressure Primary Coolant System (PCS) to lower-pressure systems extending outside containment are potentially significant contributors to an intersystem loss-of-coolant accident (LOCA). Such configurations have been found to represent a significant factor in the risk computed for core melt accidents.

The sequence of events leading to the core melt is initiated by the concurrent failure of two in-series check valves to function as a pressure isolation barrier between the high-pressure PCS and a lower-pressure system extending beyond containment. This failure can cause an overpressurization and rupture of the low-pressure system, resulting in a LOCA that bypasses containment.

The NRC has determined that the probability of failure of these check valves as a pressure isolation barrier can be significantly reduced if the pressure at each valve is continuously monitored, or if each valve is periodically inspected by leakage testing, ultrasonic examination, or radiographic inspection. The NRC has established a program to provide increased assurance that such multiple isolation barriers are in place in all operating Light Water Reactor plants designated by DOR Generic Implementation Activity B-45.

In a generic letter of February 23, 1980, the NRC requested all licensees to identify the following valve configurations which may exist in any of their plant systems communicating with the PCS: 1) two check valves in series or 2) two check valves in series with a motor-operated valve (MOV).

For plants in which valve configurations of concern are found to exist, licensees were further requested to indicate: 1) whether, to ensure integrity of the various pressure isolation check valves, continuous surveillance or periodic testing was currently being conducted, 2) whether any check valves of concern were known to lack integrity, and 3) whether plant procedures should be revised or plant modifications be made to increase reliability.

Franklin Research Center (FRC) was requested by the NRC to provide technical assistance to NRC's B-45 activity by reviewing each licensee's submittal

against criteria provided by the NRC and by verifying the licensee's reported findings from plant system drawings. This report documents FRC's technical review.

2.0 CRITERIA

2.1 Identification Criteria

For a piping system to have a valve configuration of concern, the following five items must be fulfilled:

1) The high-pressure system must be connected to the Primary Coolant System;

2) there must be a high-pressure/low-pressure interface present in the line;

3) this same piping must eventually lead outside containment;

4) the line must have one of the valve configurations shown in Figure 1; and

5) the pipe line must have a diameter greater than 1 inch.

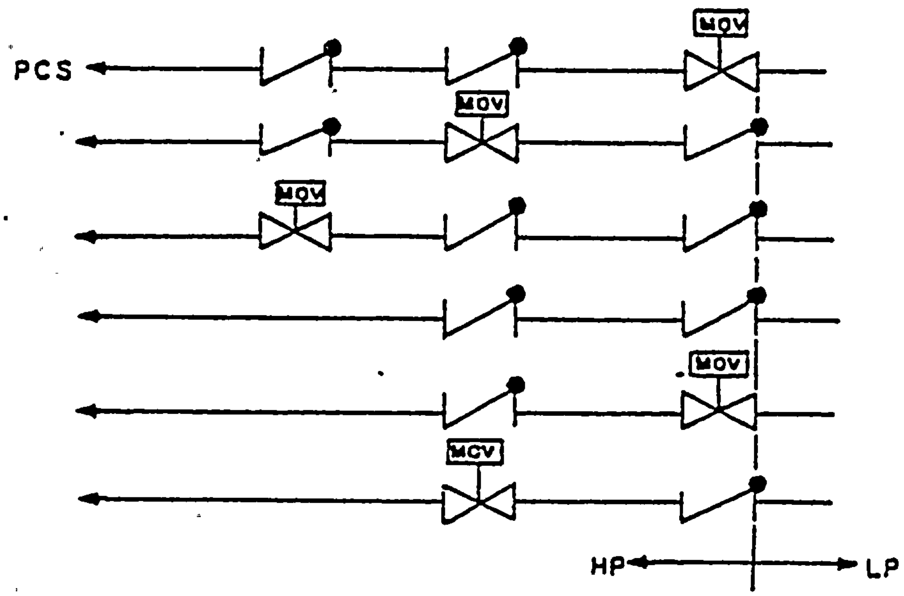

Figure 1. Valve Configurations Designated by the NRC To Be Included in This Technical Evaluation

