



Perry Nuclear Power Plant
Rod Penfield
Site Vice President
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June 20, 2024
L-24-140

10CFR50.73(a)(2)(i)(B) and 10CFR50.73(a)(2)(ii)(B)

Attention: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20585-0001

Subject: Perry Nuclear Power Plant, Docket No. 50-440, License No. NPF-58:
Licensee Event Report Submittal

Enclosed is Licensee Event Report (LER) 2024-001, "Operation of the Residual Heat Removal Loops B and C 'Alternate Keep Fill' Configuration Was Prohibited by Technical Specifications and Resulted in an Unanalyzed Condition." There are no regulatory commitments contained in this letter.

If there are any questions, or if additional information is required, please contact Mr. Robert Oesterle, Manager - Regulatory Compliance, at (419) 321-7462.

Sincerely,

A handwritten signature in black ink, appearing to read "Rod L. Penfield". The signature is fluid and cursive, with a large loop at the end.

Rod L. Penfield

Enclosure:
LER 2024-001

cc: NRC Project Manager
NRC Resident Inspector
NRC Region III Regional Administrator

Enclosure
L-24-140

Licensee Event Report 2024-001



LICENSEE EVENT REPORT (LER)

(See Page 2 for required number of digits/characters for each block)

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Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA, Library, and Information Services Branch (T-6 A10M), U. S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to Infocollects.Resource@nrc.gov, and the OMB reviewer at: OMB Office of Information and Regulatory Affairs, (3150-0104), Attn: Desk Officer for the Nuclear Regulatory Commission, 725 17th Street NW, Washington, DC 20503. The NRC may not conduct or sponsor, and a person is not required to respond to, a collection of information unless the document requesting or requiring the collection displays a currently valid OMB control number.

1. Facility Name

Perry Nuclear Power Plant

050
 052

2. Docket Number
00440

3. Page
1 **OF** 6

4. Title:
Operation of the Residual Heat Removal Loops B and C "Alternate Keep Fill" Configuration Was Prohibited by Technical Specifications and Resulted in an Unanalyzed Condition

5. Event Date			6. LER Number			7. Report Date			8. Other Facilities Involved		
Month	Day	Year	Year	Sequential Number	Rev No.	Month	Day	Year	Facility Name	<input type="checkbox"/> 050	Docket Number
04	25	2024	2024	001	00	06	20	2024	Facility Name	<input type="checkbox"/> 052	Docket Number

9. Operating Mode

1

10. Power Level

100

11. This Report is Submitted Pursuant to the Requirements of 10 CFR §: (Check all that apply)

<input checked="" type="checkbox"/> 10 CFR Part 20	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input checked="" type="checkbox"/> 10 CFR Part 50	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)	<input type="checkbox"/> 73.1200(a)
<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input checked="" type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)	<input type="checkbox"/> 73.1200(b)
<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)	<input type="checkbox"/> 73.1200(c)
<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)	<input type="checkbox"/> 73.1200(d)
<input type="checkbox"/> 20.2203(a)(2)(i)	<input checked="" type="checkbox"/> 10 CFR Part 21	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input checked="" type="checkbox"/> 10 CFR Part 73	<input type="checkbox"/> 73.1200(e)
<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 21.2(c)	<input type="checkbox"/> 50.69(g)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.77(a)(1)	<input type="checkbox"/> 73.1200(f)
<input type="checkbox"/> 20.2203(a)(2)(iii)		<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> 73.77(a)(2)(i)	<input type="checkbox"/> 73.1200(g)
<input type="checkbox"/> 20.2203(a)(2)(iv)		<input checked="" type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	<input type="checkbox"/> 73.77(a)(2)(ii)	<input type="checkbox"/> 73.1200(h)
<input type="checkbox"/> 20.2203(a)(2)(v)		<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50.73(a)(2)(vii)		

OTHER (Specify here, in abstract, or in NRC Form 366A).

