ILLINOIS POWER
CLINTON POWER STATION, P.O. BOX 678, CLINTON, ILLINOIS 61727-0678, TELEPHONE (217) 935-8881

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March 20, 1991

10CFR50.73

Docket No. 50-461

Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Subject: Clinton Power Station - Unit 1
Licensee Event Report No. 91-002-00

Dear Sir:

Please find enclosed Licensee Event Report No. 91-002-00: Complete Loss of Service and Instrument Air Due to Equipment Failure and Personnel Error Resulted in Manual SCRAM Insertion to Minimize the Loss of Reactor Vessel Inventory. This report is being submitted in accordance with the requirements of 10CFR50.73.

Sincerely yours,

F. A. Spangenberg, III
Manager, Licensing and Safety

JDP/alh

Enclosure

cc: NRC Resident Office
NRC Region III, Regional Administra
INPO Records Center
Illinois Department of Nuclear Safe
NRC Clinton Licensing Project Manager

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NRC FORM 366 (6-89) U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

APPROVED OMB NO. 3150-0104
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-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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TITLE (4) Complete Loss of Service and Instrument Air Due to Equipment Failure and Personnel Error Resulted in Manual SCRAM Insertion to Minimize the Loss of Reactor Vessel Inventory

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)
0 2	1 8	9 1	9 1	- 0 0 2	- 0 0	0 3	2 0	9 1	None	0 5 0 0 0
										0 5 0 0 0

OPERATING MODE (9)	4	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
POWER LEVEL (10)	0 0 0	20.402(b)	20.405(c)	X 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 366A)
		20.405(a)(1)(iii)	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
P. D. Yocum, Director - Plant Operations, Extension 3205	2 1 7 9 3 5 - 2 8 8 1

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	L F	C M P	I 0 7 5	N							

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)

On February 18, 1991, with the plant in Mode 4 (COLD SHUTDOWN), with the number 2 Service Air (SA) compressor in service maintaining header air pressure at 106 pounds per square inch gauge, the number 1 SA compressor automatically started and loaded. Control room instrumentation showed the running current of both SA compressors to be approximately the same, thus leading the o[illegible] to believe that both SA compressors were operating and loaded. [illegible]revent equipment damage, the operators shut down the number 1 SA compressor. This action resulted in a complete loss of SA and Instrument Air. SCRAM valves started to drift open resulting in leakage from the reactor vessel to the scram discharge volume. Reactor vessel level decreased from 79 inches to 74 inches. The flow of condensate water to the vessel stopped; however, Emergency Core Cooling Systems remained capable of supplying makeup to the reactor vessel. To minimize the loss of vessel inventory, a manual SCRAM signal was inserted. The SA system was returned to service and air header pressure was reestablished within 35 minutes. The cause of the event is attributed to equipment failure compounded by personnel error. Corrective action consisted of immediately issuing a priority one Maintenance Work Request to return the SA compressor to operation. The operating shift crews have been informed of this event.

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

DESCRIPTION OF EVENT

At 0325 hours on February 18, 1991, the plant was in Operational Condition 4 (COLD SHUTDOWN), with the reactor [RCT] coolant temperature at 200 degrees Fahrenheit and at atmospheric pressure. The Number 2 Service Air System (SA) [LF] compressor [CMP], 2SA01C, was in operation and maintaining a steady output at 106 pounds per square inch gauge (PSIG) when the number 1 Service Air compressor, 1SA01C, automatically started and loaded. The Auto Start annunciator [ANN] P800-63A-6B energized indicating automatic start of the number 1 Service Air compressor.

Control room indicators [II] showed the running current of Service Air compressor 1SA01C to be approximately the same as the running amps of Service Air compressor 2SA01C. Service Air header pressure was 108 psig, the upper limit of the normal range. To prevent system damage and to determine if Service Air compressor 2SA01C was capable of carrying the system load requirements to meet system demands, a joint decision was made by the utility licensed Control Room Operator (CRO) and by the Operations Line Assistant Shift Supervisor (LASS) to shut down Service Air compressor 1SA01C. The Shift Supervisor concurred with this decision. Subsequently, Service Air compressor 1SA01C was shut down. Immediately upon shutdown of Service Air compressor 1SA01C, air header pressure decreased rapidly. During depressurization of the air header, Service Air compressor 2SA01C indication showed that running amps remained at approximately 70 amps. No Instrument Air (IA) [LO] or Service Air system header isolation annunciators were energized at this time.

