



November 24, 1999

United States Nuclear Regulatory Commission  
Document Control Desk  
Washington, DC 20555

Operating License 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 supplemental report is being submitted:

LER 315/98-056-01, "Inadequate Control and Processing of Design Information Results in Unanalyzed Hot Leg Recirculation Switchover." This supplemental report represents an extensive revision to the original LER and replaces that report in its entirety.

No new commitments were identified in this LER.

Sincerely,

A handwritten signature in black ink that reads 'M. W. Rencheck'.

M. W. Rencheck  
Vice President – Nuclear Engineering

/mbd  
Attachment

c: J. E. Dyer, Region III  
R. C. Godley  
D. Hahn  
W. J. Kropp  
R. P. Powers  
R. Whale  
Records Center, INPO  
NRC Resident Inspector

IE22

**LICENSEE EVENT REPORT (LER)**

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

Estimated burden per response to comply with this mandatory information collection request: 50 hrs. Reported lessons learned are incorporated into the licensing process and fed back to industry. Forward comments regarding burden estimate to the Records Management Branch (T-6 F33), 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. If an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

<b>FACILITY NAME (1)</b> Cook Nuclear Plant Unit 1	<b>DOCKET NUMBER (2)</b> 05000-315	<b>PAGE (3)</b> 1 OF 4
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**TITLE (4)**  
Inadequate Control and Processing of Design Information Results in Unanalyzed Hot Leg Recirculation Switchover

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
12	11	1998	1998	056	01	11	24	1999	Cook Nuclear Plant Unit 2	05000-316
									FACILITY NAME	DOCKET NUMBER

<b>OPERATING MODE (9)</b>	5	<b>THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)</b>								
		20.2201(b)		20.2203(a)(2)(v)		50.73(a)(2)(i)		50.73(a)(2)(viii)		
<b>POWER LEVEL (10)</b>	0%	20.2203(a)(1)		20.2203(a)(3)(i)	X	50.73(a)(2)(ii)		50.73(a)(2)(x)		
		20.2203(a)(2)(i)		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)		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)**

<b>NAME</b> M. B. Depuydt, Regulatory Compliance	<b>TELEPHONE NUMBER (Include Area Code)</b> (616) 465-5901, x1589
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**COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)**

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX

**SUPPLEMENTAL REPORT EXPECTED (14)**

<b>YES</b> (If yes, complete EXPECTED SUBMISSION DATE).	X	<b>NO</b>	<b>EXPECTED</b>	<b>MONTH</b>	<b>DAY</b>	<b>YEAR</b>

**ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)**

During the fall of 1997, it was identified that issues regarding the Cook containment sump design would impact the existing hot leg switchover (HLSO) criticality calculation. The loss of margin that resulted from the partitioning of fluid between the active and inactive sump volumes was offset by taking credit for the Westinghouse Owner's Group (WOG) hot leg nozzle gap analysis in WCAP-14486, "ECCS Hot Leg Recirculation Elimination for Westinghouse 3 and 4 Loop Design NSSS." The WCAP included analyses that supported the elimination of post-Loss-of-Coolant Accident (LOCA) switchover from cold leg recirculation to hot leg recirculation, by taking credit for boric acid flow through the hot leg nozzle gap.

On October 23, 1998, after the withdrawal of WCAP-14486 from consideration by the NRC, the necessary subcriticality margin was no longer analytically available for the Cook units. Westinghouse evaluated whether subcriticality could be assured without taking credit for the hot leg nozzle gap. A successful result was obtained for Unit 1 on December 11, 1998, for the current fuel cycle by taking credit for existing burnup. However, an acceptable analysis for Unit 2, or Unit 1 with a fresh core, was not available at that time.

The root cause of the event is the inadequate control and processing of design information, which will be generically addressed by Restart Action Plan Item No. 3A, "Uncontrolled/Unintended Plant Design Changes." As corrective action to address the subcriticality margin, a license amendment request was submitted September 17, 1999, which takes credit for the negative reactivity from the Rod Cluster Control Assemblies (RCCAs) for the post-cold leg LOCA subcriticality analysis upon hot leg switchover. Based upon the safety margins within the design basis and the results of the recent post-LOCA sub-criticality analysis by Westinghouse, it has been concluded that past operation did not pose a threat to public health and safety.

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

**Conditions Prior To Event**

Unit 1 was in Mode 5, Cold Shutdown  
Unit 2 was in Mode 5, Cold Shutdown

**DESCRIPTION OF THE EVENT**

During the fall of 1997, issues were identified regarding the Cook containment sump design that affected the existing Hot Leg Switchover (HLSO) criticality calculation. A loss of subcriticality margin resulting from the partitioning of fluid between the active and inactive sump volumes was identified during the NRC Architectural and Engineering (A/E) Inspection conducted between August 4 and September 12, 1997. A Justification for Past Operation (JPO) from Westinghouse dated May 12, 1998, offset this loss of margin by crediting hot leg nozzle gap. On October 23, 1998, the Westinghouse Owners Group (WOG) withdrew WCAP-14486, "ECCS Hot Leg Recirculation Elimination for Westinghouse 3 and 4 Loop Design NSSS," from consideration by the NRC. After the withdrawal of WCAP-14486, the necessary subcriticality margin was no longer analytically available for the Cook units. Westinghouse subsequently evaluated whether subcriticality could be assured without taking credit for the hot leg nozzle gap. A successful result was obtained for Unit 1 on December 11, 1998, for the current fuel cycle by taking credit for existing burnup. However, an acceptable analysis for Unit 2, or Unit 1 with a fresh core, was not available at that time.

