



May 9, 2001  
NMP2L 2020

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

RE: Docket No. 50-410  
Licensee Event Report 00-07, Supplement 1

Gentlemen:

In accordance with 10 CFR 50.73(a)(2)(ii)(B) and 10 CFR 50.73(a)(2)(v), we are submitting Licensee Event Report 00-07, Supplement 1, "Plant Outside Design Basis due to Single Failure Susceptibility of Service Water and Emergency Core Cooling Systems." Supplement 1 corrects the description of the Service Water system response during a Loss of Offsite Power concurrent with a Loss of Coolant Accident. The discrepancy with the description of the Service Water system response was identified during an NRC inspection and is addressed in Inspection Report 0500410/2000-007. A status of corrective actions is also provided.

Sincerely,

A handwritten signature in black ink, appearing to read "M. Peckham".

Michael F. Peckham  
Plant Manager - NMP2

MFP/KLE/cld  
Attachment

xc: Mr. H. J. Miller, NRC Regional Administrator  
Mr. G. K. Hunegs, NRC Senior Resident Inspector  
Records Management

Handwritten initials in the bottom right corner, possibly "JES" or similar, with a vertical line next to them.

NRC FORM 366				U.S. NUCLEAR REGULATORY COMMISSION				APPROVED OMB NO. 3150-0104 EXPIRES:			
<b>LICENSEE EVENT REPORT (LER)</b>								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-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503			
FACILITY NAME (1) <b>Nine Mile Point Unit 2</b>						DOCKET NUMBER (2) <b>05000410</b>			PAGE (3) <b>01 OF 05</b>		
TITLE (4) <b>Plant Outside Design Basis due to Single Failure Susceptibility of Service Water and Emergency Core Cooling Systems</b>											
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)
04	13	00	00	07	01	05	09	01	N/A		
									N/A		
OPERATING MODE (9)			THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)								
POWER LEVEL (10) <b>000</b>			<input type="checkbox"/> 20.2201(b) <input type="checkbox"/> 20.2203(a)(1) <input type="checkbox"/> 20.2203(a)(2)(I) <input type="checkbox"/> 20.2203(a)(2)(ii) <input type="checkbox"/> 20.2203(a)(2)(iii) <input type="checkbox"/> 20.2203(a)(2)(iv)		<input type="checkbox"/> 20.2203(a)(2)(v) <input type="checkbox"/> 20.2203(a)(3)(I) <input type="checkbox"/> 20.2203(a)(3)(ii) <input type="checkbox"/> 20.2203(a)(4) <input type="checkbox"/> 50.36(c)(1) <input type="checkbox"/> 50.36(c)(2)		<input type="checkbox"/> 50.73(a)(2)(I) <input checked="" type="checkbox"/> 50.73(a)(2)(ii) <input type="checkbox"/> 50.73(a)(2)(iii) <input type="checkbox"/> 50.73(a)(2)(iv) <input checked="" type="checkbox"/> 50.73(a)(2)(v) <input type="checkbox"/> 50.73(a)(2)(vii)		<input type="checkbox"/> 50.73(a)(2)(viii) <input type="checkbox"/> 50.73(a)(2)(x) <input type="checkbox"/> 73.71 <input type="checkbox"/> OTHER <small>(Specify in Abstract below and in Text, NRC Form 366A)</small>		
LICENSEE CONTACT FOR THIS LER (12)											
NAME <b>Raymond J. Dean, Manager Engineering Unit 2</b>								TELEPHONE NUMBER <b>(315) 349-4240</b>			
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)											
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX		
SUPPLEMENTAL REPORT EXPECTED (14)							EXPECTED SUBMISSION DATE (15)		MONTH	DAY	YEAR
<input type="checkbox"/> YES (If yes, complete EXPECTED SUBMISSION DATE)							<input checked="" type="checkbox"/> NO				

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

April 13, 2000, the plant was shutdown for refueling in Mode 4. A review of the service water pumps' low discharge flow trip setpoint uncertainty and its impact on the service water system concluded that a single failure of the High Pressure Core Spray (HPCS) diesel, the onsite power source to Division III Emergency Core Cooling Systems (ECCS), to start following a Loss of Offsite Power (LOOP), could result in a low flow demand for service water and consequently, loss of all service water pumps due to the setting of the low flow trip. This is contrary to the criteria stated in General Design Criteria 44. The loss of all service water results in the loss of all ECCS. The review also concluded that a single failure of the HPCS diesel to start following a Loss of Coolant Accident (LOCA) concurrent with a LOOP, could result in the loss of one train of service water, leaving one train of service water and one train of ECCS operable. Subsequently, in October 2000, it was determined that the failure of the HPCS diesel to start following a LOCA concurrent with a LOOP could also result in the loss of all service water and all ECCS.

