Paul H. Kinkel
Vice President

Consolidated Edison Company of New York, Inc.
Indian Point Station
Broadway & Bleakley Avenue
Buchanan, NY 10511
Telephone (914) 734-5340
Fax: (914) 734-5923

June 12, 1998

Re: Indian Point Unit No. 2
Docket No. 50-247
LER 96-02-01

Document Control Desk
US Nuclear Regulatory Commission
Mail Station P1-137
Washington, DC 20555-0001

The attached Licensee Event Report LER 96-02-01 is hereby submitted in accordance with the requirements of 10 CFR 50.73

Very truly yours,

Paul H Kinkel

Attachment

cc: Mr. Hubert J. Miller
Regional Administrator-Region I
US Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406

Mr. Jefferey F. Harold, Project Manager
Project Directorate I-1
Division of Reactor Projects I/II
US Nuclear Regulatory Commission
Mail Stop 14B-2
Washington, DC 20555

Senior Resident Inspector
US Nuclear Regulatory Commission
PO Box 38
Buchanan, NY 10511

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NRC FORM 366 (6-89)

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-104

EXPIRES: 4/30/92

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.

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Indian Point No. 2	0 5 0 0 0 2 4 7	1 OF 0 5

TITLE (4)

Pressurizer Heatup During Plant Cooldown

EVENT DATE (5) MONTH	DAY	YEAR	LER NUMBER (6) YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	REPORT DATE (7) MONTH	DAY	YEAR	OTHER FACILITIES INVOLVED (8) FACILITY NAMES	DOCKET NUMBER(S)
0 2	1 0	9 6	9 6	- 0 0 2 -	0 1	0 6	1 2	9 8	NONE	0 5 0 0 0
										0 5 0 0 0

OPERATING MODE (9)	N
POWER LEVEL (10)	0 0 0

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: *(Check one or more of the following)* (11)

	20.402(b)		20.405(c)		50.73(a)(2)(iv)		73.71(b)
	20.405(a)(1)(i)		50.36(c)(1)		50.73(a)(2)(v)		73.71(c)
	20.405(a)(1)(ii)		50.36(c)(2)		50.73(a)(2)(vii)		OTHER *(Specify in Abstract below and in Text, NRC Form 336A)*
	20.405(a)(1)(iii)	X	50.73(a)(2)(i)		50.73(a)(2)(viii)(A)		
	20.405(a)(1)(iv)		50.73(a)(2)(ii)		50.73(a)(2)(viii)(B)		
	20.405(a)(1)(v)		50.73(a)(2)(iii)		50.73(a)(2)(x)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER AREA CODE	
Richard T. Louie, Senior Engineer	9 1 4	7 3 4 - 5 6 7 8

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS

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)

The plant was shutdown on February 9, 1996 to repair leaking Power Operated Relief Valves (PORV's) and block valves on the pressurizer. On February 10, 1996, during the plant shutdown, higher than expected cooldown and heatup evolutions of the pressurizer occurred. Due to excessive gas leakage through the PORV/block valves, the plant was not able to establish pressurizer pressure control using a Nitrogen gas bubble. Normal pressurizer spray was not available since the reactor coolant pumps were secured. Auxiliary pressurizer spray was precluded by technical specification limits on spray nozzle to fluid differential temperature. An alternate procedure was employed to cool the pressurizer by filling and emptying it via the pressurizer surge line. This procedure resulted in two cooldown and heatup evolutions which exceeded the technical specification heatup limits based upon the installed fluid temperature probe indications. A Westinghouse evaluation of the transients concluded that the structural integrity of the pressurizer was not adversely affected and that continued operation was acceptable.

PLANT AND SYSTEM IDENTIFICATION:

Westinghouse 4-Loop Pressurized Water Reactor

IDENTIFICATION OF OCCURRENCE:

Pressurizer Heatup During Plant Cooldown

EVENT DATE:

February 10, 1996

REPORT DUE DATE:

March 11, 1996

REFERENCES:

Significant Occurrence Report (SOR) 96-134
SAO-132 Event Report No. 96-05

PAST SIMILAR EVENT:

"Westinghouse Owners Group Pressurizer Surge Line Thermal Stratification Program MUHP-1090 Summary Report" WCAP-12509 (non-proprietary) discusses the program to address similar events throughout the industry.

DESCRIPTION OF OCCURRENCE:

On February 9, 1996 at 0005 hours, the unit was shutdown for a planned outage to effect repairs to leaking Power Operated Relief Valves (PORV's) and block valves on the pressurizer. In accordance with normal plant procedures, attempts were made to establish pressurizer pressure control using a Nitrogen gas bubble. These attempts were not successful due to excessive gas leakage through the PORV/block valves scheduled for repair. Normal pressurizer spray was not available since the reactor coolant pumps were secured in accordance with plant procedures. Auxiliary pressurizer spray was precluded by Technical Specification limits on spray nozzle to fluid differential temperature.