12. Licensee Contact for this LER

Licensee Contact

William Partridge, Regulatory Compliance

Phone Number (Include area code)

440-280-5913

13. Complete One Line for Each Component Failure Described in this Report

Cause	System	Component	Manufacturer	Reportable to IRIS	Cause	System	Component	Manufacturer	Reportable to IRIS

14. Supplemental Report Expected

No Yes (If yes, complete 15. Expected Submission Date)

15. Expected Submission Date

Month: Day: Year:

16. Abstract (Limit to 1326 spaces, i.e., approximately 13 single-spaced typewritten lines)

From March 25, 2024 to March 31, 2024, in Mode 1 at 100% power, Residual Heat Removal (RHR) loops B and C were not configured to the dedicated waterleg pump, a condition prohibited by Technical Specifications (TS). This condition, and an unanalyzed condition of the alternate keepfill configuration, were determined April 25, 2024.

Based on the Cause Investigation: Cause 1 was a series of human performance errors processing an improper operating procedure revision; Cause 2 was ineffective communication between Operations and Engineering; a Contributing Cause was that past evaluations of the requested procedure change had missed the opportunity to clearly state in the procedure that the change did not support single active component failure licensing basis requirements

The RHR procedure was revised to reflect the licensing basis. Planned corrective actions include: implementing an operations procedure department's guidance document; authoring a new Training case study about communications; revising RHR and inservice testing program procedures to explain why alternate keep fill configuration causes RHR loop inoperability.

The March 2024 RHR operational configurations are being reported as a condition prohibited by TS under 10 CFR 50.73(a)(2)(i)(B), and as an unanalyzed condition under 10 CFR 50.73(a)(2)(ii)(B).



**LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET**

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1. FACILITY NAME Perry Nuclear Power Plant	<input checked="" type="checkbox"/> 050	2. DOCKET NUMBER 00440	3. LER NUMBER		
	<input type="checkbox"/> 052		YEAR 2024	SEQUENTIAL NUMBER - 001	REV NO. - 00

NARRATIVE

Energy Industry Identification System and Component (EISS) codes are identified in the text as [XX].

System Description

The Perry Residual Heat Removal (RHR) System [BO] is part of the Emergency Core Cooling System (ECCS) that is designed to provide cooling water (the RHR's Low Pressure Coolant Injection (LPCI) function) to the reactor vessel [RPV] as protection against postulated loss-of-coolant accidents (LOCA).

The RHR System has three loops (A, B, C), each with its own injection pump [P], which differ from the waterleg pumps. The licensing basis, as stated in the Updated Safety Analysis Report (USAR), requires that RHR cooling water flow from the Suppression Pool [BT] to the reactor vessel be initiated rapidly when the RHR System is called on to perform its function. The lag between the signal to start an RHR pump and the initiation of flow can be minimized by keeping the pumps' discharge lines full. The licensing basis credits only the specific safety related, seismically qualified RHR waterleg pumps to automatically provide water to the RHR loops, downstream of each loop's main RHR pump, to maintain the loops water solid. One waterleg pump supplies water to the RHR A loop, and another waterleg pump supplies water to both the RHR B and RHR C loops.

An alternate keep fill configuration, relying upon water from non-safety related, non-seismically qualified, and non-essentially powered Condensate Transfer and Storage System [KA] piping, can be used to provide initial filling of the RHR discharge lines. The Condensate Transfer and Storage System piping water enters, via the alternate keep fill lineup, at each RHR loop's piping downstream of where each loop would receive the waterleg pump's water. At the interface of RHR and Condensate Transfer and Storage piping, each RHR loop has a single 8-inch safety-related check valve [V]. This alternate keep fill configuration is not a licensing basis credited method of keeping the RHR discharge lines water solid.

Perry Technical Specification (TS) 3.5.1 is "ECCS - Operating." Limiting Condition for Operation (LCO) 3.5.1 requires each ECCS injection/spray subsystem be Operable in Modes 1, 2, and 3. With one low pressure ECCS injection/spray subsystem inoperable, TS LCO 3.5.1 Required Action A.1 requires the subsystem be restored to Operable status in 7 days. With two ECCS injection subsystems inoperable, Required Action C.1 requires one subsystem be restored to Operable status in 72 hours. If the C.1 Required Action and associated Completion Time are not performed and met, Required Action D.1 requires the unit be in Mode 3 Hot Shutdown in 12 hours, and Required Action D.2 requires the unit be in Mode 4 Cold Shutdown in 36 hours.