The cause was that the original design of the service water system did not consider all possible low flow conditions that may contribute to the tripping of the service water pumps.

A temporary modification was implemented that provided additional service water flow by throttling flow through the Division I and Division II Residual Heat Removal heat exchangers. A corrective action was implemented that modified the service water pumps' control logic such that the pumps no longer trip on low discharge flow.

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

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Nine Mile Point Unit 2	05000410					02 OF 05

TEXT (If more space is required, use additional NRC Form 366A's) (17)

## I. DESCRIPTION OF EVENT

April 13, 2000, while the plant was shutdown for refueling, Niagara Mohawk Power Corporation (NMPC) identified that because of the service water pumps' low discharge flow trip, a single failure of the High Pressure Core Spray (HPCS) diesel to start could impact the running service water pumps. The service water system consists of two trains, Division I and Division II. The initial evaluation, contained in Deviation / Event Report (DER) 2-2000-1452, concluded that: (1) during a Loss of Offsite Power (LOOP) all service water could be lost resulting in the loss of all Emergency Core Cooling Systems (ECCS) and (2) during a Loss of Coolant Accident (LOCA) concurrent with a LOOP one train of service water, Division I service water, could be lost. In the LOCA concurrent with a LOOP scenario, Division II service water and Division II ECCS remained operable. The potential trip of the service water pumps was identified during the extent of condition review of a previously identified single failure susceptibility in the automatic closing circuitry of the non-essential service water isolation valves. The single failure susceptibility in the automatic closing circuitry of the non-essential service water isolation valves is described in Licensee Event Report (LER) 00-05, "Service Water Does Not Meet Single Failure Requirement."

The single failure susceptibility resulting from a HPCS diesel failure was described in LER 00-07, "Plant Outside Design Basis due to Single Failure Susceptibility of Service Water and Emergency Core Cooling Systems." During an NRC inspection, in September 2000, it was identified that the description of service water response during a LOCA concurrent with a LOOP and a failure of the HPCS diesel, in the DER and LER 00-07, was not consistent with the description of service water response in a supporting calculation. The calculation concluded that both trains of service water could be lost. A review of the DER and calculation determined that the calculation was correct. A failure of the HPCS diesel to start could result in the loss of all service water and ECCS during a LOOP and during a LOCA concurrent with a LOOP.

The HPCS diesel is the onsite source of power to Division III ECCS. The HPCS diesel can be supplied by either Division I or Division II service water. If the HPCS diesel starts, discharge valves to Division I and Division II service water open, establishing service water flow. If the HPCS diesel fails to start these valves do not open.

During a LOOP or a LOCA concurrent with a LOOP, the failure of the HPCS diesel to start could result in actuating the low discharge flow trips of the running service water pumps in Division I and Division II. Each service water pump has a low discharge flow protective trip set at less than 1000 gallons per minute (gpm) with a time delay of 10 seconds. However, engineering has determined that due to instrument uncertainty, the upper analytical limit for the trip setpoint is 2100 gpm. With no service water flow to the HPCS diesel, service water flow could be less than 2100 gpm, which could result in the service water pumps tripping on low flow.

On April 17, 2000, a temporary modification was implemented that provided additional service water flow by throttling flow through the Division I and Division II Residual Heat Removal (RHR) heat exchangers. This ensured that there was sufficient flow demand for the service water system to preclude tripping the service water pumps on low discharge flow during the LOOP and LOCA concurrent with a LOOP scenarios.

On May 17, 2000, the service water pumps' control logic was modified such that the pumps would no longer trip on low discharge flow. Subsequently, the temporary modification directing additional service water through the RHR heat exchangers was removed.

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## **II. CAUSE OF EVENT**

The cause was that the original design of the service water system did not consider all possible low flow conditions that may contribute to the tripping of the service water pumps.