IA/SA system header pressure continued to decrease. An attempt was made to restart Service Air compressor 1SA01C when header pressure reached 100 psig, decreasing. The attempt to start Service Air compressor 1SA01C was unsuccessful; amps reached the maximum indicated value then decreased to zero and the 1SA01C breaker [BKR] tripped. Service Air compressor 1SA01C surged and tripped because of the rapidly decreasing system pressure. The breaker trip of Service Air compressor 1SA01C was followed by the breaker trip of Service Air compressor 2SA01C.

When air header pressure reached 70 psig, the annunciator for "Trouble Instrument Air Dryer" energized. The Operations Staff Assistant Shift Supervisor (SASS) and the utility Non-Licensed "D" Area Operator were dispatched to the Service Air compressors for the purpose of starting an air compressor. Concurrently with this activity, at 0327 hours, a SCRAM discharge volume high alarm [AL] was printed on the alarm typer. This alarm indicates that containment IA pressure was less than 60 psig and that SCRAM valves [V] were starting to drift open. Additionally, vent and drain valves on the SCRAM discharge volume were in their normal position, open, providing a flow path allowing reactor water to drain

through the SCPAM discharge volume. Reactor vessel level decreased approximately five inches from 79 inches to 74 inches on the shutdown range. Condensate [SD] pump [P] 1D had been operating in short cycle. The loss of IA pressure caused all condensate and booster pump minimum flow valves to fail open per design. As a result of the loss of IA, condensate pump 1D was shut down at 0328 hours to prevent pump run out. At this time, all normal methods of vessel makeup were lost. Emergency Core Cooling Systems remained capable of supplying makeup to the reactor vessel throughout the event.

At 0330 hours, based on recommendations of the CRO and of the LASS, the Operations Shift Supervisor directed that a manual SCRAM be initiated to minimize loss of reactor inventory. At this time and over the next several minutes, the following heating, ventilation and air conditioning systems automatically shut down as a result of the IA system pressure loss:

- Fuel Building Heating, Ventilation and Air Conditioning (VF) [VG]
- Turbine Building Heating, Ventilation and Air Conditioning (VT) [VK]
- Laboratory Heating, Ventilation and Air Conditioning (VL)
- Radwaste Building Heating, Ventilation and Air Conditioning (VW) [VH]
- Machine Shop Heating, Ventilation and Air Conditioning (VJ)
- Containment Continuous Purge system (CCP)

Station off-normal procedure CPS 4004.01, "Instrument Air Loss," was referred to by the operations crew during this event. Applicable automatic actions were verified to have occurred, per design. Additionally, the Shift Supervisor initiated a priority one emergency work request to repair a Service Air compressor.

Operations Non-Licensed Operators attempted to restart each of the three compressors but, due to misinterpretation of procedural steps, they were unsuccessful after each attempt. Subsequently, at 0400 hours, Service Air Compressor 2SA01C was restarted.

At 0418 hours, CCP ventilation and VF ventilation systems were restored. At 0440 hours, condensate pump 1D was started to reestablish a normal method for reactor vessel makeup.

No other automatic or manually initiated safety system responses were necessary to place the plant in a safe and stable condition. No other equipment or components were inoperable at the time of the event such that their inoperable condition contributed to this event.

CAUSE OF EVENT

The cause of this event was attributed to equipment failure compounded by personnel error. On February 17, 1991, Control and Instrumentation (C&I) technicians performed work on Service Air compressor 2SA01C under Maintenance Work Request (MWR) D16908. During performance of this work, the surge suppression switch was recalibrated. Post maintenance testing included operating Service Air compressor 2SA01C at the completion of work associated with MWR D16908. The compressor maintained a steady output within the normal operating range. Service Air compressor 2SA01C remained running and Service Air compressor 1SA01C was placed in Standby.

The compressors remained in this configuration until Service Air compressor 1SA01C automatically started and loaded on February 18, 1991. Based on running amperage indications provided in the control room, i.e., both compressors indicating approximately 70 amps, the Operations crew secured Service Air compressor 1SA01C without first determining the reason that Service Air compressor 1SA01C automatically started. Subsequent investigation showed that Service Air compressor 2SA01C unloaded due to a surge suppression switch which had not been calibrated in accordance with the most recent recommendations contained in the manufacturer factory service manual update. This condition was identified by a utility C&I technician who had attended external training on maintenance and repair of the Service Air compressors. Investigation showed that this update to the manufacturer factory service manual had not been previously sent to Illinois Power Company by the manufacturer. Additionally, the inlet valve on Service Air compressor 2SA01C failed to go from full open to its minimum position, approximately 40 percent open, when 2SA01C unloaded. The inlet valve positioner was determined to be broken. Running current was not reduced since a flow path existed from the inlet valve through the blowdown valve. This provided Control Room Operators with a misleading indication as to which Service Air compressor was actually loaded.