In anticipation of these challenges, an alternate procedure had been prepared and reviewed for cooling the pressurizer by filling and emptying it via the pressurizer surge line. Prior to initiating this alternate procedure, the reactor coolant system (RCS) temperature was established at about 140 degrees Fahrenheit, the pressurizer liquid and steam space temperature was about 440 degrees Fahrenheit and the pressurizer level indicated 89 percent. At 1555 hours on February 10, 1996 the level in the pressurizer was slowly decreased until 1645 hours to a level of 26 percent. At this time, the pressurizer level was slowly increased until 1654 hours to 30.7 percent when the pressurizer liquid space temperature probe indicated a rapid decrease from 425 degrees Fahrenheit to 272 degrees Fahrenheit over a time span of about 3 minutes. The pressurizer level increase was terminated and held at 31.3 percent. The level was then slowly decreased to 30.1 percent resulting in the pressurizer liquid space temperature increasing to 415 degrees Fahrenheit in about 5 minutes. Following this evolution another slow increase and subsequent decrease in pressurizer level was implemented resulting in a pressurizer liquid space temperature decrease to 259 degrees Fahrenheit in about 14 minutes and increase to 395 degrees Fahrenheit in about 15 minutes respectively. Pressurizer level was then stabilized at about 30 percent and the evolution terminated while the effects of the evolution were examined with respect to the Technical Specification limits for pressurizer heatup and cooldown rates. By this time, ambient losses had reduced the pressurizer steam space temperature to within the allowable Technical Specification limits for spray nozzle to fluid differential temperature allowing the use of alternate spray for continued cooldown.

ANALYSIS OF OCCURRENCE:

This report is being made under 10 CFR 50.73(a)(2)(I)(B) because the plant was in a condition prohibited by the Technical Specifications based upon the installed liquid space temperature probe.

Technical Specification 3.1.B.5 states: "The pressurizer heatup and cooldown rates averaged over one hour shall not exceed 100 degrees Fahrenheit/hr and 200 degrees Fahrenheit/hr, respectively." The indicated liquid space temperature heatup change exceeded 100 degrees Fahrenheit. This heatup rate was only experienced in a portion of the liquid space and was not seen by the rest of the pressurizer. An evaluation of the effects on the pressurizer was requested of Westinghouse. Two potential failure modes were evaluated. A fatigue assessment and a fracture assessment were performed against the criteria of ASME Section XI typically used in evaluations of this type. The fracture assessment performed demonstrated that the transient did not result in stress intensity factors of the magnitude required to cause initiation of a flaw. The comparison between the fracture toughness at which crack initiation is likely to occur and the stress intensity factor distribution resulted in a margin of safety of at least a factor of two. The fatigue assessment demonstrated that the resulting change in fatigue usage for the affected pressurizer components would be negligible for this event. This analysis demonstrates that the limiting stress results from the cooldown transient (which was less than the Technical Specification limit of 200 degrees Fahrenheit/hr averaged over one hour.) Based on the analysis performed by Westinghouse, the pressurizer vessel remains acceptable with respect to brittle fracture and the allowable fatigue usage factor established in the ASME Code. Technical Specification 3.1.B.5 also states: "The spray shall not be used if the temperature difference between the pressurizer and the spray fluid is greater than 320 degrees Fahrenheit." This Technical Specification limits the availability of the alternate pressurizer spray since the fluid immediately upstream of the spray nozzle in the alternate spray header is usually at containment ambient temperature (in this case about 72 degrees Fahrenheit.) This limitation protects the spray nozzle from excessive thermal cycling. Because of the unavailability of the alternate pressurizer spray, the method of pressurizer pressure control routinely preferred is a method which employs a Nitrogen gas bubble.

CAUSE OF OCCURRENCE:

The higher than expected pressurizer cooldown and heatup rates resulted from the occurrence of a phenomenon known as thermal stratification. A separation of hot and cold fluid temperature bands had occurred in the pressurizer surge line. During the fill and drain evolutions, the hot/cold fluid temperature separation layer had risen and then fallen past the pressurizer water space temperature probe, accounting for the rapid indicated temperature differences. This phenomenon was described in NRC Bulletin 88-11.

The station event analysis found that this phenomenon, thermal stratification, was not adequately considered in the development and review of the alternate procedural guidance. A combination of non-rigorous procedural requirements, an incorrect calculation and the fact that these events all occurred within approximately 74 hours of a scheduled plant shutdown, contributed to inadequate procedural guidance that produced non-optimum results.

CORRECTIVE ACTION:

An evaluation of pressurizer insurge and outsurge effects was performed by Westinghouse for the Westinghouse Owners Group (WOG) which included evaluations of actual plant heatup and cooldown evolutions at several pilot plants using additional instrumentation. The results of the WOG program were documented in a report provided to the WOG utilities. This report identified procedural recommendations to mitigate and evaluate thermal transients in the pressurizer lower head caused by insurges and outsurges. The specific recommendations

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

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

identified by the report had already been incorporated into our plant operating procedures.

As a result of the station event analysis, Station Administrative Order (SAO) 404, "Station Nuclear Safety Committee," was revised to include additional pre-SNSC review requirements. In addition, this event was reviewed during training for Operations and engineering support personnel.