**CAUSE OF THE EVENT**

The root cause of the inappropriate actions which led to the Unit 2 unanalyzed HLSO is the inadequate control and processing of design information. Factors that contributed to, or influenced, the root cause include:

- Lack of adequate communication between Cook and Westinghouse in areas where exchange of the technical data and interface is required.
- Inadequate oversight of the containment sump modeling.
- High dependence on Westinghouse analysis without detailed reviews.
- Inadequate documentation of the design input and analysis review.
- Lack of defined design basis ownership by Cook engineering.

**ANALYSIS OF THE EVENT**

On December 11, 1998, an engineering review identified an unanalyzed condition pertaining to the post-Loss-of-Coolant Accident (LOCA) Emergency Core Cooling System (ECCS) hot leg switchover sub-criticality analysis for Unit 2. This condition was reported on December 11, 1998, as any event which was found while the reactor was shutdown, which, had it been found while the reactor was operating, would have resulted in the nuclear power plant being in an unanalyzed condition that significantly compromised plant safety, pursuant to the requirements of 10CFR50.72(b)(2)(i). This event is also reportable pursuant to the requirements of 10CFR50.73(a)(2)(ii)(A), as any event that resulted in the nuclear power plant being in an unanalyzed condition that significantly compromised plant safety.

Prior to the shutdown on September 8, 1997, existing calculations for both Cook units demonstrated that there was sufficient boron to prevent re-criticality at the time of switchover to hot leg re-circulation. This inaccurate conclusion was caused by the oversimplified analytical model and assumptions described below. Specifically, the CNP post-LOCA sub-criticality analysis performed by Westinghouse assumed that the sump was a single volume, while the sump consisted of the active sump, the reactor cavity and the annulus. Also, a review of the Westinghouse post-LOCA sub-criticality analysis by the Cook Nuclear Safety and Analysis Department in November 1997, found that Westinghouse had not considered the diversion of coolant to either the pipe annulus or the reactor cavity.

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

The design and analyses deficiencies noted above led to overestimation of the boron concentration in the active sump at the time of switchover to hot leg re-circulation. Therefore, the calculated design margins in the Westinghouse analyses for current and past cycles were non-conservative.

In an effort to offset recirculation sump boron dilution penalty concerns, in September 1997 D.C. Cook elected to take credit for the hot leg nozzle gap, as recommended by NSAL 94-016 issued by Westinghouse and supported by WCAP-14486. Cook requested a Westinghouse analysis which credited the approach in the current and future post-LOCA criticality calculations performed as part of the reload safety evaluation, which was provided in October, 1997.

On May 12, 1998, Westinghouse provided Cook a written Justification for Past Operation (JPO), which demonstrated post-LOCA subcriticality upon hot leg switchover (HLSO) for D.C. Cook Unit 1 Cycles 1 through 16, and Unit 2 Cycles 1 through 11, except for Unit 2 cycle 3. The JPO took credit for the flow path of borated liquid through the reactor vessel hot leg nozzle gap in the subcriticality analysis. On October 23, 1998, the Westinghouse Owners Group (WOG) withdrew WCAP-14486 from consideration by the NRC. As a consequence, the credit taken for the nozzle gap could not be a valid methodology for resolving the post-LOCA recriticality issue for Cook.

On February 19, 1999, Westinghouse provided a report documenting JPO evaluations which addressed the impact on safety of the as-found conditions that existed prior to the plant shutdown in September 1997. This JPO, which applies to all past operating cycles for units 1 and 2, concludes that, assuming control rod insertion occurs, recriticality is no longer an issue. Thus, all past cycles were shown to remain sub-critical.

A Westinghouse analysis that demonstrates control rod insertion following a cold leg large break LOCA has been developed for Cook for future cycles. This approach represents a change to the Licensing Basis, as described in the UFSAR and Technical Specifications.

The re-criticality upon HLSO concern was identified when both units were in mode 5. Both units are currently defueled, thus, there is no immediate safety concern. For past operation, the JPO performed by Westinghouse concluded that there has been no potential safety hazard.

Based upon the safety margins within the design basis of the CNP plants and the results of the recent post-LOCA sub-criticality analysis by Westinghouse, it has been concluded that CNP past operation did not pose a threat to public health and safety.

**CORRECTIVE ACTIONS**

AEP:NRC:1260GH, "Enforcement Actions 98-150, 98-151, 98-152 and 98-186 Reply to Notice Of Violation October 13, 1998", dated March 19, 1999, responded to identified programmatic weaknesses in control of plant Design. The Engineering Leadership Plan establishes a configuration management program to control plant design and a new design control process, which includes design verification, design document control, vendor technical documentation control and testing of design changes. Restart Action Plan item No. 3A, "Uncontrolled/Unintended Plant Design Changes," will address the inadequate control of design information.

A control rod insertion analysis has been completed by Westinghouse which credits the negative reactivity available due to control rod insertion following a cold leg large break LOCA. It is important to note that the hot leg switchover re-criticality issue does not apply to hot leg large break LOCA scenarios, as the break flow maintains the containment sump borated. A

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license amendment request was submitted September 17, 1999, which takes credit for the negative reactivity from the Rod Cluster Control Assemblies (RCCAs) for the post-cold leg LOCA subcriticality analysis upon hot leg switchover.

**SIMILAR EVENTS**

LER 315/97-017-01