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ACCESSION NBR:9305250323 DOC.DATE: 93/05/14 NOTARIZED: NO DOCKET #
 FACIL:50-305 Kewaunee Nuclear Power Plant, Wisconsin Public Service 05000305
 AUTH.NAME AUTHOR AFFILIATION
 MOLZAHN,D.J. Wisconsin Public Service Corp.
 SCHROCK,C.A. Wisconsin Public Service Corp.
 RECIP.NAME RECIPIENT AFFILIATION

SUBJECT: LER 93-010-00:on 930414,generator instability resulted in potential for loss of all transmission sources to plant substation.Sys operating procedure developed & night order issued.W/930514 ltr.

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 TITLE: 50.73/50.9 Licensee Event Report (LER), Incident Rpt, etc.

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

May 14, 1993

10 CFR 50.73

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 93-010-00

In accordance with the requirements of 10 CFR 50.73, "Licensee Event Report System," the attached Licensee Event Report for reportable occurrence 93-010-00 is being submitted.

Sincerely,

A handwritten signature in cursive script that reads "C.A. Schrock".

C.A. Schrock
Manager-Nuclear Engineering

DJM/jms

Attach.

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

200062
9305250323 930514
PDR ADOCK 05000305
S PDR

Handwritten initials "JFR" with two vertical lines below them.

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) 05000305	PAGE (3) 1 OF 4
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TITLE (4) **Generator Instability Results in the Potential for a Loss of All Transmission Sources to the Plant's Substation**

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
04	14	93	93	010	00	05	14	93	N/A	05000
									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	<input type="checkbox"/> 20.402(b)	<input type="checkbox"/> 20.405(c)	<input type="checkbox"/> 50.73(a)(2)(iv)	<input type="checkbox"/> 73.71(b)
	<input type="checkbox"/> 20.405(a)(1)(i)	<input type="checkbox"/> 50.36(c)(1)	<input type="checkbox"/> 50.73(a)(2)(v)	<input type="checkbox"/> 73.71(c)
	<input type="checkbox"/> 20.405(a)(1)(ii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input checked="" type="checkbox"/> OTHER
	<input type="checkbox"/> 20.405(a)(1)(iii)	<input type="checkbox"/> 50.73(a)(2)(i)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)	(Specify in Abstract below and in Text, NRC Form 366A)
	<input type="checkbox"/> 20.405(a)(1)(iv)	<input type="checkbox"/> 50.73(a)(2)(ii)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)	
	<input type="checkbox"/> 20.405(a)(1)(v)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME David J. Molzahn Assistant to Nuclear Licensing & Systems Supt.	TELEPHONE NUMBER (Include Area Code) (414) 433-1308
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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.)	<input checked="" type="checkbox"/>	NO	<input type="checkbox"/>	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR

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

In June 1992, WPSC became aware of the potential for certain multiple transmission line contingencies causing the KNPP generator (GEN) to go unstable and, as a result of the instability, cause all transmission sources into the plant's substation to trip. In order to resolve this issue, WPSC initiated a study to determine whether pre-existing line outages in combination with a transmission line fault could result in credible scenarios by which the KNPP could lose all off-site power.

On April 14, 1993, with the plant in hot shutdown, the results of a stability study of the KNPP were completed. This study confirmed the potential for certain multiple transmission line contingencies causing the KNPP (GEN) to go unstable and, as a result of the instability, cause all transmission sources into the plant's substation to trip.

To ensure the reliability of the transmission sources to the plant's substation, the following interim actions were initiated by WPSC. A WPSC System Operating Procedure was developed requiring the KNPP to be notified when certain transmission lines are out-of-service. This notification along with a KNPP Plant Operations night order, will direct the plant operators to initiate action to place the plant in a condition that is within the limits established by the stability study. A summary of the stability study was included as required reading for the plant operators.

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

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)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
Kewaunee Nuclear Power Plant	05000305	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	2 OF 4
		93	010	00	

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

DESCRIPTION OF EVENT

In June 1992, WPSC became aware of the potential for certain multiple transmission line contingencies causing the KNPP generator (GEN) to go unstable and, as a result of the instability, cause all transmission sources into the plant's substation to trip. In order to resolve this issue, WPSC initiated a study to determine whether pre-existing line outages in combination with a transmission line fault could result in credible scenarios by which the KNPP could lose all off-site power. WPSC determined that due to the substation configuration, the study needed to only evaluate scenarios involving 345 KV transmission line outages. Therefore, the study evaluated two scenarios and in each scenario the KNPP was at its maximum output of 530 MW and the Point Beach Plant was at its maximum output of 990 MW. Each scenario was also evaluated at peak and light load conditions (100% and 40% of peak load) of the surrounding transmission system. The scenarios evaluated were:

- A. Transmission line Q-303, (345 KV line from KNPP to Pt. Beach) open as a pre-existing outage and a close in fault trips R-304 (345 KV line from KNPP to North Appleton substation).
- B. Transmission line L-151, (345 KV line from Pt. Beach to North Appleton substation) open as a pre-existing outage, and a close in fault trips R-304.

