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 FACIL:50-315 Donald C. Cook Nuclear Power Plant, Unit 1, Indiana M 05000315
 AUTH.NAME AUTHOR AFFILIATION
 WEBER,G.A. Indiana Michigan Power Co. (formerly Indiana & Michigan Ele
 BLIND,A.A. Indiana Michigan Power Co. (formerly Indiana & Michigan Ele
 RECIP.NAME RECIPIENT AFFILIATION

SUBJECT: LER 94-001-01:on 940205,thirteen of twenty MSSVs lift
 settings were found out of tolerance.Caused by disc was
 found to have been covered with mixed iron-chromium oxides.
 Corrective action:MSSV was repaired & retested.W/940527 ltr.

DISTRIBUTION CODE: IE22T COPIES RECEIVED:LTR 1 ENCL 1 SIZE: 7
 TITLE: 50.73/50.9 Licensee Event Report (LER), Incident Rpt, etc.

NOTES:

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Indiana Michigan
Power Company
Cook Nuclear Plant
One Cook Place
Bridgman, MI 49106
616 465 5901



May 27, 1994

United States Nuclear Regulatory Commission
Document Control Desk
Rockville, Maryland 20852


Operating Licenses DPR-58
Docket No. 50-315

Document Control Manager:

In accordance with the criteria established by
10 CFR 50.73 entitled Licensee Event Report System, the
following report is being submitted:

94-001-01

Sincerely,


A. A. Blind
Plant Manager

/sb

Attachment

c: J. B. Martin, Region III
E. E. Fitzpatrick
P. A. Barrett
R. F. Kroeger
M. A. Bailey - Ft. Wayne
NRC Resident Inspector
J. B. Hickman - NRC
J. R. Padgett
G. Charnoff, Esq.
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S. J. Brewer

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9406010230 940527
PDR ADDCK 05000315
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LICENSEE EVENT REPORT (LER)

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

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)

D. C. COOK NUCLEAR PLANT - UNIT 1

DOCKET NUMBER (2)

05000 315

PAGE (3)

1 OF 5

TITLE (4) FAILURE OF THE UNIT ONE MAIN STEAM SAFETY VALVES TO MEET TECHNICAL SPECIFICATION
LIFT SETPOINT REQUIREMENTS

EVENT DATE (5)			LER NUMBER (6)			REPORT NUMBER (7)			OTHER FACILITIES INVOLVED (8)		
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER	
02	05	94	94	001	01	05	27	94	Cook - Unit 2	05000316	
OPERATING MODE (9)			THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)								
1			20.402(b)			20.405(c)			50.73(a)(2)(iv)		73.71(b)
POWER LEVEL (10)			20.405(a)(1)(i)			50.36(c)(1)			50.73(a)(2)(v)		73.71(c)
062			20.405(a)(1)(ii)			50.36(c)(2)			50.73(a)(2)(vii)		OTHER
			20.405(a)(1)(iii)			X 50.73(a)(2)(i)			50.73(a)(2)(viii)(A)		(Specify in Abstract below and in Text, NRC Form 366A)
			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

G. A. WEBER - PLANT ENGINEERING SUPERINTENDENT

TELEPHONE NUMBER (Include Area Code)

(616) 465-5901

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
X	SB	RV	D243	Y						

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE)	X	NO	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
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ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

This supplemental report is being submitted to provide additional information regarding the Main Steam Safety Valve Lift Setpoint testing initially reported on March 7, 1994. On February 3, 4, and 5, 1994, with the Unit 1 Reactor in Mode 1 (power operation) at 62 percent Thermal Power, thirteen of the twenty Main Steam Safety Valves' (MSSVs) lift settings were found out of tolerance as established in Technical Specifications during Surveillance testing. Due to the results of the Unit 1 MSSV testing, the MSSVs in Unit 2 were also tested. Nine Unit 2 MSSVs were found out of specification. Based on the Safety Evaluation conducted for this event, the MSSV as-found setpoints did not exceed the design pressure rating of the steam generators in either Unit 1 or Unit 2. The most likely cause of this event is attributed to mild galling between the disk and nozzle components along with "mechanical keying" and/or chemical reaction of the mixed oxides on the disk with the chromium oxide on the nozzle. It is believed these combined affects, over time, caused the elevated lift setpoint on the MSSV's initial lifts. Corrective actions are being pursued which will include approval for the following: 1) Exercising the MSSVs mid-cycle to improve valve setpoint performance; 2) Develop in-house test capabilities; 3) obtain spare MSSVs; 4) work with vendor and another utility to develop a long term solution to the disc/nozzle binding problem.