DESCRIPTION OF EVENT

1. Operation in a condition prohibited by Technical Specifications.

On February 22, 2024, operating procedure SOI-E12 Revision 79, "Residual Heat Removal System," had been updated to Revision 80. The main purpose of that revision had been to delete revision 79's directives pertaining to waterleg pump and alternate keep fill operation.

Revision 79 reflected the licensing basis by stating as a Precaution and Limitation (P&L) that "If RHR A, B, or C are placed on alternate keep fill or the respective Waterleg pump is shutdown the affected RHR loop will be inoperable," and by directing as a procedure step to "DECLARE the affected RHR loop inoperable."

Revision 80 of SOI-E12 deleted directives to declare an RHR loop inoperable, whenever that RHR loop has an inoperable waterleg pump or is in alternate keep fill configuration. Revision 80 directed in a new Precaution and Limitation that "If RHR A, B, OR C are placed on alternate keep fill AND the RHR PUMP A(B,C) DISCHARGE PRESSURE HI/LO. . . is received the RHR loop will be inoperable," thereby allowing the system to be considered operable otherwise.



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NARRATIVE

On March 25, 2024 at 2015 hours (Mode 1 Power Operation, 100% power), the RHR waterleg pump, for RHR loops B and C, was undergoing scheduled maintenance and was declared inoperable. At this time, RHR loops B and C should have been declared inoperable but were not, as the operators were following SOI-E12 revision 80's directions. TS 3.5.1 LCO Conditions A (One low pressure ECCS injection/spray subsystem inoperable) and C (Two ECCS injection subsystems inoperable) were not entered.

On March 25, 2024 at 2020 hours, the RHR alternate keep fill startup was established per SOI-E12 revision 80, to keep RHR B and C discharge lines water solid.

LCO 3.5.1 Condition C Required Action C.1 (Restore one ECCS injection/spray subsystem to OPERABLE status) has a 72 hour Completion Time, which would have expired on March 28, 2024 at 2015 hours, at which time Condition D (Required Action and associated Completion Time of Condition A, B, or C not met) should have been entered but was not.

LCO 3.5.1 Condition D Required Action D.1 (Be in MODE 3, Hot Shutdown) has a 12 hour Completion Time, which would have expired on March 29, 2024 at 0815 hours. Required Action D.2 (Be in MODE 4, Cold Shutdown) has a 36 hour Completion Time, which would have expired on March 30, 2024 at 0815 hours.

On March 30, 2024 at 2024 hours, anticipating removal from the alternate keep fill configuration and acknowledging the inoperability of the RHR waterleg pump for B and C loops pending completion of post-maintenance testing, the Operators' Log stated, "RHR loops B and C are INOPERABLE but AVAILABLE. Technical Specification LCO 3.5.1 is not met. Enter Conditions A and C for LPCI B and C."

On March 30, 2024 at 2032 hours, RHR loops B and C were removed from the alternate keep fill configuration.

On March 31, 2024 at 0440 hours, following a surveillance test, the RHR waterleg pump for RHR loops B and C, and the associated RHR loops, were declared Operable; LCO 3.5.1 was declared met.

On April 4, 2024, the Corrective Action Program's Condition Report (CR) CR-2024-02947, "Potentially Inadequate Review of RHR Alternate Keep-fill Allowance in SOI-E12, Rev. 80," was initiated "to determine if an unanalyzed condition was inadvertently permitted by the procedure revision." The Cause Investigation of this Reportable Event rolled the concerns of this CR into the CR-2024-03694.

On April 11, 2024, CR-2024-03160, "10 CFR 50.59 Review Committee – Failed Product," was submitted by engineering regarding the 50.59 Screen that had helped process revision 80 of SOI-E12. The Cause Investigation of this Reportable Event rolled the concerns of this CR into the CR-2024-03694.

