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 FACIL: 50-305 Kewaunee Nuclear Power Plant, Wisconsin Public Service      05000305  
 AUTH. NAME      AUTHOR AFFILIATION  
 PULEC, R.      Wisconsin Public Service Corp.  
 MARCHI, M. L.      Wisconsin Public Service Corp.  
 RECIP. NAME      RECIPIENT AFFILIATION

SUBJECT: LER 96-010-00: on 961125, LOCA model error cause analysis to exceed peak clad temperature limit. Caused by error in development of 1986 model. Analysis using an alternate NRC approved model will be completed. W/961220 ltr.

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**WISCONSIN PUBLIC SERVICE CORPORATION**

600 North Adams • P.O. Box 19002 • Green Bay, WI 54307-9002

NRC-96-135

December 20, 1996

10CFR50.73  
10CFR50.46

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

Ladies/Gentlemen:

Docket 50-305  
Operating License DPR-43  
Kewaunee Nuclear Power Plant  
Reportable Occurrence 96-010-00

In accordance with the requirements of 10 CFR 50.73, "Licensee Event Report System," the attached Licensee Event Report (LER) for reportable occurrence 96-010-00 is being submitted.

Sincerely,

M. L. Marchi  
Manager - Nuclear Business Group

RPP

Attach.

cc - INPO Records Center  
US NRC Senior Resident Inspector  
US NRC, Region III

270010

## 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)

Kewaunee Nuclear Power Plant

DOCKET NUMBER (2)

05000 305

PAGE (3)

1 OF 5

TITLE (4)

LOCA Model Error Causes Analysis To Exceed Peak Clad Temperature Limit

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
11	25	96	96	010	00	12	20	96	FACILITY NAME	DOCKET NUMBER
										05000
OPERATING MODE (9)		N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)							
POWER LEVEL (10)		000	20.402(b)		20.405(c)		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	
			20.405(a)(1)(iii)		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)		X 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

Richard Pulec - Licensing Director

TELEPHONE NUMBER (include Area Code)

(414) 388-2560 ext. 2376

## 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)

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)

On November 25, 1996, with the reactor plant in the refueling shutdown mode, the Wisconsin Public Service Corporation Nuclear Licensing Group received formal notification from Siemens Power Corporation (SPC) on the conclusions of their assessment of an error in the 1986 ECCS large break LOCA evaluation model. SPC concluded that the peak clad temperature would be greater than 2200°F; this exceeds the acceptance criteria of 10CFR50.46.

SPC was using the 1986 model with an interim correction to perform an assessment subsequent to NRC notification that 1) the 1991 model (the current analysis of record for Kewaunee) was unacceptable for continued use and 2) the 1986 model contained an unacceptable error. On November 22, 1996 SPC filed a 10CFR21 report notifying the NRC that the unacceptable error in the 1986 model was a substantial safety defect.

The causes of this event appear to be an error in the development of the 1986 model and the failure of SPC to understand and implement NRC requirements for review and approval of significant evaluation model changes. Prior to plant startup, WPSC will complete reanalysis using an acceptable large break LOCA evaluation model.

**LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION**

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Kewaunee Nuclear Power Plant		05000305		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	2 OF 5
				96	- 010 -	00	

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

**DESCRIPTION OF EVENT**

On November 25, 1996, with the reactor plant in the refueling shutdown mode, the Wisconsin Public Service Corporation Nuclear Licensing Group received formal notification from Siemens Power Corporation (SPC) on the conclusions of their assessment of an error in the 1986 ECCS large break LOCA evaluation model. SPC projected that the peak clad temperature would be greater than 2200°F; this exceeds the acceptance criteria of 10CFR50.46.

Following an ongoing NRC review of SPC large break LOCA evaluation models, on October 11, 1996, the NRC formally notified SPC as detailed in Reference 1 that 1) modifications made to the 1986 evaluation model and incorporated in 1991 were unacceptable, and 2) the 1986 evaluation model contained an unacceptable error. The 1991 model was determined by the NRC to be unacceptable for continued use. The 1991 model is used for the current large break LOCA analysis of record for the Kewaunee Plant. The unacceptable error in the 1986 evaluation model concerned the reflood heat transfer correlation. For a range of reflood rates, the correlation may predict that the heat transfer coefficient increases with a decreasing reflood rate. The NRC concluded that this is a non-physical behavior and therefore unacceptable.