**REQUIRED NUMBER OF DIGITS/CHARACTERS
FOR EACH BLOCK**

BLOCK NUMBER	NUMBER OF DIGITS/CHARACTERS	TITLE
1	UP TO 46	FACILITY NAME
2	8 TOTAL 3 IN ADDITION TO 05000	DOCKET NUMBER
3	VARIES	PAGE NUMBER
4	UP TO 76	TITLE
5	6 TOTAL 2 PER BLOCK	EVENT DATE
6	7 TOTAL 2 FOR YEAR 3 FOR SEQUENTIAL NUMBER 2 FOR REVISION NUMBER	LER NUMBER
7	6 TOTAL 2 PER BLOCK	REPORT DATE
8	UP TO 18 -- FACILITY NAME 8 TOTAL -- DOCKET NUMBER 3 IN ADDITION TO 05000	OTHER FACILITIES INVOLVED
9	1	OPERATING MODE
10	3	POWER LEVEL
11	1 CHECK BOX THAT APPLIES	REQUIREMENTS OF 10 CFR
12	UP TO 50 FOR NAME 14 FOR TELEPHONE	LICENSEE CONTACT
13	CAUSE VARIES 2 FOR SYSTEM 4 FOR COMPONENT 4 FOR MANUFACTURER NPRDS VARIES	EACH COMPONENT FAILURE
14	1 CHECK BOX THAT APPLIES	SUPPLEMENTAL REPORT EXPECTED
15	6 TOTAL 2 PER BLOCK	EXPECTED SUBMISSION DATE

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

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)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)					
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER						
D. C. COOK NUCLEAR PLANT - UNIT 1	0 5 0 0 0 3 1 5	9	4	—	0 0 1	—	0 1	0 2	OF	0 5

TEXT (If more space is required, use additional NRC Form 368A's) (17)

Conditions Prior to Occurrence:

Unit One - Mode 1 (power operation) at 62 percent Reactor Thermal Power

Description of Event:

This supplemental report is being submitted to provide additional information regarding the Main Steam Safety Valve Lift Setpoint testing initially reported on March 7, 1994.

On February 3, 4, and 5, 1994 thirteen of the twenty Main Steam Safety Valves (MSSVs) (E11S/SB-RV) lift settings were found outside of the +/- one percent tolerance limits established in Unit 1 Technical Specification 3.7.1.1. Three of the MSSVs lifted between 1 and 3 percent high. Nine MSSVs lifted between 3 and 6.9 percent high. One MSSV had a lift pressure greater than 9.8 percent high (1180 psig). This is the maximum lifting pressure obtainable by the test equipment.

The MSSVs at Cook are Dresser Model 3707RA Safety Valves. Based on operating experience and vendor input, the valve lift setpoints cannot be consistently maintained within +/- one percent tolerance limits.

The required relief pressure setpoint ranges and the as-found setpoints for the MSSVs found out of specification are listed below:

Date	Valve I.D. No.	Stm. Gen.	T/S Setpoint	Allowable Range (PSIG)	As Found (PSIG)	Percent Deviation
02-04-94	1-SV-1A-1	1	1065	1054-1076	1103	3.6
02-04-94	1-SV-1B-1	1	1065	1054-1076	1099	3.2
02-05-94	1-SV-2B-1	1	1075	1064-1086	>1180	>9.8
02-04-94	1-SV-1A-2	2	1065	1054-1076	1135	6.6
02-04-94	1-SV-2A-2	2	1075	1064-1086	1116	3.8
02-04-94	1-SV-2B-2	2	1075	1064-1086	1101	2.4
02-04-94	1-SV-3-2	2	1085	1074-1096	1145	5.5
02-03-94	1-SV-1B-3	3	1065	1054-1076	1123	5.4
02-03-94	1-SV-3-3	3	1085	1074-1096	1117	2.9
02-05-94	1-SV-1A-4	4	1065	1054-1076	1085	1.9
02-05-94	1-SV-1B-4	4	1065	1054-1076	1125	5.6
02-05-94	1-SV-2A-4	4	1075	1064-1086	1127	4.8
02-05-94	1-SV-2B-4	4	1075	1064-1086	1149	6.9

