ATTACHMENT 1

TECHNICAL EVALUATION REPORT

PRIMARY COOLANT SYSTEM PRESSURE ISOLATION VALVES

DAIRYLAND POWER COOPERATIVE
LA CROSSE UNIT 1

NRC DOCKET NO. 50-409

NRC TAC NO. 12917

NRC CONTRACT NO. NRC-03-79-118

FRC PROJECT C5257

FRC TASK 250

Prepared by

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Prepared for

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Washington, D.C. 20555

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Franklin Research Center

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

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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.

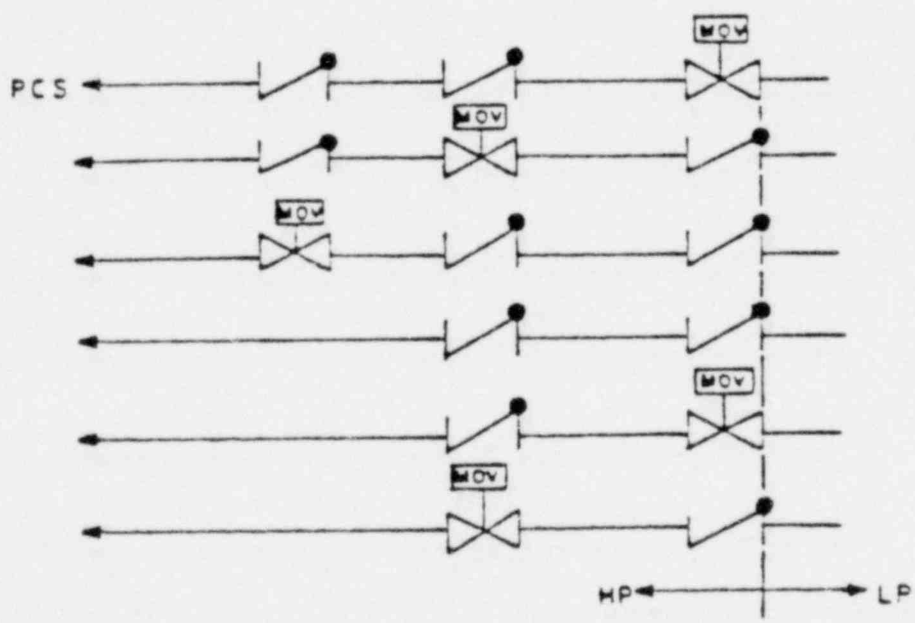

Figure 1. Valve Configurations Designated by the NRC To Be Included in This Technical Evaluation

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 Dairyland Power Cooperative (DLP) stated [Ref. 2] that, "The Alternative Core Spray (ACS) System is similar to an Event V isolation valve configuration, but there are several noteworthy differences. The LACBWR configuration utilizes two check valves and a motor-operated valve (MOV) all in series, but the MOV is closed during normal plant operation, (see enclosed Figure 1). The LACBWR Low Pressure Core Spray System does not conform to an Event V isolation valve configuration, but is a low pressure system connected to the PCS through a check valve and a power-operated-valve (POV), which is closed during normal plant operation (see enclosed Figure 2)."

The Licensee further stated, "In both of the LACBWR system configurations described above, continuous surveillance of pressure barrier leakage is effected by the relief valve located on the low pressure piping. The relief valves are observed daily for evidence of lifting."

"Testing for seat leakage through the ACS check valves is performed annually by procedure at a test pressure equivalent to the pressure of a DBA."

It is FRC's understanding that, with DLP's concurrence, the NRC will direct DLP 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 Alternate Core Spray (ACS) System.

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

> The Alternate Core Spray (ACS) System piping is composed of two in-series check valves inside containment leading to a normally open gate valve outside containment followed by two parallel motor-operated valves (MOVs).
>
> All piping leading from the reactor vessel up to and including the two motor-operated valves outside containment is high-pressure, with low-pressure piping existing from this point on. These valves of the ACS system are listed below:

Alternate Core Spray System

- high-pressure check valve, 38-26-001
- high-pressure check valve, 38-26-002
- high-pressure gate valve, 38-24-003, normally closed (n.c.)
- high-pressure MOV, 38-30-001, n.c.
- high-pressure MOV, 38-30-002, 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 La Crosse Unit 1.

4.0 CONCLUSION

The La Crosse Unit 1 has been determined to have valves in one of the configurations of concern in the Alternate Core Spray System.

If DLP modifies the Plant Technical Specification for La Crosse 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*
Alternate Core Spray	38-26-001 38-26-002	

5.0 REFERENCES

[1]. Generic NRC letter, dated 2/23/80, from Mr. D. G. Eisenhut, Department of Operating Reactors (DOR), to Mr. F. Linder, Dairyland Power Cooperative (DLP).

[2]. Dairyland Power Cooperative's response to NRC's letter, dated 3/13/80, from Mr. F. Linder (DLP) to Mr. D. G. Eisenhut (DOR).

