U-600931
L30-87(05-22)-L
1A.120

ILLINOIS POWER COMPANY

CLINTON POWER STATION, P.O. BOX 678, CLINTON, ILLINOIS 61727

10CFR50.73
10CFR50.72

May 22, 1987

Docket No. 50-461

Mr. A. Bert Davis
Acting Regional Administrator
Region III
U.S. Nuclear Regulatory Commission
799 Roosevelt Road
Glen Ellyn, Illinois 60137

Subject: Reactor Water Cleanup System Isolations

Dear Mr. Davis:

Illinois Power requests NRC concurrence with a NUREG 1022 interpretation which classifies specific Reactor Water Cleanup (RWCU) system isolations as preplanned Engineered Safety Feature (ESF) Actuations which are not reportable under the requirements of 10CFR50.72(b)(2)(ii) or 10CFR50.73(a)(2)(iv). During plant conditions of low reactor power (less than 2%) and low feedwater flowrates (less than 300 gpm) the RWCU system is very sensitive to high differential flow isolations. Cautions in Clinton Power Station procedures warn the operators that a RWCU isolation may occur during these plant conditions. In the past, these isolations have been reported as LER events; however, NUREG 1022 guidance indicates that events of this nature need not be reported. NRC concurrence with this interpretation is requested.

Further information about the conditions involved in these RWCU isolations is in the attachment. If any additional information is required, please call.

Sincerely yours,

F. A. Spangenberg
Manager - Licensing and Safety

GSL/ckc

Attachment

cc: B. L. Siegel, NRC Clinton Licensing Project Manager
NRC Resident Inspector
Illinois Department of Nuclear Safety

IE22
1/1

Clinton Power Station
Reactor Water Cleanup Isolations

1. Plant Conditions when RWCU Isolations Occur

Clinton Power Station has experienced numerous Reactor Water Cleanup (RWCU) containment isolations (Engineered Safety Feature, (ESF)) during the past several months. During each of these events reactor power was less than 2% of rated power, and feedwater flow was less than 300 gpm. All of these events were preceded by flow adjustments to the RWCU system or the feedwater system. These events are described in CPS LER 87-013 (attached).

These events have been quite frequent in the past due to the extended period of time that CPS has been required to be in this operating condition due to startup testing. The plant will be in this operating condition for a short time during normal plant startups, and during periods when the plant is at low power in the hot standby condition.

2. Requirements

Flow elements measure flow differential between the RWCU suction and discharge piping. The purpose of the flow elements is to assure that 10CFR50 App. A, General Design Criteria (GDC) 54 is met. GDC 54 requires the monitoring of reactor leakage. This is performed by comparing the flow into the RWCU system with the summation of the flow out of the system. CPS Technical Specification Table 3.3.2-2 setpoint for differential flow is at 59 gpm. This value is based on 25 gpm of leakage, with the setpoint adjusted to compensate for temperature (density) differences between the influent and effluent temperatures for the RWCU system.

3. Engineering Evaluation

RWCU is normally used to help maintain reactor water chemistry during various modes of operation. It is also used to supplement reactor water level control during startup, shutdown, and low power operations. It is during startup and low power operations that the most sensitive conditions exist for isolations. At this time operations must maintain a minimum temperature differential between feedwater and RWCU water. This is normally done by mixing normal return temperature RWCU water (435°F) and cooler RWCU water (120°F) that has not been through the regenerative heat exchanger. This in itself, because of density differences, will increase the monitored differential flow. At the same time, RWCU is being used to maintain reactor level by sending some of the RWCU water to the condenser. Since the water to the condenser is at 120°F or less this also increases the monitored differential flow. The root cause of these isolation events is that during certain modes of operation the sensed differential flow rate at steady state conditions is very close to the trip setpoint.

Clinton Power Station
Reactor Water Cleanup Isolations

3a. Lineup to Discharge to the Feedwater System

At low feedwater flowrates (<300 gpm), the flowrate is manually adjusted. Even small manual adjustment of feedwater will induce significant pressure oscillations in the feedwater system. These pressure oscillations are sensed as flow oscillations by the flow orifice in the RWCU discharge to the feedwater system. These sensed flow oscillations may be of sufficient magnitude to cause a RWCU isolation when the previously described condition also exists.