Retests were performed on the MSSVs to make necessary setpoint adjustments and ensure as-left lift setpoints were acceptable. The subsequent MSSV tests revealed that sticking was experienced on the initial lifts and was not indicative of the actual setpoint values. Ten of the MSSVs were found to be set correctly and required no adjustment. Two of the MSSVs had lift setpoints that were slightly below acceptable values and adjustments were needed to raise the lift setpoints to meet the Technical Specification Acceptance Criteria.

LICENSEE EVENT REPORT (LER)
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-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) D. C. COOK NUCLEAR PLANT - UNIT 1	DOCKET NUMBER (2) 0 5 0 0 0 3 1 5 9 4 -	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
		0 0 1	0 1	0 3	OF 0 5	

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

Description of Event continued:

With the poor performance of the Unit 1 MSSVs, testing was performed on the Unit 2 MSSVs. Nine Unit 2 MSSVs were found to exceed the +/- one percent Technical Specification Acceptance Criteria. However, all nine of the Unit 2 MSSVs were within three percent of the Technical Specification Setpoint.

The required relief pressure setpoint ranges and the as-found setpoints for the MSSVs found out of specification are listed below:

Date	Valve I.D. No.	Stm. Gen.	T/S Setpoint	Allowable Range (PSIG)	As Found (PSIG)	Percent Deviation
02-11-94	2-SV-1B-1	1	1065	1054-1076	1083	1.7
02-11-94	2-SV-2A-1	1	1075	1064-1086	1052	2.1
02-12-94	2-SV-1A-2	2	1065	1054-1076	1088	2.2
02-12-94	2-SV-2A-2	2	1075	1064-1086	1087	1.1
02-10-94	2-SV-2B-2	2	1075	1064-1086	1097	2.0
02-12-94	2-SV-2B-3	3	1075	1064-1086	1092	1.6
02-11-94	2-SV-1B-4	4	1065	1054-1076	1091	2.4
02-11-94	2-SV-2B-4	4	1075	1064-1086	1089	1.3
02-11-94	2-SV-3-4	4	1085	1074-1096	1062	2.1

Retests were performed on the MSSVs to make necessary setpoint adjustments and ensure as-left lift setpoints were acceptable. The subsequent MSSV tests revealed that sticking was experienced on the initial lifts and was not indicative of the actual setpoint values. Seven of the MSSVs were found to be set correctly and required no adjustment. Two of the MSSVs had lift setpoints that were below acceptable values and adjustments were needed to raise the lift setpoints to meet the Technical Specification Acceptance Criteria.

There were no other inoperable structures, systems, or components that contributed to this event.

On February 5, 1994, at 1600 Hours, this event was reported as a One Hour Report to the U. S. Nuclear Regulatory Commission Operations Center, per 10CFR 50.72(b)(ii)(B). The One Hour Report was submitted since the as-found condition of the MSSVs may have been a condition that was outside the design basis of the plant.

Following completion of the MSSV testing in both Unit 1 and Unit 2, an inaccuracy was discovered in the test method used by the vendor performing the MSSV Lift Setpoint Trevi Testing. The Trevi Test inaccuracy was reported in LER 50-315/94-003. The findings, reported in this LER (50-315/94-001) reflect the findings of the original MSSV deficiency only.

LICENSEE EVENT REPORT (LER)
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-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)

DOCKET NUMBER (2)

LER NUMBER (6)

PAGE (3)

D. C. COOK NUCLEAR PLANT - UNIT 1

0 5 0 0 0 3 1 5 9 4 - 0 0 1 - 0 1 0 4 OF 0 5

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

Cause of Event:

The most likely cause of this event is attributed to mild galling between the disk and nozzle components along with "mechanical keying" and/or chemical reaction of the mixed oxides on the disk with the chromium oxide on the nozzle. It is believed these combined effects over time caused the elevated lift setpoint on the MSSV's initial lifts.

