



GPU Nuclear Corporation  
Route 441 South  
P.O. Box 480  
Middletown, Pennsylvania 17057-0480  
(717) 944-7621  
Writer's Direct Dial Number:

(717) 948-8005

March 5, 1993  
C311-93-2029

U.S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, DC 20555

Dear Sir:

Three Mile Island Nuclear Station, Unit 1 (TMI-1)  
Operating Licensing No. DPR-50  
Docket No. 50-289  
LER 93-002-00

This letter transmits Licensee Event Report (LER) No 93-002-00. The event involves the January 29, 1993 performance of a periodic weekly operation of the Decay Heat River Water Pumps. The purpose of running the pumps weekly is to prevent the buildup of silt at the pump suction. During performance of the procedure on this date, personnel error resulted in a valve lineup which caused cooling water to bypass both Decay Heat Service Coolers. These Emergency Safeguards (ES) coolers are part of an emergency standby system which is not normally operated during power operation. Public health and safety were not affected.

This LER is being submitted pursuant to 10 CFR 50.73. The abstract provides a brief description of the event. For a complete understanding of the event, refer to the text of the report. Additional time for responding was provided by the NRC Region I Staff.

Sincerely,

T. G. Broughton  
Vice President and Director, TMI-1

MRK

Attachment  
cc: Region I Administrator  
TMI-1 Senior Project Manager  
TMI Senior Resident Inspector

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## LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) THREE MILE ISLAND, UNIT 1										DOCKET NUMBER (2) 0 5 0 0 0 2 8 9				PAGE (3) 1 OF 0 6										
TITLE (4) BYPASS OF BOTH DECAY HEAT SERVICE COOLERS DUE TO PERSONNEL ERROR																								
EVENT DATE (5)			LER NUMBER (6)				REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)														
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES				DOCKET NUMBER(S)											
5	1	2	9	9	3	9	3	0	0	2	0	0	0	3	0	5	9	3	0	5	0	0	0	0
OPERATING MODE (9) N		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR § (Check one or more of the following) (11):																						
POWER LEVEL (10) 1 0 0		20.402(h)				20.406(e)				80.73(a)(2)(iv)				73.71(b)										
		20.406(a)(1)(i)				80.38(e)(1)				80.73(a)(2)(v)				73.71(c)										
		20.406(a)(1)(ii)				80.38(e)(2)				80.73(a)(2)(vi)				OTHER (Specify in Abstract below and in Text, NRC Form 305A)										
		20.406(a)(1)(iii)				80.73(a)(2)(i)				80.73(a)(2)(viii)(A)														
		20.406(a)(1)(iv)				80.73(a)(2)(ii)				80.73(a)(2)(vii)(B)														
		20.406(a)(1)(v)				80.73(a)(2)(iii)				80.73(a)(2)(ix)														
LICENSEE CONTACT FOR THIS LER (12)																								
NAME M. R. Knight, TMI-1 Licensing Engineer										TELEPHONE NUMBER AREA CODE 7 1 7 9 4 8 - 8 5 5 4														
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)																								
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRCDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRCDS														
SUPPLEMENTAL REPORT EXPECTED (14)												EXPECTED SUBMISSION DATE (15)		MONTH		DAY		YEAR						
YES (If yes, complete EXPECTED SUBMISSION DATE: )												X NO												

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

## BYPASS OF BOTH DECAY HEAT SERVICE COOLERS DUE TO PERSONNEL ERROR

TMI-1 was operating at 100% power. On January 29, 1993 during the performance of a weekly procedure, not required by Technical Specifications (TS), the Auxiliary Operator (AO) failed to follow established operator work practices and established a valve lineup which caused river water to bypass both Decay Heat Service Coolers (DC-C-2A/B) simultaneously. When discovered, the proper alignment was immediately restored. The root cause of this event was personnel error.

TS 3.3.1.1.d requires two Decay Heat Removal Coolers (DH-C-1A/B) and their cooling water supplies, including coolers DC-C-2A/B, during plant operation. With both coolers bypassed, TS 3.0.1 was applicable. This condition is reportable under 50.73.a.2.i.B and also under 50.73.a.2.vii.

Bypassing both coolers simultaneously had no immediate safety significance during the event because the equipment was not called upon to be in operation. In the event of a worst case Loss of Coolant Accident, the safety systems would have fulfilled their intended function.

Management has reviewed this event with the affected crew. Procedures will be upgraded. Each Operating crew will review the event.