## **III. ANALYSIS OF EVENT**

This condition is reportable in accordance with 10 CFR 50.73(a)(2)(ii)(B), "Any event or condition that resulted in the condition of the nuclear power plant, including its principal safety barriers, being seriously degraded; or that resulted in the nuclear power plant being: (B) In a condition that was outside the design basis of the plant." The service water system design basis and ECCS design basis require that single failure criteria be met. An engineering review determined that the service water and ECCS systems did not meet single failure criteria during a LOOP or a LOCA concurrent with a LOOP. Additionally, this condition is also reportable in accordance with 10 CFR 50.73(a)(2)(v), "Any event or condition that alone could have prevented the fulfillment of the safety function of structures or systems that are needed to: (A) Shut down the reactor and maintain it in a safe shutdown condition; (B) Remove residual heat; (C) Control the release of radioactive material; or (D) Mitigate the consequences of an accident." The single failure of the Division III HPCS diesel could result in a loss of all service water pumps leading to a loss of all ECCS.

Previous engineering evaluations have concluded that there would be sufficient service water flow to support the safety function of the service water system, however the current evaluations are more restrictive. Current evaluations consider instrument uncertainty, various pump conditions and equipment availability during postulated events. Not all service water system loads can be assumed available as evaluated in the past. Equipment cooling flow requirements that are based on area temperature and equipment heat loads cannot be assumed to be immediately available. The net effect is that service water flow considered during a LOOP and LOCA concurrent with a LOOP is lower than previously evaluated. The lower flow combined with the setpoint uncertainty on the upper limit of the low flow trip creates conditions where the running service water pumps may trip.

Each pump is provided with a low discharge flow trip for equipment protection. The setpoint for tripping the pump is flow less than 1000 gpm with a time delay of 10 seconds. However, engineering has determined that due to instrument uncertainty, an actual flow of less than 2100 gpm may cause a trip.

A LOOP signal closes non-essential service water isolation valves, isolates Division I service water from Division II service water, establishes one service water pump in Division I and one service water pump in Division II and sends a start signal to the HPCS diesel. The HPCS diesel supplies onsite power to Division III ECCS.

The HPCS diesel can be supplied by either Division I or Division II service water. If the HPCS diesel starts, discharge valves to Division I and Division II service water open, establishing service water flow. If the HPCS diesel fails to start these valves do not open.

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### III. ANALYSIS OF EVENT (Cont'd)

If the HPCS diesel fails to start during a LOOP scenario or a LOCA concurrent with a LOOP scenario then, using revised service water flow values, the Division I and Division II service water pumps may trip due to low discharge flow.

In the scenarios described above, whether a running pump trips depends upon the uncertainty associated with the low flow trip setpoint and the actual service water load at the time of the scenario. However, if the running service water pumps had tripped, the low flow trip logic does not lock out the pump and the pump can be manually restarted as soon as the low flow condition is resolved. If the service water pumps had tripped, training and procedural guidance would have directed operators to take manual actions to promptly restore service water flow.

A probabilistic assessment that estimated the risk impact of a scenario involving a single failure of the Division III HPCS diesel that could result in a loss of all ECCS concluded that the scenario at Nine Mile Point Unit 2 has very low risk significance.

The discrepancy between the description of service water response in DER 2-2000-1452 and the supporting calculation has been placed in the corrective action program for resolution.

### IV. CORRECTIVE ACTIONS

1. A temporary modification was implemented that throttled service water flow through Division I and Division II RHR heat exchangers. The additional service water flow corrected the service water pump susceptibility to low discharge flow trips.

On May 17, 2000, Niagara Mohawk Power Corporation implemented a permanent plant modification that removed the low discharge flow trips from the service water pumps.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

**V. INFORMATION ADDITIONAL**

A. Failed components: none

B. Previous similar events:

Licensee Event Reports 98-23, "Potential Standby Gas Treatment System Inoperability Due to Original Design Deficiency", 98-17 "Control Room Ventilation Inoperable Due to Original Design Deficiency" and 96-10 "Inoperability of Redundant Safety-Related Chillers Caused by Design Analysis Deficiency" have similar root causes, inadequate original design. The corrective actions associated with these reports could not have prevented the condition described in this report.

C. Identification of components referred to in this LER:

Component	IEEE 803A Function	IEEE 805 System ID
Service Water System	N/A	BI
Pumps	P	BI
Valves	ISV	BI
Diesel Generator	DG	EK
High Pressure Core Spray*	N/A	BG
Low Pressure Core Spray*	N/A	BM
Low Pressure Core Injection*	N/A	BP
Automatic Depressurization System*	N/A	BN
Residual Heat Removal Heat Exchanger	HX	BP

\*Emergency Core Cooling System comprises these systems