To address this unacceptable error, SPC performed an assessment for the Kewaunee Plant implementing a conservative adjustment to the 1986 model by linearizing the reflood rates in the range of concern to eliminate the non-physical behavior. This assessment projected that the resulting peak clad temperature would be greater than the 10CFR50.46 acceptance criteria.

On November 22, 1996, SPC filed a 10CFR21 report (Reference 2) notifying the NRC that the unacceptable code feature in the 1986 model was a substantial safety defect.

**LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION**

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

**CAUSE OF THE EVENT**

Siemens Power Corporation continues to evaluate the causes of this event. The preliminary causes appear to be an error in the development of the 1986 model and the failure of SPC to fully understand and implement NRC requirements for review and approval of evaluation model changes, particularly with regard to changes considered "significant."

**ANALYSIS OF THE EVENT**

Currently the Kewaunee Plant is in an extended outage due to steam generator tube repairs. An acceptable large break LOCA evaluation model is not required in this plant condition. Corrective actions will be taken prior to plant criticality.

To assess the consequences of this error in the large break LOCA evaluation model, WPSC reviewed the actual plant operating history for the period during which this model was used. This review indicated that significant margins were always available between the measured nuclear flux hot channel factors ( $F_Q^N$ ) and analysis limits. As a base loaded plant, the majority of Kewaunee's operation is at steady state full power. With these conditions hot channel margins of greater than 15% were always available. For those infrequent periods of transient operation, hot channel margins could have been as low as 7%. Both of these values are most restrictive at the beginning of a fuel cycle, and larger margins are actually available for the majority of the operating cycles. Based upon SPC experience, it is expected that analysis reflecting actual plant operation would demonstrate that the peak clad limit acceptance criterion would not have been exceeded during a large break LOCA.

**LICENSEE EVENT REPORT (LER)  
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In addition, to support the timely assessment, a conservative adjustment to the model was used by SPC until a more realistic model change could be implemented. It is likely that the final model revision would produce acceptable results.

This event is reportable in accordance with 10 CFR 50.73(a)(2)(ii)(A) as an event that resulted in the plant being in an unanalyzed condition that significantly compromised plant safety. This report also fulfills the reporting requirements of 50.46(a)(3)(ii). This event was also reported on November 25, 1996, in accordance with 10 CFR 50.72(b)(2)(I) as an event found while the reactor is shutdown that during operation would have placed the plant in an unanalyzed condition that significantly compromised plant safety.

**CORRECTIVE ACTIONS**

Previously, in Reference 3, WPSC made commitments to address the concerns of this LER as follows:

Prior to the reactor plant being made critical following the current outage:

- 1) Actions to resolve the unacceptable error in the 1986 SPC model (e.g., an interim model adjustment to address the non-physical behavior of the reflood heat transfer correlation, restrictions on fuel peaking factors, restrictions on power levels, etc.) will be taken, or
- 2) Analysis using an alternate NRC approved model will be completed (most likely as outlined in Reference 4).

**LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION**

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

Implementation of the first alternative, if chosen, will include providing the NRC with the information requested in Reference 5.

**ADDITIONAL INFORMATION**

Equipment failures: None

- References:
- 1) B. W. Sheron (NRC) to M. L. Marchi (WPSC) dated October 11, 1996.
  - 2) H. D. Curet (SPC) to Document Control Desk dated November 22, 1996 (Part 21).
  - 3) M. L. Marchi (WPSC) to Document Control Desk dated October 25, 1996.
  - 4) M. L. Marchi (WPSC) to Document Control Desk dated July 23, 1996.
  - 5) R. J. Laufer (NRC) to M. L. Marchi (WPSC) dated December 3, 1996.

**SIMILAR EVENTS**

None.