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TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 500 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-830), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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TEXT (If more space is required, use additional NRC Form 386A's) (17)

## BYPASS OF BOTH DECAY HEAT SERVICE COOLERS DUE TO PERSONNEL ERROR

## I. Plant Operating Conditions before Event:

TMI-1 was operating at 100% rated power.

## II. Status of Structures, Components, or Systems that were Inoperable at the Start of the Event and that Contributed to the Event:

None

## III. Event Description:

Operations Surveillance OPS-S227, "DR-P-1A/B Periodic Operation," is a weekly non-Tech Spec surveillance normally performed by the operating shift between 11:00 pm and 7:00 am. The purpose of this surveillance is to assure that each Decay Heat River Water (DR) Pump [BI/P] operates for at least one hour per week to avoid the potential for silt buildup at the pump suction. During the early 1980s, when the facility was in extended shutdown and core decay heat levels were extremely low, OPS-S227 provided guidance for bypassing a Decay Heat Service Cooler (DC-C-2A or DC-C-2B) [BI/CLR] if there was a concern for a thermal transient (extreme cooling) on the Decay Heat Removal (DHR) System or the Decay Heat Closed Cooling Water (DCCW) System. The option to bypass coolers in accordance with OPS-S227 has not been needed since restart in 1985 after the six year shutdown.

During the performance of OPS-S227 on January 29, 1993, the non-licensed Auxiliary Operator (AO) failed to follow established operator work practices and bypassed both DC-C-2A and DC-C-2B simultaneously at about 0100 hours. The DR System was not required to be in operation, so neither DR Pump was operating.

Control Room personnel were unaware that both coolers were bypassed until about 0330 hours when a licensed Control Room Operator (CRO) discovered this condition while attempting to determine the status of preparations for performing OPS-S227. During a later critique of the event, the AO stated that after bypassing both coolers he reported the condition to the Control Room so the surveillance could proceed. However, Control Room personnel do not remember receiving the report. When the CRO discovered that the DR valves (DR-V3A/B, and DR-V5A/B) [BI/V] were not in the required position, he immediately informed the Shift Supervisor who directed the crew to restore and independently verify the required Engineered Safeguards (ES) valve alignment. Realignment of the coolers

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ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-630), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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and independent verification were completed by approximately 0355 hours.

DCCW is a closed loop cooling water system which rejects heat to river water (ultimate heat sink) through the Decay Heat Service Coolers (DC-C-2A/B). DCCW cools the Decay Heat Removal System (DHR) Coolers [BP/CLR] and the following safety related pumps:

1. DCCW Pumps bearings [CC/P] (TS 3.3.1.4.c),
2. DHR Pumps motor and bearings [BP/P] (TS 3.3.1.1.c),
3. Reactor Building Spray (BS) Pumps motor and bearings [BE/MO] (TS 3.3.1.3.a), and
4. Makeup Pumps (MU-P1A and C) motor [CB/MO], gear reducer [CB/RGR], and bearings (TS 3.3.1.1.b).<sup>1</sup>

Technical Specification (TS) 3.3.1.1.d requires two DHR Coolers (DH-C-1A/B) [BP/CLR] and their cooling water supplies, which includes the Decay Heat Service Coolers (DC-C-2A/B), during plant operation. One train is allowed to be removed from service for up to 72 hours. With both coolers inoperable (bypassed), TS 3.3.1.1.d was not met. TS 3.0.1 (comparable to STS 3.0.3) was applicable. This condition was reportable under 50.73.a.2.i.B as an event or condition prohibited by the Plant's Technical Specifications, and also under 50.73.a.2.vii as an event where a single cause or condition caused two independent trains to become inoperable in a single system designed to remove residual heat or mitigate the consequences of an accident.

The root cause of this event was personnel error. The AO bypassed both coolers at the same time in violation of established operator work practices. The AO failed to operate the equipment in accordance with Administrative Procedure (AP) 1029, "Conduct of Operations," which would have required authorization from the Shift Supervisor, Shift Foreman, or CRO prior to manipulating the valves. Additionally, operation of both trains of ESAS components was in violation of operator work practices. Further evaluation will determine to what extent communications, work preparation, and work control by the shift personnel contributed to this event.

To a lesser extent, clarity of the procedural guidance also contributed. The instructions in OPS-S227 did not provide guidance for determining if a thermal transient would occur, did not specify that only one cooler at a time should be bypassed and that bypassing a cooler rendered the train out of service and started a TS time clock. However, the instructions in OPS-S227 that contributed to this event could have been eliminated

<sup>1</sup> Makeup Pump MU-P1B is cooled by Nuclear Services Closed Cooling Water (NSCCW) and was unaffected by this event.