Subsequently, MWR D16908 was revised and reissued to Maintenance personnel to perform additional work on Service Air compressor 2SA01C. Numerous compression fittings on air lines located under the compressor skid were found to be loose and leaking excessively. Leakage of the compressor air line compression fittings is attributed to normal compressor vibration over an extended period of time. Excessive leakage from compression fittings in addition to normal system demands may have resulted in the surge suppression switch sensing a pressure surge versus an increase in pressure demand. The major equipment problems noted on the Service Air compressor were the surge suppression switch which was not operating correctly, excessive leakage through compression fittings on the air lines and the inlet valve positioner which was not functioning.

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Shutdown of Service Air compressor 1SA01C by Operations personnel without determining the reason for the automatic start resulted in securing the only Service Air compressor providing air supply to the SA/IA header. This caused air header pressure to drop to zero psig.

The duration of the event was extended due to Operations non-licensed personnel misinterpretation of procedural requirements contained in station procedure 3214.01 while attempting to restart the pre-lube pumps for Service Air compressors. Specifically, the Service Air compressor pre-lube pumps failed to start because insufficient control air pressure was supplied to the control panel. Additionally, personnel error resulted in the isolation of an air dryer to Service Air compressor 2SA01C due to a misinterpretation of procedural requirements.

CORRECTIVE ACTION

The Operations crew has recognized their errors associated with the shutdown of Service Air compressor 1SA01C without thoroughly investigating and determining the cause for the automatic start. Additionally, the area operator has recognized his errors associated with the procedural misinterpretations including isolation of the air dryers.

The Operations shift crews have been informed of this event through the issuance of an Operations Night Order.

The surge suppression switch on Service Air compressor 2SA01C has been recalibrated utilizing the most current methodology contained in the manufacturer factory service manual. Compression fittings on the compressor air lines have been tightened to eliminate leakage. This work has been completed under MWR D16908.

The surge suppression switch on Service Air compressor 0SA01C has been recalibrated utilizing the most current methodology contained in the manufacturer factory service manual. Excessive dirt has been removed from the control components. Compression fittings on the compressor have been checked for tightness. This work has been completed under MWR D17204.

The preventive maintenance program for the Service Air compressors will be enhanced to provide specific calibration requirements incorporating guidance of the manufacturer factory service manual. Additionally, the preventive maintenance program will address requirements to improve cleanliness of the control components associated with Service Air compressors. Secureness of air line fittings will be checked during periodic preventative maintenance. This revision to the preventive maintenance program is expected to be completed by July 7, 1991.

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

Calibration of the surge suppression switch and removal of excessive dirt from the control components, if applicable, on Service Air compressor 1SA01C has been scheduled and will be completed by April 30, 1991.

Annunciator procedure 5041.06B, "Auto Start Service Air Compressor", will be revised to change operator action number 2. The revision will require an area operator be dispatched to the affected Service Air compressor skid to determine the cause as indicated by local panel status lights and valve positions. This action is expected to be completed by May 15, 1991.

Station procedure 3214.01 will be revised for clarity of initial startup of Service Air compressors with the Service Air system decreased to zero psig. This action is expected to be completed by April 30, 1991.

Training will be provided to Operations Non-Licensed Operators on the revisions of station procedure 3214.01. This training will be accomplished during requalification training and will be completed by August 16, 1991.

ANALYSIS OF EVENT

This event is reportable under the provisions of 10CFR50.73(a)(2)(iv) due to a manual actuation of a reactor protection system.

Assessment of the safety consequences and implications of this event indicates that the event was not safety significant for existing plant conditions or other plant modes and power levels. The Service Air and Instrument Air systems perform no nuclear safety-related functions. Events resulting from the loss of the Instrument Air system have been analyzed in Chapter 15 of the Updated Safety Analysis Report and the resulting transients were determined to be within limits of the plant.

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ADDITIONAL INFORMATION

The Service Air compressors discussed in this Licensee Event Report were manufactured by Ingersoll-Rand, Model Number 1C25M4.

No Licensee Event Reports have been issued at Clinton Power Station for a similar event.

For additional information regarding this event, contact P. D. Yocum, Director - Plant Operations at (217) 935-8881, extension 3205.