2.2 Periodic Testing Criteria

For licensees whose plants have valve configurations of concern and choose to institute periodic valve leakage testing, the NRC has established criteria for frequency of testing, test conditions, and acceptable leakage rates. These criteria may be summarized as follows:

2.2.1 Frequency of Testing

Periodic hydrostatic leakage testing* on each check valve shall be accomplished every time the plant is placed in the cold shutdown condition for refueling, each time the plant is placed in a cold shutdown condition for 72 hours if testing has not been accomplished in the preceding 9 months, each time any check valve may have moved from the fully closed position (i.e., any time the differen- tial pressure across the valve is less than 100 psig), and prior to returning the valve to service after maintenance, repair, or replacement work is performed.

2.2.2 Hydrostatic Pressure Criteria

Leakage tests involving pressure differentials lower than function pressure differentials are permitted in those types of valves in which service pressure will tend to diminish the overall leakage channel opening, as by pressing the disk into or onto the seat with greater force. Gate valves, check valves, and globe-type valves, having function pressure differential applied over the seat, are examples of valve applications satisfying this requirement. When leakage tests are made in such cases using pressures lower than function maximum pressure differential, the observed leakage shall be adjusted to function maximum pressure differential value. This adjustment shall be made by calculation appropriate to the test media and the ratio between test and function pressure differential, assuming leakage to be directly proportional to the pressure differential to the one-half power.

2.2.3 Acceptable Leakage Rates:

- Leakage rates less than or equal to 1.0 gpm are considered acceptable.
- Leakage rates greater than 1.0 gpm but less than or equal to 5.0 gpm are considered acceptable if the latest measured rate has not exceeded the rate determined by the previous test by an amount

The basis for our existing Tech Spec!

*To satisfy ALARA requirements, leakage may be measured indirectly (as from the performance of pressure indicators) if accomplished in accordance with approved procedures and supported by computations showing that the method is capable of demonstrating valve compliance with the leakage criteria.

that reduces the margin between the measured leakage rate and the maximum permissible rate of 5.0 gpm by 50% or greater.

- Leakage rates greater than 1.0 gpm but less than or equal to 5.0 gpm are considered unacceptable if the latest measured rate exceeded the rate determined by the previous test by an amount that reduces the margin between measured leakage rate and the maximum permissible rate of 5.0 gpm by 50% or greater.
- Leakage rates greater than 5.0 gpm are considered unacceptable.

3.0 TECHNICAL EVALUATION

3.1 Licensee's Response to the Generic Letter

In response to the NRC's generic letter [Ref. 1], the Rochester Gas and Electric Corporation (RGE) indicated that the High-Head Safety Injection System, cold leg side, and the Low-head Safety Injection System are two suspect piping systems.

The licensee further stated "At the present time there is no continuous surveillance or periodic testing on these valves to ensure pressure integrity. However, in ten years of operation there has been no indication of any gross leakage in any of these check valves."

It was discovered by FRC that the hot leg branches of the High-Head Safety Injection System also contain valve configurations of concern.

It is FRC's understanding that, with RGE's concurrence, the NRC will direct RGE to change its Plant Technical Specifications as necessary to ensure that periodic leakage testing (or equivalent testing) is conducted in accordance with the criteria of Section 2.2.

3.2 FRC Review of Licensee's Response

FRC has reviewed the licensee's response against the plant-specific Piping and Instrumentation Diagrams (P&IDs) [Ref. 3] that might have the valve configurations of concern.

FRC has also reviewed the efficacy of instituting periodic testing for the check valves involved in this particular application with respect to the reduction of the probability of an intersystem LOCA in the cold and hot legs of the High-Head Safety Injection as well as in the Low-Head Safety Injection System piping.