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entirely since they are not applicable to an operating station. If the guidance had been contained in the appropriate Operating Procedure, exposure to the biennial review process could have resulted in either enhanced presentation to clarify the use of this option or removed it entirely.

## IV. Component Failure Data:

None.

## V. Automatic or Manually Initiated Safety System Responses:

No safety system responses were involved in this event.

## VI. Assessment of the Safety Consequences and Implications of the Event:

Bypassing both coolers had no immediate safety significance during the event since neither train was called upon to be in operation.

GPU Nuclear has completed calculations which predict the temperature and pressure versus time for the containment during a Large Break Loss Of Coolant Accident (LBLOCA) with DR not available. The analysis was performed using single train availability and other standard FSAR assumptions regarding ambient conditions, core decay heat, Reactor Building (RB) initial conditions and equipment operability. The calculations were performed with Borated Water Storage Tank (BWST) temperature at 120°F, as well as at the actual temperature at the time of the event (70°F). The assumption of single train availability results in a time for switchover from the BWST to sump recirculation of about 72.5 minutes following an accident. Assuming all pumps are operable, the time to switchover would be about 30 minutes (minimum time).

GPU Nuclear has concluded that if a worst case LOCA were to occur with DR isolated, the core and containment response would be unaffected prior to sump recirculation. Following sump recirculation, the core and containment cooling would be continued since sufficient Net Positive Suction Head (NPSH) would be available to the Low Pressure Injection (LPI) and BS pumps and the Reactor Building Emergency Cooling (RBEC) fan coolers [BK/FCU] would remove decay heat from containment. The automatic Control Room alarm on Main Annunciator Panel C-2-8 [IB/TA] actuates almost immediately after starting RB sump recirculation at a Decay Heat Service Cooler, DCCW outlet temperature of 100°F.

The remaining concern is to provide continuous DCCW cooling to assure long term LPI and BS pump component cooling. The exact time period over which

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these components would continue to operate without DR flow through the coolers has not been determined by quantitative calculations. GPU Nuclear engineering judgement indicates that at least 30 minutes would be available for operator action to restore the DR valve alignment after receiving the alarm in the Control Room (i.e., at least one hour after the start of the event). If the conservatism of this evaluation was removed, it could be shown that the safety function of DCCW components could be sustained longer, perhaps indefinitely.

On receiving the alarm in the Control Room, the operators are directed to investigate reduced DR system flow and verify the DR System valve lineup. With the installed alarm actuated on DCCW high temperature followed by the individual high bearing temperature alarms on these components, GPU Nuclear concludes that, in accordance with procedure instructions, operator action to reopen the isolation valves would be taken promptly to successfully reestablish full DCCW cooling prior to component degradation.

Based on the above, GPU Nuclear concludes that the safety function of mitigating the consequences of an accident and of removing core decay heat, would have been achieved if a LBLOCA had occurred while the coolers were bypassed.

## VII. Previous Events of a Similar Nature:

None.

## VIII. Corrective Actions Taken:

The Operations Director has reviewed this incident with the crew involved to ensure that they recognize the errors that were committed and their significance.

## IX. Corrective Actions Planned:

1. Administrative Procedure (AP) 1016 will be revised to exclude from the Operations Surveillance Program tasks which operate a system or component outside the envelope of the approved system Operating Procedure.
2. Operations Surveillance Procedures similar to OPS-S227 will be revised to ensure that detailed procedural guidance for evolutions that can potentially affect safe plant operations are removed and placed in approved Operating Procedures. Initial review of the program has identified three surveillances that are similar to

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OPS-S227. A comprehensive review is in progress and it is expected that only a small number of procedures will be affected. These Operations Surveillance Procedures will reference approved Operating Procedures for proper guidance. This will assure that such activities receive a periodic review through the biennial procedure review process.

3. Each operating crew will review this event to ensure their understanding of the errors that were committed and how similar errors can be avoided. Conformance to the Administrative Procedure guidance on verbal communications, work preparation, and work control will be emphasized.
4. A more comprehensive review of the human performance aspects involved in this event will be conducted to include the roll of supervision, communications, and what improvements in work practices and controls are indicated.

These actions will be completed by May 1993.

\* The Energy Industry Identification System (EIIS), System Identification (SI) and Component Function Identification (CFI) Codes are included in brackets, "[SI/CFI]", where applicable, as required by 10 CFR 50.73(b)(2)(ii)(F).