SOI-E12 Revision 81, effective April 11, 2024, and Revision 82, effective April 15, 2024, restored SOI-E12 Revision 79 Inoperability requirements for RHR loops when in the alternate keep fill configuration.

On April 25, 2024, design analysis engineering submitted CR-2024-03694, "SOI-E12 Revision 80 RHR Alternate Keep-fill Operability Concerns." This CR prompted making an Event Notification to the NRC of operation in an unanalyzed condition. This CR is the foundation for the Reportable Event's Cause Investigation, which included the April 4 CR and April 11 CR concerns into the Investigation scope.

On April 25, 2024, evaluation of this event concluded that RHR loops B and C should have been declared inoperable, and TS LCO 3.5.1 Condition A and Condition C should have been entered when the waterleg pump for RHR loops B and C had been declared inoperable on March 25, 2024, at 2015 hours. The waterleg pump was inoperable until March 31, 2024, at



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NARRATIVE

0440 hours. RHR loops B and C were not declared inoperable, the Required Actions C.1, D.1, D.2 were not performed, and these Actions' required Completion Times were not met. As a result, this event is being reported in accordance with 10 CFR 50.73(a)(2)(i)(B) as a condition that was prohibited by the Technical Specifications

2. Operation in an Unanalyzed Condition

On April 25, 2024 at 1755 hours, it was determined that the use of alternate keep fill configuration for RHR Loops B and C constituted an unanalyzed condition. The site contacted the NRC with a 10 CFR 50.72(b)(3)(ii)(B) Event Notification (ENS # 57092) on April 25, 2024 at 2024 hours.

The details of this unanalyzed condition are discussed in the "Analysis of Event" section below.

CAUSES OF EVENT

The Cause Investigation determined:

- Cause 1: A series of human performance errors during the preparation, review, and approval of SOI-E12 RHR Rev 80 being implemented as a Simple Change.
- Cause 2: Communication of vital information between Operations and Engineering that could have directly prevented the procedure change leading to the plant being operated in an unanalyzed condition was not effective.
- Contributing Cause: Previous evaluations of the same requested procedure change to make RHR operable using Alternate Keepfill missed the opportunity to embed guidance in SOI-E12 that clearly states that this change does not support Design Basis Criteria (SACF) [Single Active Component Failure] USAR Chapter 15 Requirements.

ANALYSIS OF EVENT

This event is reportable due to the plant having operated in an unanalyzed condition under 10 CFR 50.73(a)(2)(ii)(B). This unanalyzed condition (the RHR B and C loop operation on the alternate keep fill configuration) occurred from March 25, 2024 at 2020 hours, to March 30, 2024 at 2032 hours.

The Design Basis Accident (DBA) is the sudden break of a main steam line or reactor recirculation line (USAR Table 3.9-3). USAR Section 15.6.5, "Loss-of-Coolant Accidents (Resulting from Spectrum of Postulated Piping Breaks within the Reactor Coolant Pressure Boundary) - Inside Containment," states that this loss of coolant accident (LOCA) is also coincident with a safe shutdown earthquake.

The USAR's Chapter 15 "Accident Analysis" directs that "only safety grade equipment is assumed to be used to mitigate accidents and safely shut down the reactor." USAR Table 3.6-3, "Systems To Be Protected Against Piping Failures" lists among such systems the RHR (LPCI Injection A, B, and C loops) System, but not the Condensate Transfer and Storage System.

USAR Section 6.3.1.1.3, "ECCS Requirements for Protection from Physical Damage," states that ECCS "piping and components are protected against damage from movement, from thermal stresses, from the effects of the LOCA, and the safe shutdown earthquake (SSE)."



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USAR Section 15.A.2.8, "General Nuclear Safety Operational Criteria," states, "The plant shall be operated in such a way that no Single Active Component Failure (SACF) can prevent the safety actions essential to avoiding the unacceptable consequences associated with anticipated or abnormal operational transients or design basis accidents."

