ATTACHMENT 2

THIS REPORT SUPERSEDES ISSUE OF AUGUST 22, 1980

TECHNICAL EVALUATION REPORT

PRIMARY COOLANT SYSTEM PRESSURE ISOLATION VALVES

FLORIDA POWER & LIGHT COMPANY
TURKEY POINT UNITS 3 AND 4

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NRC TAC NO. 12940, 12941

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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.

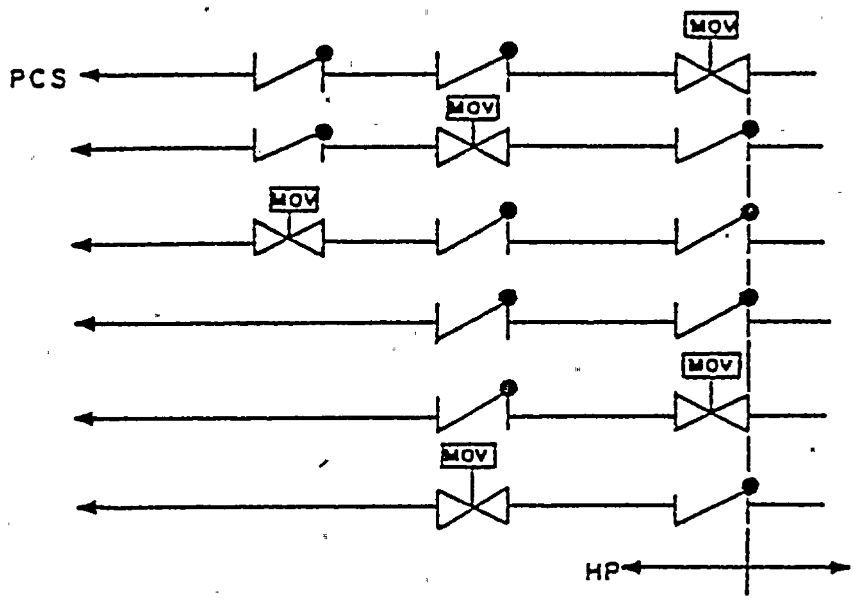

Figure 1. Valve Configurations Designated by the NRC To Be Included in This Technical Evaluation

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

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*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 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 Florida Power & Light Company (FPL) submitted [Ref. 2] two simplified flow diagrams showing the valve configurations of concern for Turkey Point Units 3 and 4.

The Licensee indicated in Reference 2 that specific surveillance tests to assess check valve status are not being performed on check valves in the various configurations of concern. Also, FPL's operating records covering the past 5 years have not indicated problems with these same check valves.

It is FRC's understanding that, with FPL's concurrence, the NRC will direct FPL 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 High-Head Safety Injection System and the Residual Heat Removal System (low-head system) piping lines.

In its review of the P&IDs [Ref. 3] for the Turkey Point Units 3 and 4, FRC found the following two piping systems to be of concern:

The High-Head Safety Injection System is connected to the hot-leg sides of two PCS loops (A and B) and also to the cold-leg side of all three PCS loops (A, B, and C). This system was examined for valve configurations of concern since the piping system is designed to an intermediate pressure level (1500 psig) which is lower than full reactor pressure. Each hot leg branch of the High-Head Safety Injection System has a single check valve and a motor-operated valve in one of the series configurations of concern. For the cold-leg branches of the High-Head Safety System, the two check valves and motor-operated valve in-series comprise the configuration of concern.

The second system of concern is the Residual Heat Removal System. This low-head injection system is connected to the cold legs of all three primary coolant loops in a two check valve and a single motor-operated valve configuration.

In both the High-Head Injection and the Residual Heat Removal systems the high-pressure/low-pressure interface exists at the upstream side of the motor-operated valves (MOVs). The valve configurations of concern for both previously mentioned systems are listed below for Turkey Point Units 3 and 4:

High-Head Safety Injection System

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

high-pressure check valve, 874A

high-pressure MOV, 866A, normally closed (n.c.)

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

high-pressure check valve, 874B

high-pressure MOV, 866B, n.c.

