

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Palisades Nuclear Plant	DOCKET NUMBER (2) 0 5 0 0 0 2 5 5	PAGE (3) 1 OF 0 3
--	--------------------------------------	----------------------

TITLE (4)
Diesel Generator Inoperability Due to Slow Voltage Regulator Response

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 9	0 3	8 7	8 7	0 3	1 0	1 0	0 5	8 7	N/A		0 5 0 0 0
									N/A		0 5 0 0 0

OPERATING MODE (9) N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)											
POWER LEVEL (10) 0 9 2	20.402(b)			20.406(e)			50.73(a)(2)(iv)			73.71(b)		
	20.406(a)(1)(i)			50.36(c)(1)			50.73(a)(2)(v)			73.71(a)		
	20.406(a)(1)(ii)			50.36(c)(2)			X 50.73(a)(2)(vi)			OTHER (Specify in Abstract below and in Text, NRC Form 388A)		
	20.406(a)(1)(iii)			X 50.73(a)(2)(i)			50.73(a)(2)(vii)(A)					
	20.406(a)(1)(iv)			50.73(a)(2)(ii)			50.73(a)(2)(vii)(B)					
20.406(a)(1)(v)			50.73(a)(2)(iii)			50.73(a)(2)(x)						

LICENSEE CONTACT FOR THIS LER (12)									
NAME CSKozup, Technical Engineer, Palisades							TELEPHONE NUMBER 6 1 6 7 6 4 - 8 9 1 3		

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	
B	EK	VR	B 0 9 3	Yes							

SUPPLEMENTAL REPORT EXPECTED (14)							EXPECTED SUBMISSION DATE (15)		
<input type="checkbox"/> YES (If yes, complete EXPECTED SUBMISSION DATE) <input checked="" type="checkbox"/> NO							MONTH	DAY	YEAR

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

On September 3, 1987 at 1100, 1-1 diesel generator (DG) [EK;DG] was declared administratively inoperable due to potential deficiencies in the exciter voltage regulator [EK;EXC] response time and the terminal voltage setting. This potential deficiency was identified by Consumers Power engineering personnel through Technical Specification (TS) surveillance procedure data reviews and subsequent computer simulations to model accident conditions. The reactor was critical with the Plant operating at 92 percent of rated power when the condition was identified.

While developing and updating the Continuous System Modeling Program (CSMP) for the DG computer model which simulates DG performance using data obtained from TS surveillance procedure RO-8, "Engineered Safeguards Systems", engineering personnel identified that 1-1 DG may not be able to sufficiently maintain output voltage to the required equipment for short periods of time under design basis accident (DBA) conditions. The voltage transient due to starting auxiliary feedwater pump [SJ;P] P8A with the "as found" slow voltage time response combined with a low reference voltage setting, created the potential for a loss of the 1-1 DG due to low output voltage. Adjustments were made to the 1-1 DG reference voltage and voltage stability feedback circuit to correct the deficiencies on September 4, 1987. The 1-1 DG was declared operable at 1350 on September 5, 1987.

I-22
11

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1) Palisades Nuclear Plant	DOCKET NUMBER (2) 0 5 0 0 0 2 5 5	LER NUMBER (6)			PAGE (3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
		8 7	- 0 3 1	- 0 0	0 2	OF	0 3

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

Description

On September 3, 1987 at 1100, 1-1 diesel generator (DG) [EK;DG] was declared administratively inoperable due to potential deficiencies in the exciter voltage regulator [EK;EXC]. These potential deficiencies could have allowed the voltage of 1-1 DG to momentarily drop low enough to trip the DG output breaker or cause a loss of individual loads from the DG. This condition would only occur during the DBA load sequencing of the DG when the last load started, the auxiliary feedwater pump P-8A [SJ;P]. The reactor was critical with the Plant operating at 92 percent of rated power when the condition was identified. The 1-1 DG voltage regulator response time was tested and adjusted on September 4, 1987. The 1-1 DG was declared operable at 1350 on September 5, 1987.

