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ILLINOIS POWER

10CFR50.73
10CFR21.21

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NRC FORM 366 (4-95)			U. S. NUCLEAR REGULATORY COMMISSION			APPROVED BY OMB NO. 3160-0104 EXPIRES 04/30/98 <small>ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 60.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (T-6 F33), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20566-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3160-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.</small>				
LICENSEE EVENT REPORT (LER)										
(See reverse for required number of digits/characters for each block)										
FACILITY NAME (1) Clinton Power Station						DOCKET NUMBER (2) 05000461		PAGE (3) 1 OF 5		
TITLE (4) Failure of Nuclear Fuel Supplier to Analyze Turbine Pressure Regulator Downscale Failure Event in the Off-Rated Condition Results in Operation in an Unanalyzed Condition										
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 NAME	DOCKET NUMBER
01	03	97	97	001	00	01	28	97	None	05000
									FACILITY NAME	DOCKET NUMBER
									None	05000
OPERATING MODE (9)		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)								
5		20.2201(b)			20.2203(a)(2)(v)			50.73(a)(2)(i)		50.73(a)(2)(vii)
POWER LEVEL (10)		20.2203(a)(1)			20.2203(a)(3)(i)			<input checked="" type="checkbox"/> 50.73(a)(2)(ii)	50.73(a)(2)(x)	
000		20.2203(a)(2)(ii)			20.2203(a)(3)(ii)			50.73(a)(2)(iii)		73.71
		20.2203(a)(2)(ii)			20.2203(a)(4)			50.73(a)(2)(iv)		<input checked="" type="checkbox"/> OTHER
		20.2203(a)(2)(iii)			50.36(c)(1)			50.73(a)(2)(v)		Specify in Abstract below or in NRC Form 366A
		20.2203(a)(2)(iv)			50.36(c)(2)			50.73(a)(2)(vii)		
LICENSEE CONTACT FOR THIS LER (12)										
NAME R. W. Chickering, Engineering Projects								TELEPHONE NUMBER (Include Area Code) (217) 935-8881, Extension 3334		
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)										
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS						
SUPPLEMENTAL REPORT EXPECTED (14)					EXPECTED SUBMISSION DATE (15)		MONTH	DAY	YEAR	
YES <small>(If yes, complete EXPECTED SUBMISSION DATE).</small>				<input checked="" type="checkbox"/> NO						
ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)										
<p>Because of a nuclear fuel supplier error, the Turbine Pressure Regulator Downscale Failure (PRDF) event for 40 to 80 percent of rated thermal power had not been quantitatively analyzed during past operation. The fuel supplier issued a revision to the power-dependent operating limit for the cycle 7 Minimum Critical Power Ratio (MCPR) to correct the previous limit which was not adequate for conditions between 40 and 80 percent of rated thermal power for the PRDF event. Utility engineers reviewing the documentation identified that there was some potential to exceed the Safety Limit MCPR if the PRDF event had occurred during any of the past 5 fuel cycles. The engineers identified that the plant had operated in an unanalyzed condition during fuel cycle 6 and may have operated in unanalyzed conditions during fuel cycles 2, 3, 4, and 5. The cause of this event is attributed to an error by the nuclear fuel supplier in determining which events were the limiting anticipated operational occurrences that required analysis for the fuel design. Corrective action includes implementing corrected power-dependent operating limits for the MCPR. This event is also reportable under 10CFR, Part 21.</p>										

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

DESCRIPTION OF EVENT

On January 3, 1997, the plant was in Mode 5 (REFUELING) and the sixth refueling outage (RF-6) was in progress. Reactor [RCT] coolant temperature was being maintained between 75 and 85 degrees Fahrenheit and pressure was atmospheric.

Because of a nuclear fuel supplier error, the Turbine Pressure Regulator Downscale Failure (PRDF) event for 40 to 80 percent of rated thermal power had not been quantitatively analyzed during past operation for fuel cycles 2, 3, 4, 5, and 6. The PRDF event leads to a larger change in the power-dependent operating limit Minimum Critical Power Ratio (MCPR) than any of the other Anticipated Operational Occurrences. This condition is unique to the Boiling Water Reactor (BWR)-6 reactor type because a single failure may cause the pressure regulation system to fail downscale.