SOI-E12 Revision 80 allowed the plant to be placed in an alignment that required the RHR System's B and C check valves to not only have a passive function but also to operate as an isolation valve [ISV] with an active function.

A DBA with Single Active Failure postulation of the 8-inch check valve, in the alternate keep fill alignment (failure of the given train's check valve to fully close), would result in diversion of radioactive Suppression Pool water through RHR and Condensate Transfer and Storage System piping to the environment. The quantities of radioactive water and dose released outside Containment in this scenario have not been analyzed and would exceed the USAR Loss of Coolant Accident analysis values for leakage outside primary Containment.

The potential drainage from the Suppression Pool, and the diversion of RHR injection flow away from the reactor vessel, are also unanalyzed configurations. USAR Section 6.3.1.1.1 (Emergency Core Cooling System Design Bases Performance and Functional Requirements) states, "The ECCS is designed to provide protection against postulated loss-of-coolant accidents (LOCA) caused by ruptures in primary system piping. . . . In addition, the ECCS is designed to following requirements . . . f. A sufficient water source and the necessary piping, pumps and other hardware are provided so that the containment and reactor core can be flooded for possible core heat removal following a LOCA."

RHR A loop remained operable, in its proper waterleg pump configuration, throughout this event between March 25 and March 31, 2024; therefore there was no loss of safety function.

A probabilistic risk assessment (PRA) evaluation was performed for the March 2024 RHR B and C loop operation in the alternate keep fill configuration, using the full power PRA model. High winds and external flooding were qualitatively addressed to be of very low safety significance. The dominant fire scenarios were qualitatively expected to be similar to that for the seismic analysis. The analysis of this event (the March 2024 operation of RHR B and C loops in the alternate keep fill configuration), including both internal events and seismic hazards, results in delta core damage frequency (CDF) and delta large early relief frequency (LERF) values that are below the acceptable thresholds of 1.0E-06/yr and 1.0E-07/yr, as discussed in Regulatory Guide 1.174. Performance of a sensitivity study that added the postulated condition of the alternate keep fill configuration existing simultaneously for all three RHR loops did not change this conclusion. The risk of this event is therefore considered to be of very low safety significance in accordance with the regulatory guidance.

The RHR B and C waterleg pump was declared inoperable on March 25, 2024 at 2015 hours, and alternate keep fill startup commenced on March 25, 2024 at 2020 hours; the unanalyzed condition of the RHR B and C loop operation lasted until March 30, 2024, at 2024 hours, when TS LCO 3.5.1 Conditions A and C were entered. This event was determined to represent an unanalyzed condition and was reported in accordance with 10 CFR 50.72(b)(3)(ii)(B) to the NRC Operations Center on April 25, 2024, at 2024 hours as Event Number 57092. This event is being reported within 60 days from the discovery of the reportable issue on April 25, 2024, as an unanalyzed condition per 10 CFR 50.73(a)(2)(ii)(B).

CORRECTIVE ACTIONS

Completed Corrective Actions: SOI-E12 was revised (Revision 81, effective April 11, 2024, and Revision 82, effective April 15, 2024) to reflect the plant's licensing basis, declaring RHR loop inoperable when in the alternate keep fill configuration.

Scheduled Corrective Actions:



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NARRATIVE

1. The Operations procedure section will develop and implement a WELL [What Excellent Looks Like] sheet for the procedure preparation process, 50.59 RAD [Regulatory Applicability Determination], and Screen processes that validates cross functional engaging behaviors, proper risk assessment, and Operating Experience review to establish excellence in product development and review behaviors.
2. Develop and deliver a case study on communications. Reference the communication issues identified in this formal report. Recommend this be delivered in the Site Supervisor continuing training program.
3. Anchor the reason why RHR is inoperable on Alternate Keepfill to SOI-E12.
4. Anchor the reason why RHR is inoperable on Alternate Keepfill to the inservice testing program procedure.

PREVIOUS SIMILAR EVENTS

None.