In its review of the P&IDs [Ref. 3] for Robert E. Ginna Unit 1, FRC found the following two piping systems to be of concern:

> The High-Head Safety Injection System is connected to the two Reactor Coolant System loops by two hot and cold leg branches. Each branch contains two check valves and a motor-operated valve (MOV) in a series configuration of concern. In all four branches, the high-pressure/low-pressure interface is on the upstream side of the MOVs.
>
> The Low-Head Safety Injection System, connected by two branches directly to the Reactor Vessel, contains a single check valve and MOV in a series configuration of concern. Again, the high-pressure/low-pressure interface is located on the upstream side of the MOV.
>
> All valves of concern are listed for both systems below:

High-Head Safety Injection System

<u>Loop A, cold leg</u>

high-pressure check valve, 867B
high-pressure check valve, 878J
high-pressure MOV, 878D, normally open (n.o.)

<u>Loop A, hot leg</u>

high-pressure check valve, 877B
high-pressure check valve, 878H
high-pressure MOV, 878C, normally closed (n.c.)

<u>Loop B, cold leg</u>

high-pressure check valve, 867A
high-pressure check valve, 878G
high-pressure MOV, 878B, n.o.

<u>Loop B, hot leg</u>

high-pressure check valve, 877A
high-pressure check valve, 878F
high-pressure MOV, 878A, n.c.

Low-Head Safety Injection System

<u>Reactor Vessel</u>

Branch A
- high-pressure check valve, 853A
- high-pressure MOV, 852A

Branch B

- high-pressure check valve, 853B
- high-pressure MOV, 852B

In accordance with the criteria of Section 2.0, FRC found no other valve configurations of concern existing in this plant.

FRC reviewed the effectiveness of instituting periodic leakage testing of the check valves in these lines as a means of reducing the probability of an intersystem LOCA occurring. FRC found that introducing a program of check valve leakage testing in accordance with the criteria summarized in Section 2.0 will be an effective measure in substantially reducing the probability of an intersystem LOCA occurring in these lines, and a means of increasing the probability that these lines will be able to perform their safety-related functions. It is also a step toward achieving a corresponding reduction in the plant probability of an intersystem LOCA in Robert E. Ginna Unit 1.

4.0 CONCLUSION

It has been determined that the High-Head Safety Injection system, cold-leg branches, and the Low-Head Safety Injection system in Ginna Unit 1, incorporate valving in two of the configurations (identified in Figure 1) designated by the NRC as valve configurations of concern. Moreover, based on the previously docketed information and drawings made available for FRC review, FRC found that the High-head Safety Injection system, hot-leg branches also incorporate a valve configuration of concern. Thus, if the licensee's review of the valve configurations contained in the hot-leg branches of the High-Head Safety Injection system confirms FRC's finding, then valve configurations of concern existing in Ginna Unit 1 incorporate the valves as listed in Table 1.0.

If RGE modifies the Plant Technical Specifications for Robert E. Ginna Unit 1 to incorporate periodic testing (as delineated in Section 2.2) for the check valves itemized in Table 1.0, then FRC considers this an acceptable means of achieving plant compliance with the NRC staff objectives of Reference 1.

Table 1.0

Primary Coolant System Pressure Isolation Valves

System	Check Valve No.	Allowable Leakage*
High-Head Safety Injection		
Loop A		
cold Leg	867B 878J	
hot leg	877B 878H	
Loop B		
cold Leg	867A 878G	
hot leg	877A 878F	
Low-Head Safety Injection		
Branch A	853A	
Branch B	853B	

*To be provided by the licensee at a future date in accordance with Section 2.2.3.

5.0 REFERENCES

1. Generic NRC letter, dated 2/23/80, from Mr. D. G. Eisenhut, Department of Operating Reactors (DOR), to Mr. L. D. White Jr., Rochester Gas and Electric Corporation (RGE).

2. Rochester Gas and Electric Corporation's response to the NRC's letter, dated 3/14/80, from Mr. L. D. White (RGE) to Mr. D. G. Eisenhut (DOR).

3. List of examined P&IDs:

Rochester Gas and Electric Corporation drawings of Robert E. Ginna Unit 1:

33013-422-C

33013-424-B

33013-425-A

33013-426-D

33013-427-B

33013-432-A

33013-433-A

33013-434-0

33013-435-0

33013-436-0