3b. Lineup to Discharge to the Condenser

In the RWCU system discharge to the condenser, the flow element is sized for flows up to 350 gpm, and is very sensitive to changes in differential pressure at flows below 70 gpm (normal flow for one pump operation). That is, small changes in differential pressure are sensed as large changes in flow. Due to the large pressure drop across the restricting orifice, the effluent water has a potential to cause cavitation and pressure oscillations in the downstream piping. These pressure oscillations may cause sufficient sensed flow oscillations and initiate a RWCU isolation. These sensed flow oscillations are most probable when adjusting the flow around the RWCU regenerative heat exchangers. This manipulation is performed when adjusting RWCU discharge temperature at low power.

4. Interpretation of NUREG 1022

10CFR50.72(b)(2)(ii) and 10CFR50.73(a)(2)(iv) require reporting of Engineered Safety Feature (ESF) actuations, unless the ESF actuation is part of a preplanned sequence during testing or plant operation. CPS No. 3303.01, REACTOR WATER CLEANUP, contains warnings to the operators of possible RWCU system isolations from high differential flow when initiating the feedwater flow to the vessel or when RWCU is started or its flow path is changed. In the past IP voluntarily reported these events. NUREG 1022 guidance indicates that events of this nature are not reportable. The control room operators will continue to respond to all RWCU isolations as if an actual leak existed until a system walkdown verifies no leakage. If the isolation is obviously due to a sensed high differential flow signal IP interprets this as not being a reportable event.

5. Summary

IP has clearly defined the conditions for which RWCU isolation is expected as reactor operation at low power with low feedwater flowrates (<300 gpm) in conjunction with a manipulation of either the feedwater system or the RWCU system. The events described are not actually or potentially safety significant. Continued reporting of these events will provide no new generic information.

NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES 8/31/88

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Clinton Power Station	0 5 0 0 0 4 6 1	1 OF 0 4

TITLE (4): Automatic Isolation of Reactor Water Cleanup System Due to High Differential Flow Signal

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 3	1 0	8 7	8 7	— 0 1 3	— 0 0				NONE	0 5 0 0 0
										0 5 0 0 0

OPERATING MODE (9)	2	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
POWER LEVEL (10)	0 1 2	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
R. F. Schaller, Assistant Plant Manager - Operations, Ext. 3205	AREA CODE 2 1 1 7 — 9 3 5 - 1 8 1 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 1200 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

ABSTRACT

On March 10, 1987, at 0835 hours, the Reactor Water Cleanup System automatically isolated due to a system high differential flow trip signal. The plant was in Mode 2, 2% Reactor Power, reactor pressure at 100 psig and temperature at 350 degrees Fahrenheit. On March 18, 1987 at 1252 hours, the Reactor Water Cleanup System again isolated due to high differential flow trip signal. Three additional system isolations occurred, also due to high differential flow. These events occurred on March 21, 1987, at 0940 hours and 1723 hours, and March 31, 1987, at 0610 hours. The cause of these five events is attributed to Reactor Water Cleanup System differential flow detector sensitivity to flow/pressure oscillations that result due to feedwater flowrate adjustments/changes at very low reactor vessel feedwater flowrates. To preclude recurrence of these events, the Reactor Water Cleanup System is being removed from service during the periods of very low feedwater flowrates. The isolation of the RWCU System does not cause the loss of any plant safety features and does not represent a condition adverse to plant safety. Plant water chemistry is monitored to ensure that water chemistry remains within required limits. This event is reportable under the provisions of 10CFR50.73(a)(2)(iv) due to an automatic actuation of an Engineered Safety Feature.

8704140410
5pp.

DESCRIPTION OF EVENT

On March 10, 1987, at 0835 hours, the Reactor Water Cleanup (RWCU)[CE] System automatically isolated due to a high differential flow signal. The plant was in Mode 2, 2% Reactor Power, and reactor pressure at 100 psig and temperature at 350 degrees Fahrenheit. The RWCU system was returned to service at 0855 hours.

On March 18, 1987, at 1252 hours, the Reactor Water Cleanup System automatically isolated due to a high differential flow signal. The plant was in Mode 2, < 1% Reactor Power, and reactor pressure at < 140 psig and temperature at 345 degrees Fahrenheit. The system was returned to service at 1407 hours.