This potential deficiency was identified by Consumers Power engineering personnel during the development of a computer simulation model of the bus loadings during accident conditions. Data from the February 1986 Technical Specification (TS) Surveillance Procedure (RO-8) was put into the computer simulation model. The computer model predicted that under the worst case starting voltage and the observed (as found) voltage response time of the RO-8 data, a voltage collapse would occur when auxiliary feedwater (AFW) pump was started on the loaded bus. The AFW pump P-8A, is 450 HP load and is the last large 2300 V load to be sequenced onto the bus. It is started after approximately 50 seconds by the DBA sequencer.

The auxiliary feedwater pump load was added in 1982 as a TMI follow-up item. The engineering analysis that authorized this addition used a computer model fashioned after a Detroit Edison model and test data collected from Diesel Generator 1-2. In 1985 Engineering personnel became aware of an improved model developed by Duke Power. As part of the validation effort for the new CSMP model, another set of test data was collected while running surveillance test RO-8, only this time the data was taken on Diesel Generator 1-1. In early September 1987, the computer model was considered tuned and was found to predict the voltage collapse for the 1-1 DG.

Cause Of The Event

Our evaluation concluded that under certain conditions the 1-1 diesel generator model predicted a voltage collapse during the start of the auxiliary feedwater pump (P-8A). A voltage collapse resulted from:

1. An improper setting in the feedback circuitry of the voltage regulator assembly.
2. An inadequate reference voltage setting due to the generator shutdown practices.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1) Palisades Nuclear Plant	DOCKET NUMBER (2) 0 5 0 0 0 2 5 5	LER NUMBER (6)			PAGE (3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
		8 7	- 0 3 1	- 0 0	0 3	OF	0 3

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

The root cause of these deficiencies was inadequate knowledge of the importance of these parameters on the response of the DG during the DBA condition. Only after the development of the (CSMP) DG model and the application of the CSMP model to accident conditions were the importance of these parameters and deficiencies discovered. A review of all vendor recommendations and instruction manuals did not uncover any specification or limits on these parameters.

Corrective Actions

Upon discovery of the deficiency, the 1-1 diesel generator was declared inoperable at 1100 on September 3, 1987. Sensitivity studies were run to determine the acceptable time response for the voltage regulator. Then on September 4, 1987 DG 1-1 was tested and adjusted to obtain the proper voltage response time. In addition, the reference voltage was adjusted to 2400 volts. The diesel generator was declared operable on September 5, 1987.

The monthly DG Technical Specification Test will be revised to ensure the terminal voltage is proper after the completion of the test. In addition, an evaluation of the voltage regulator periodic maintenance and testing will be conducted to assure similar conditions do not reoccur.

Analysis Of The Event

The DBA with the loss of one DG is an analyzed transient with no adverse safety consequences. The CSMP DG model predicts a voltage collapse during a DBA with all of the containment spray pumps and the containment cooling water pumps starting and running. This voltage collapse would prevent the DG from carrying its rated load for a period of time after the AFW pump loaded onto the bus. During the voltage collapse, various loads on the bus would be tripped until voltage recovered. Some of these loads would restart after voltage recovered and others would have to be manually restarted. A prediction of which loads would be lost is beyond the capability of the computer model.

Because the computer model predicts the DG would not have been able to carry its full rated load during a DBA, the DG was declared inoperable. A review of the maintenance history of the voltage regulator found no record of adjustments to the time response of the voltage regulator during the lifetime of the Plant.

Because the Technical Specifications limit the inoperability of a DG to seven days per month, this event is being reported per 10CFR50.73 (a)(2)(i)(B) as a condition prohibited by the Technical Specifications.



Consumers
Power

**POWERING
MICHIGAN'S PROGRESS**

General Offices: 1945 West Parnall Road, Jackson, MI 49201 • (517) 788-0550

September 5, 1987

Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

DOCKET 50-255 - LICENSE DPR-20 - PALISADES PLANT -
LICENSEE EVENT REPORT 87-031 - DIESEL GENERATOR
INOPERABILITY DUE TO SLOW VOLTAGE REGULATOR RESPONSE

Licensee Event Report (LER) 87-031, (Diesel Generator Inoperability Due to Slow Voltage Regulator Response) is attached. This event is reportable to the NRC per 10CFR50.73(a)(2)(i) and 10CFR50.73(a)(2)(vii).

Brian D Johnson
Staff Licensing Engineer

CC Administrator, Region III, USNRC
NRC Resident Inspector - Palisades

Attachment

IE22
1/1