[3]. List of examined P&IDs:

Dairyland Power Drawings:

C/LR-53, (Rev. 1)

C/LR-69, (Rev. 1)

C/LR-74, (Rev. 2)

C/LR-79, (Rev. 2)

Sargent & Lundy Drawings:

41-503350, (Rev. S)

41-503351, (Rev. 0)

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

41-503358, (Rev. K)

M-12, (Rev. P)

M-13, (Rev. S)

M-13, (Rev. T)

M-17, (Rev. T)

M-21, (Rev. W)

Allis-Chalmers Drawings:

41-300-080, (Rev. 2)

41-300-081, (Rev. 3)

41-300-082

41-300-083, (Rev. 2)

41-300-084, (Rev. 4)

41-300-102, (Rev. 3)

41-400-416, (Rev. 2)

MEMORANDUM FOR: , Chief
Operating Reactors Branch #
Division of Licensing

FROM: Philip J. Polk, Project Manager
Operating Reactors Branch #2
Division of Licensing

SUBJECT: WAS 1400 EVENT V ORDERS

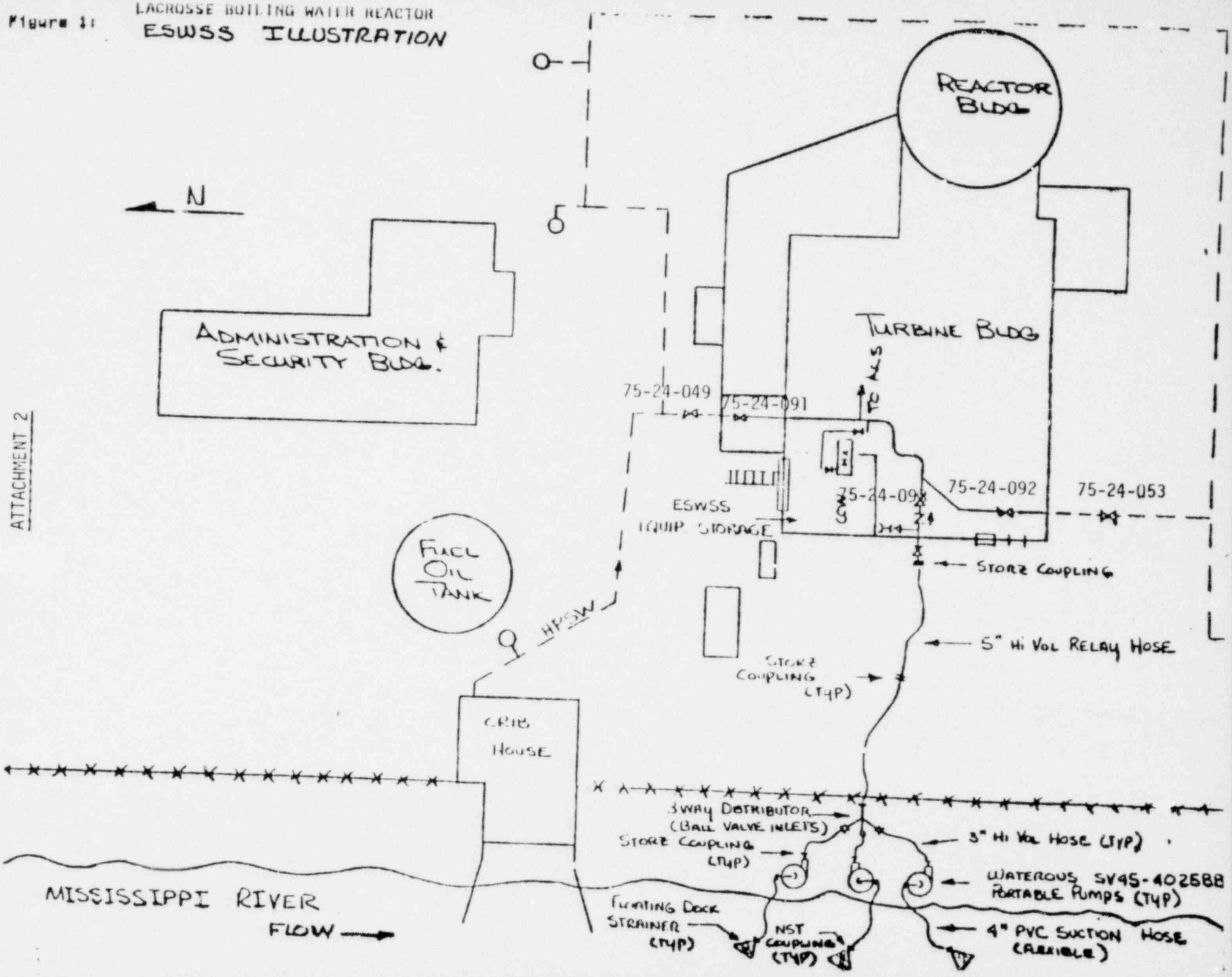
The enclosed Event V Order packages have been reviewed.

The cover letters and Orders can go to final type at this time. With respect to the attached Technical Specifications comments have been made. Please ask the PM's to incorporate these comments. (I will be available to resolve PM concerns, if any.)

Please shoot for final packages with PM and your concurrence by close of business Friday. I will get the remaining concurrences.

Thanks,

Figure 1: LACROSSE BOILING WATER REACTOR
ESWSS ILLUSTRATION



ATTACHMENT 2