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

high-pressure check valve, 875A

high-pressure gate valve, 868A, normally open (n.o.)

high-pressure check valve, 873A

high-pressure MOVs, 843A and B in parallel, n.c.

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

high-pressure check valve, 875B

high-pressure gate valve, 868B, n.o.

high-pressure check valve, 873B

high-pressure MOVs, 843A and B in parallel, n.c.

Loop C, cold leg

high-pressure check valve, 875C
high-pressure gate valve, 868C, n.o.
high-pressure check valve, 873C
high-pressure MOVs, 843A and B in parallel, n.c.

Residual Heat Removal System

Turkey Point Unit 3

Loop A, cold leg

high-pressure check valve, 875A
high-pressure check valve, 876A
high-pressure MOV, 744A, n.c.

Loop B, cold leg

Branch 1

high-pressure check valve, 875B
high-pressure check valve, 876B
high-pressure MOV, 744B, n.c.

Branch 2

high-pressure check valve, 875B
high-pressure check valve, 876D
high-pressure MOV, 872, n.c.

Loop C, cold leg

high-pressure check valve, 875C
high-pressure check valve, 876C
high-pressure MOV, 744B, n.c.

Turkey Point Unit 4

Loop A, cold leg

Branch 1

high-pressure check valve, 875A

high-pressure check valve, 876A

high-pressure MOV, 744A, n.c.

Branch 2

high-pressure check valve, 875A

high-pressure check valve, 876E

high-pressure MOV, 872, n.c.

Loop B, cold leg

Branch 1

high-pressure check valve, 875B

high-pressure check valve, 876B

high-pressure MOV, 744A and B, n.c., in parallel

Branch 2

high-pressure check valve, 875B

high-pressure check valve, 876D

high-pressure MOV, 872, n.c.

Loop C, cold leg

high-pressure check valve, 875C

high-pressure check valve, 876C

high-pressure MOV, 744B, n.c.

In accordance with the criteria of Section 2.0, FRC has found no other valve configurations of concern existing in this plant. These findings confirm the licensee's response [Ref. 2].

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 the Turkey Point Units 3 and 4.

4.0 CONCLUSION

Turkey Point Units 3 and 4 has been determined to have valves in two of the configurations of concern having (1) a two check valve and single MOV in-series configuration in the cold leg branches of the High-Head Injection and Residual Heat Removal Systems, and (2) a single check valve, MOV inseries configuration in the two hot leg branches of the High-Head Safety Injection System.

If FPL modifies the Plant Technical Specification for Turkey Point Units 3 and 4 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	Unit 3	Unit 4	
Loop A, hot leg	3-874A	4-874A	
cold leg	3-875A	4-875A	
cold leg	3-873A	4-873A	
Loop B, hot leg	3-874B	4-874B	
cold leg	3-875B	4-875A	
cold leg	3-873B	4-873B	
Loop C, cold leg	3-875C	4-875C	
cold leg	3-873C	4-873C	
Residual Heat Removal			
Loop A, cold leg	3-876A	4-876A 4-876E	

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

Loop B, cold leg	3-876B 3-876D	4-876B 4-876D
Loop C, cold leg	3-876C	4-876C

5.0 REFERENCES

[1]. Generic NRC letter, dated 2/23/80, from Mr. D. G. Eisenhut, Department of Operating Reactors (DOR), to Mr. R. E. Uhrig, Florida Power & Light Company (FPL).

[2]. Florida Power & Light Company's response to NRC's letter, dated 3/17/80, from Mr. R. E. Uhrig (FPL) to Mr. D. G. Eisenhut (DOR).

[3]. List of examined P&IDs:

FSAR Drawings of Turkey Point Units 3 and 4:

Fig. 4.2-1, (Rev. 30)

Fig. 6.2-1, (Rev. 33)

Fig. 9.2-1, (Rev. 33) sh. 1

Fig. 9.2-2, (Rev. 30) sh. 2

Fig. 9.2-3, (Rev. 30) sh. 3

Fig. 9.3-1a, (Rev. 33) sh. 1

Fig. 9.3-1b, (Rev. 33) sh. 2

Fig. 9.3-2, (Rev. 33)

Fig. 9.3-3, (Rev. 33)

Fig. 9.4-1, (Rev. 33)