The fuel supplier issued a revision to the power-dependent operating limit for the MCPR for fuel cycle 7 to correct the previous limit which was not adequate for conditions between 40 and 80 percent of rated thermal power in the PRDF event. Utility engineers were performing an approval review of the fuel supplier documentation for the fuel cycle 7 Supplemental Reload Licensing Report and the core performance monitoring computer [CPU] [IO] data bank. The review identified that there was some potential to exceed the Technical Specification Safety Limit MCPR if the PRDF event had occurred during any of the past 5 fuel cycles.

At about 1520 hours, while comparing fuel cycle 6 actual operating data with the new limits for fuel cycle 7, the engineers identified that the plant had operated in an unanalyzed condition during fuel cycle 6 and may have operated in unanalyzed conditions during fuel cycles 2, 3, 4, and 5.

Investigation of the condition identified that the PRDF event should have been analyzed for power levels between 40 and 80 percent of rated thermal power during fuel cycles 2, 3, 4, 5, and 6 because the impact of PRDF is more limiting than the other events used for establishing the operating limit for MCPR. Because the standard margins for uncertainty and instrument error for the calculations were not maintained, if a PRDF event occurred while operating near the operating limit for MCPR, the Safety Limit MCPR could have been violated.

During fuel cycle 6, non-conservative power-dependent operating limits for the MCPR were used to monitor the reactor. On several occasions during reactor startups, the reactor was in a condition that placed the MCPR on a few lead fuel bundles close to the power-dependent operating limit for the MCPR. The power-dependent operating limit for the MCPR would have been exceeded if it had been correctly calculated for fuel cycle 6.

The error in the analysis of the power-dependent operating limit for the MCPR has been applicable since the first refueling outage (RF-1) when the Maximum Extended Operating Domain (MEOD) modification was implemented. The MEOD modification eliminated the conservative Total Peaking Factor requirements and replaced them with the power-dependent operating limit for the MCPR.

The Operations Shift Supervisor was notified about the non-conservative power-dependent operating limit for the MCPR at about 1545 hours.

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Condition Report 1-97-01-030 was initiated to track a cause and corrective action determination for this event.

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

CAUSE OF EVENT

The cause of this event is attributed to an error by the nuclear fuel supplier, GE Nuclear Energy, in determining which events were the limiting Anticipated Operational Occurrences that required analysis for the fuel design. The error occurred in the generic design of MEOD which was completed long before its installation at Clinton Power Station (CPS). Previous CPS reviews of the MEOD modification and fuel design changes did not identify the GE error. The fuel supplier has informed CPS that it plans to perform a root cause analysis of the error.

CORRECTIVE ACTION

Corrected power-dependent operating limits for the MCPR will be implemented in the core performance monitoring computer and incorporated into the Core Operating Limits Report of the CPS Operating Manual after the fuel cycle 7 Supplemental Reload Licensing Report is approved.

ANALYSIS OF EVENT

This event is reportable under the provisions of 10CFR50.73(a)(2)(ii)(A) due to the plant being in an unanalyzed condition that could have compromised plant safety.

An assessment of the safety consequences and implications of this event indicated that this event had potential nuclear safety significance. The potential to exceed the Safety Limit for the MCPR in fuel cycles 2, 3, 4, 5, and 6 due to a PRDF event was not conservatively analyzed for conditions between 40 and 80 percent of rated thermal power. If a PRDF event had occurred while operating near the non-conservative power-dependent operating limit for the MCPR in those fuel cycles, the potential would have existed to exceed the Safety Limit for MCPR for fuel bundles that were near the power-dependent operating limit for the MCPR.