In each scenario, the fault applied was a three phase fault close to the KNPP 345 KV bus, and it was cleared by tripping the transmission line. The fault duration was 5 cycles for both scenarios. There were two sets of simulations performed for each scenario. The first set of simulations was done to determine if the system with the pre-existing line outages is stable for the given fault. For those cases that showed the KNPP (GEN) unstable, a second set of simulations was run in which output from KNPP was redispatched. For these cases a determination was made of the maximum KNPP generation in which the system remained stable. On April 14, 1993, with the plant in hot shutdown, the results of a stability study of the KNPP were completed. This study confirmed the potential for certain multiple transmission line contingencies causing the KNPP (GEN) to go unstable and, as a result of the instability, cause all transmission sources into the plant's substation to trip. The results of this study are summarized in the following table.

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

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			93	010	00	

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

Scenario	KNPP Stable at Maximum Output of 530 MW	Loss of Off-Site Transmission Sources to the KNPP Substation	Backdown Available to Avoid Instability
A-Peak Load	No	Yes	Yes - 10 MW
A-Light Load	No	Yes	Yes - 20 MW
B-Peak Load	Yes	No	Not Applicable
B-Light Load	No	Yes	Yes - 20 MW

In scenario A, with maximum KNPP generation, the system is unstable at both peak and light load conditions. In order to maintain the Kewaunee (GEN) stable for peak load conditions, a unit backdown of 10 MW net generation is required. In the light load condition, the Kewaunee (GEN) will remain stable if output is reduced by 20 MW net generation.

In scenario B, since the system was stable at peak load, no generation reduction was necessary. At light load conditions, the Kewaunee generation will remain stable if output is reduced by 20 MW net generation.

CAUSE OF EVENT

The cause of this concern is the design and inherent characteristics of the electrical grid. The potential for certain transmission line contingencies resulting in the KNPP (GEN) going unstable and tripping off-line was previously recognized by WPSC. In previous evaluations, the electrical (GEN) output breaker was assumed to open, thus preventing the instability from affecting the transmission system. Recent improvements in analysis capability have now identified the potential for the (GEN) instability to be reflected onto the transmission system and result in the loss of multiple transmission lines.

ANALYSIS OF EVENT

This event is being submitted for informational purposes. This event was initially reported in a letter to the Document Control Desk from C. A. Schrock dated April 23, 1993. None of the KNPP Updated Safety Analysis Report (USAR) Section 14 accident scenarios take credit for off-site power, and therefore this event had no effect on the health and safety of the public.

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

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Kewaunee Nuclear Power Plant	05000305	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	4 OF 4
		93	010	00	

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

CORRECTIVE ACTIONS

To ensure the reliability of the transmission sources to the plant's substation, and to address the concerns identified by the study, the following interim actions were initiated by WPSC for unplanned transmission line outages. For planned transmission line outages, WPSC will initiate these same actions prior to taking the line out of service. These actions were in place prior to the KNPP exceeding 500 MW net generation after the 1993 refueling outage.

- 1) WPSC System Operations developed a "System Operating Procedure" which will require the KNPP to be notified whenever any of the following transmission lines are out-of-service: R-304, Q-303, or L-151. This notification will direct the plant operators to initiate action to place the plant in a condition that is within the limits established by the stability study.
- 2) KNPP Plant Operations initiated a night order which will direct the operators to initiate a unit backdown within one hour in accordance with standard operating practices when notified by WPSC system operating. This backdown will place the plant in a condition that is within the limits established by the stability study. A summary of the stability study will also be included as required reading for the plant operators.

WPSC is continuing to evaluate the best way of resolving the long term concerns associated with this issue. As part of WPSC's effort to address this issue, an evaluation of the adequacy of the KNPP technical specifications in this area will be made.

ADDITIONAL INFORMATION

Equipment Failures: None

Similar Events: None