Attachment 2

THIS REPORT SUPERCEDES ISSUE OF JULY 21, 1980

TECHNICAL EVALUATION REPORT

PRIMARY COOLANT SYSTEM PRESSURE ISOLATION VALVES

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT UNIT 1

NRC DOCKET NO. 50-220

NRC TAC NO. 12904

FRC PROJECT C5257

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FRC TASK 237

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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.

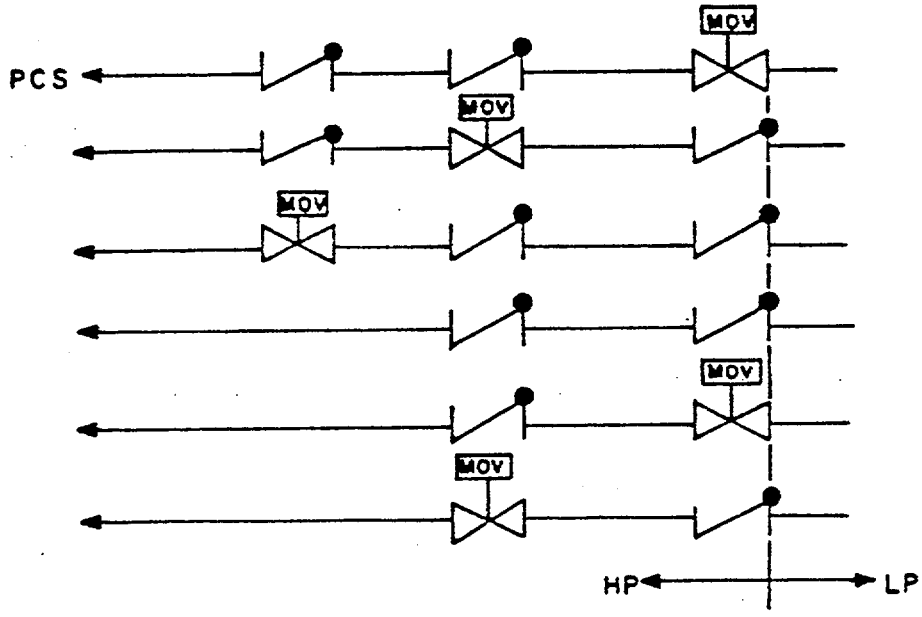

Figure 1. Valve Configurations Designated by the NRC To Be Included in This Technical Evaluation

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* (ultrasonic testing or radiographic 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 differential 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.

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*To satisfy ALARA (as low as reasonably achievable) requirements, pressure indicators may be used in accordance with approved procedures as documented by calculation to determine the need for hydrostatic testing.

- 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 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 Niagara Mohawk Power Corporation (NMP) stated [Ref. 2] that, "Wash-1400 describes an Event V configuration as two in series check valves that isolate a low pressure system from the reactor coolant system. There are no configurations at Nine Mile Point Unit 1 which conform with this definition."

The licensee also submitted a one line diagram for ten systems which interface with the primary coolant system.

It is FRC's understanding that, with NMP's concurrence, the NRC will direct NMP 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 Core Spray System pipe lines.

In its review of the P&IDs [Ref. 3] for Nine Mile Point Unit 1, FRC found the following piping system to be of concern:

- The valve configuration of concern existing in both the A and B loops of the Core Spray System consists of two parallel normally closed, motor-operated valves (MOVs) inside the Drywell, leading away from the Reactor Vessel. These two MOVs join together in a common line leading to a single locked-open MOV and check valve configuration outside containment. The high-pressure/low-pressure

interface was found to exist at the upstream side of the single check valve outside containment. The appropriate valves of the Core Spray System are listed below.

Core Spray System

Loop A

high-pressure, parallel MOV, CRS-12A, normally closed (n.c.)
high-pressure, parallel MOV, CRS-12B, n.c.
high-pressure, MOV, CRS-12, locked open (l.o.)
high-pressure, check valve, CRS-20

Loop B

high-pressure, parallel MOV, CRS-11A, n.c.
high-pressure, parallel MOV, CRS-11B, n.c.
high-pressure, MOV, CRS-11, l.o.
high-pressure, check valve, CRS-19

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 Nine Mile Point Unit 1.