However, CPS has not experienced any Turbine Pressure Regulator Downscale Failure events while operating between 40 and 80 percent of rated thermal power during fuel cycles 2, 3, 4, 5, or 6. Additionally, at low power levels and at near 100 percent rated thermal power, the power-dependent operating limit for the MCPR was adequate. Further, the reactor was not operated for long periods of time close to the power-dependent operating limit for the MCPR. Following completion of RF-6, and during fuel cycle 7, the power-dependent operating limit for the MCPR will be correct.

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ADDITIONAL INFORMATION

No equipment or components failed during or as a result of this event.

CPS has not issued LERs for similar events in recent history; however, GE Nuclear Energy has reported similar fuel design errors regarding the Safety Limit MCPR under the provisions of 10CFR, Part 21.

For further information regarding this event, contact R. W. Chickering, Engineering Projects, at (217) 935-8881, extension 3334.

10CFR, PART 21 REPORT 21-97-003

While performing an approval review of GE Nuclear Energy documentation for the fuel cycle 7 Supplemental Reload Licensing Report and core performance monitoring computer data bank, Illinois Power (IP) determined that there was some potential during the past 5 fuel cycles to exceed the Safety Limit MCPR if a PRDF event had occurred. Review of fuel cycle 6 actual operating data identified that CPS had operated in an unanalyzed condition during fuel cycle 6 and may have done so in fuel cycles 2, 3, 4, and 5 as well. The cause of this condition is an error in the MEOD analysis performed by GE Nuclear Energy, the nuclear fuel supplier for CPS.

IP has evaluated this issue and concludes that it is reportable under the provisions of 10CFR, Part 21.

IP is providing the following information in accordance with 10CFR21.21(c)(4). Initial notification of this matter will be provided by facsimile of this letter to the NRC Operations Center in accordance with 10CFR21.21(c)(3) within 2 days of the date the responsible officer approves this report.

- (i) Wilfred Connell, Vice President of Illinois Power Company, Clinton Power Station, Post Office Box 678, Clinton, Illinois, 61727, is informing the Commission by means of this report.
- (ii) The basic component involved in this report is the reload core. The core was to be designed to operate with adequate margins during all conditions as described by the CPS Updated Safety Analysis Report (USAR). This includes the conditions of the MEOD. One of the conditions the core design must meet is operating limits for MCPR that provide margin to the Safety Limit MCPR for all Anticipated Operational Occurrences between 40 and 80 percent of rated thermal power. The PRDF event is a limiting transient for a region of the MEOD.
- (iii) The reload core designs with the MEOD for fuel cycles 2, 3, 4, 5, and 6 were supplied by GE Nuclear Energy.

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- (iv) As discussed in the DESCRIPTION OF EVENT portion of this document, the nature of the defect is the failure of the fuel supplier to include the PRDF event for 40 to 80 percent of rated thermal power in the MEOD analysis. If the PRDF event had occurred during any of fuel cycles 2, 3, 4, 5, or 6, while operating near the non-conservative power-dependent operating limit for the MCPR, the potential would have existed to exceed the Technical Specification Safety Limit MCPR on fuel bundles that were at or near the power-dependent operating limit for the MCPR.
- (v) GE Nuclear Energy notified CPS about the deficiency in the MEOD analysis in a letter dated December 22, 1996. The letter reported that the GE evaluation of reportability under 10CFR, Part 21, concluded that the condition was not reportable. On January 3, 1997, while comparing fuel cycle 6 actual operating data with the new limits for fuel cycle 7, IP engineers identified that the plant had operated in an unanalyzed condition during fuel cycle 6 and may have operated in unanalyzed conditions during fuel cycles 2, 3, 4, and 5 as well. This event was determined to be potentially reportable under the provisions of 10CFR, Part 21 at that time.
- (vi) The GE Nuclear Energy letter reports that the deficient reload core analysis applies to Clinton Power Station and other BWR-6 reactor types.
- (vii) The corrective action that IP is taking for this event is discussed in the CORRECTIVE ACTION section of this document.
- (viii) IP expects that GE Nuclear Energy will notify or has notified affected reactor owners and has no additional advice to offer.