To determine the root cause, several of the MSSV discs were sent to an independent laboratory for analysis. Results of the analysis indicated that the contact surfaces of the discs were found to have been covered with mixed iron-chromium oxides over most of their surfaces except for islands of nozzle material. The nozzle material transfer most likely occurred by a galling or adhesive wear mechanism rather than a diffusion bonding process. The mixed oxides on most of the sealing surface are postulated to have developed from normal oxidation of the disk alloy along with possible deposition of iron-oxide particulates from the steam.

Both the Unit 1 and Unit 2 MSSV lift setpoint failures are attributed to the above findings. Particular attention was paid to 1-SV-2B-1 during disassembly. MSSV 1-SV-2B-1 could not be lift tested since the capacity of the test equipment had been exceeded. No mechanical abnormalities were detected that would account for the as-found lift setpoint. The disc for 1-SV-2B-1 was found to have a greater scale thickness than observed on the other disc samples.

There is a definite correlation between the number of MSSV failures and the main steam pressure transients/unit trips. With fewer transients occurring during an operating cycle, more MSSV failures would occur. As evidenced by the February, 1994 Unit 1 MSSV surveillance testing, the worst case experienced by either unit had followed a record run of 470 days.

Analysis of Event:

This event is reportable via the provisions of 10CFR50.73(a)(2)(i)(B) as an operation prohibited by Plant Technical Specification 3.7.1.1. The Technical Specification 3.7.1.1 requires that the Main Steam Safety Valves be operable in Modes 1 through 3. Operability requires that all twenty Main Steam Safety Valves lift within +/- 1 percent of the Technical Specification Setpoints.

The Safety Evaluation revealed that the MSSV as-found lift setpoints would not have resulted in exceeding the design rating of the steam generators. After the initial lift pressure was obtained, the MSSVs would have went full open. Full flow would have been obtained instantly. The MSSVs would not require an additional three percent pressure to reach a full flow condition.

A review of the Westinghouse Nuclear Safety Advisory Letter (NSAL-94-001, Operation at Reduced Power Levels with Inoperable MSSVs) was performed and reported via LER 050-315/94-003.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

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) D. C. COOK NUCLEAR PLANT - UNIT 1	DOCKET NUMBER (2) 0 5 0 0 0 3 1 5 9 4	LER NUMBER (8)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
		0 1	0 1	0 1	0 5	OF 0 5

TEXT (If more space is required, use additional NRC Form 368A's) (17)

Corrective Action:

Ten of the Unit 1 and seven of the Unit 2 MSSVs with lift setpoints outside the acceptable setpoint ranges retested satisfactorily and did not require any adjustments. Two Unit 1 MSSVs and two Unit 2 MSSVs required adjustment to return the setpoint to acceptable values. MSSV 1-SV-2B-1 was repaired and retested along with all other Unit 1 and Unit 2 MSSVs.

The valve manufacturer has recently recommended that the nozzle and disc seating surfaces have a grey matt finish instead of a mirror finish. The valve manufacturer believed that this action could reduce the sticking phenomena between the seats. A new lapping procedure was employed during the repair of ten Unit 1 MSSVs during this Refueling Outage.

A Task Force was established to determine the cause for the MSSV Lift Setpoint problems. The Task Force and manufacturer believe that the safety valves could be exercised mid-cycle to clear the seat of any oxide buildup. This activity is being reviewed by the licensing group to determine its feasibility and safety concerns.

Other corrective actions being considered at this time:

- Purchasing our own test equipment.
- Purchasing spare MSSVs.
- Continue to pursue a resolution to the MSSV sticking phenomena and continue to gather and share information with other plants and valve manufacturers. The cooperative effort will contribute to developing a long term solution to the disc/nozzle bonding problem.
- Technical Specification Change submitted to modify MSSV setpoint to +/- 3%.

Failed Component Identification:

Main Steam Safety Valve
Manufacturer: Dresser Consolidated Valves
Model: 3707RA-RT22
EIIIS Code: SB-RV

Previous Similar Events:

50-315/92-06	50-316/92-03
50-315/90-13	50-316/90-06
50-315/89-02	50-316/88-04
50-315/87-11	
50-315/86-20	