On March 21, 1987, at 0940 hours and 1723 hours, the Reactor Water Cleanup System automatically isolated due to a high differential flow signal. At 0940 hours, the plant was in Mode 2, < 4% Reactor Power, and reactor pressure at < 400 psig and temperature at 400 degrees Fahrenheit. At 1723 hours, the plant was in Mode 2, 1% Reactor Power, and reactor pressure at 392 psig and temperature at 440 degrees Fahrenheit. The RWCU System was returned to service at 1222 hours, and 0845 hours, March 22, 1987.

On March 31, 1987, at 0610 hours, the Reactor Water Cleanup System automatically isolated due to a high differential flow signal. The plant was in Mode 2, 1% Reactor Power, and reactor pressure at 174 psig and temperature at 370 degrees Fahrenheit. When reactor vessel feedwater flowrate had been sufficiently increased, the RWCU System was returned to service.

During these events, the reactor vessel feedwater flowrates were very low and were being manually controlled by throttling a feedwater control valve. At these very low feedwater flowrates (< 300 gpm) adjustments to the feedwater flowrate resulted in flow/pressure oscillations that were sensed by the RWCU differential flow instruments and summation circuitry causing an isolation of the RWCU System on high differential flow. Following these isolation events, it was verified that there was no actual leakage from the RWCU system that could have caused the high differential flow. There were no structures, components or systems inoperable at start of these events that contributed to these events.

CAUSE OF EVENT

The cause of the RWCU isolation events is attributed to flow/pressure oscillations experienced by the RWCU system during reactor vessel feedwater flowrate adjustments/changes at very low (< 300 gpm) feedwater flowrates. The periodic flow/pressure oscillations that result from the feedwater flowrate adjustments/changes cause the RWCU flow instrumentation to generate a false high differential flow trip signal that results in the RWCU system isolation.

At feedwater flowrates of < 300 gpm, the return flow from the RWCU System is directed to the condenser rather than to the feedwater line due to thermal considerations on the feedwater line. During this lineup the return line from the RWCU to the feedwater line is isolated. The RWCU flow sensing instrument for this line is located on the feedwater line side of the isolation valve. Although no flow from the RWCU is passing through this line, any flow/pressure oscillations occurring in the feedwater line are sensed by the RWCU flow sensing instrument. This flow sensing instrument, although mechanically isolated from RWCU flow, is not electrically isolated from the RWCU flow summing circuitry. Therefore, false RWCU flow signals generated by this instrument due to flow/pressure oscillation in the feedwater line are transmitted to the RWCU flow summing circuitry resulting in the RWCU high differential flow signal.

Under normal plant startup conditions, the probability of causing an RWCU isolation due to the effects of the flow/pressure oscillations on the RWCU differential flow sensors is significantly minimized due to the short period of time that the plant would be operating at the very low feedflow conditions. The effects of the flow/pressure oscillations have been more pronounced due to the extended periods of plant operation at low power levels and very low feedwater flowrates during low power testing.

CORRECTIVE ACTION

To preclude recurrence of these isolation events, the RWCU System is being removed from service during startup of the feedwater system and during periods of very low feedwater flowrates (< 300 gpm).

Illinois Power's Nuclear Station Engineering Department is reviewing and evaluating these events and will make recommendations to Illinois Power Management regarding possible enhancements to RWCU System that will minimize/eliminate the flow/pressure oscillation effects on the RWCU differential flow instruments at very low reactor feedwater flowrates.

ANALYSIS OF EVENT

These events are reportable under 10CFR50.73(a)(2)(iv) as automatic actuations of an Engineered Safety Feature. During these events, the RWCU system responded as designed to the high differential flow signal by isolating the RWCU system through closure of inboard/outboard containment isolation valves and deenergizing the pumps. The isolation of the RWCU System does not cause the loss of any plant safety features and does not represent a condition adverse to plant safety. Plant chemistry is monitored to ensure that primary system water chemistry remains within the required limits.

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Clinton Power Station	0 5 0 0 0 4 6 1	8 7	— 0 1 3	— 0 0	0 4 OF 0 4

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

ADDITIONAL INFORMATION

Another Clinton Power Station LER involving automatic isolation of the Reactor Water Cleanup System due to high differential flow is listed below:

LER 86-007-00 occurred on October 9, 1986. This Reactor Water Cleanup isolation was caused by a lack of proper venting and filling of the system prior to system restoration.

For further information regarding this event, contact R. F. Schaller, Assistant Plant Manager - Operations at (217)935-8881, Ext. 3205.