4.0 CONCLUSION

Based on the previously docketed information and drawings made available for FRC review, FRC found that loops A and B of the Core Spray System in Nine Mile Point Unit 1 contain a valve configuration of concern (identified in Figure 1). Thus, if the licensee's review of the valving configuration contained in the loops A and B of the Core Spray System confirms FRC's finding, then the valve configurations of concern existing in Nine Mile Point Unit 1 incorporate the valves listed in Table 1.0.

If NMP modifies the Plant Technical Specifications for Nine Mile Point 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*
Core Spray		
Loop A	CRS-20	
Loop B	CRS-19	

*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. D. P. Dise, Niagara Mohawk Power Corporation (NMP).

2. Niagara Mohawk Power Corporation's response to the generic NRC letter, dated 3/19/80, from Mr. D. P. Dise (NMP) to Mr. D. G. Eisenhut (DOR).

3. List of examined P&IDs:

Niagara Mohawk Drawing:

C-18000-C	(Rev. 2)	
C-18002-C	(Rev. 9)	Sh. 1 of 3
C-18002-C	(Rev. 5)	Sh. 2 of 3
C-18002-C	(Rev. 3)	Sh. 3 of 3
C-18004-C	(Rev. 3)	
C-18005-C	(Rev. 5)	
C-18006-C	(Rev. 2)	Sh. 1 of 2
C-18006-C	(Rev. 1)	Sh. 2 of 2
C-18007-C	(Rev. 7)	
C-18009-C	(Rev. 4)	Sh. 1 of 2
C-18009-C	(Rev. 4)	Sh. 2 of 2
C-18016-C		
C-18017-C	(Rev. 6)	
C-18018-C	(Rev. 3)	
C-18019-C	(Rev. 3)	
C-18041-C		Sh. 1 of 6
C-18041-C		Sh. 2 of 6
C-18041-C		Sh. 3 of 6
C-18041-C		Sh. 4 of 6
C-18041-C		Sh. 5 of 6
C-18041-C		Sh. 6 of 6

ATTACHMENT TO ORDER FOR MODIFICATION OF

FACILITY OPERATING LICENSE NO. DPR-63

DOCKET NO. 50-220

Add page 120a and 120b to the Appendix "A" Technical Specifications.

LIMITING CONDITION FOR OPERATION	SURVEILLANCE REQUIREMENT

3.2.7.1 PRIMARY COOLANT SYSTEM PRESSURE ISOLATION VALVES

Applicability:

Applies to the operating status of isolation valves for systems connected to the primary coolant system.

Objective:

To increase the reliability of primary coolant system pressure isolation valves thereby reducing the potential of an intersystem loss of coolant accident.

Specification:

a. The integrity of all pressure isolation valves listed in Table 3.2.7.1 shall be demonstrated. Valve leakage shall not exceed the amounts indicated.

b. If Specification a cannot be met, an orderly shutdown shall be initiated within 1 hour and the reactor shall be in the cold shutdown condition within 10 hours.

4.2.7.1 PRIMARY COOLANT SYSTEM PRESSURE ISOLATION VALVES

Applicability:

Applies to the periodic testing of primary coolant system pressure isolation valves.

Objective

To increase the reliability of primary coolant system pressure isolation valves thereby reducing the potential of an intersystem loss of coolant accident.

Specification:

a. Periodic leakage testing[(a)] on each valve listed in Table 3.2.7.1 shall be accomplished prior to exceeding 2% power while in the power operating condition every time the plant is placed in a 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, and prior to returning the valve to service after maintenance, repair or replacement work is performed.

[(a)] 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.

TABLE 3.2.7.1

PRIMARY COOLANT SYSTEM PRESSURE ISOLATION VALVES

System	Valve No.	Maximum[(a)] Allowable Leakage
1. Core Spray System	40-03	≤5.0 gpm
	40-13	≤5.0 gpm
2. Condensate Supply to Core Spray (Keep Fill System)	40-20	≤5.0 gpm
	40-21	≤5.0 gpm
	40-22	≤5.0 gpm
	40-23	≤5.0 gpm

Footnote:

(a) 1. Leakage rates less than or equal to 1.0 gpm are considered acceptable

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

3. 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.

4. Leakage rates greater than 5.0 gpm are considered unacceptable.

5. Test differential pressure shall not be less than 150 psid.