



Zion Generating Station
101 Shiloh Blvd.
Zion, Illinois 60099
Telephone 708 / 746-2084
(847)

September 24, 1995

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

The enclosed Licensee Event Report number 96-022-00, docket No. 50-295/DPR-39 from Zion Generating Station is being transmitted to you pursuant to 10 CFR 50.73(a)(2)(ii)(B) which requires a thirty-day written report when any event or condition resulted in the nuclear power plant being in a condition outside the design basis of the plant.

Very truly yours,

G. K. Schwartz
Station Manager
Zion Generating Station

GKS/hjw

Enclosure: Licensee Event Report

cc: NRC Region III Administrator
NRC Resident Inspector
IDNS Resident Inspector
INPO Record Center
Illinois Department of Nuclear Safety
ComEd Distribution List

300034

ZLER\96022a.00(7)

9609300280 960924
PDR ADCK 05000295
S PDR

JE 22
11

LICENSEE EVENT REPORT (LER)

FACILITY NAME Zion Nuclear Power Station Unit 1	DOCKET NUMBER 0 5 0 0 0 2 9 5	PAGE 1 OF 0 6
--	----------------------------------	------------------

TITLE Single Failure of the Blackout Detection Control Circuit Prevents Automatic Sequencing of Safe Shutdown Loads Caused by Original Design

EVENT DATE			LER NUMBER			REPORT DATE			OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQ.	REV.	MONTH	DAY	YEAR	FACILITY NAMES	DOCKET NUMBER(S)
0 8	2 5	9 6	9 6	0 2 2	0 0	0 9	2 4	9 6	ZION UNIT 2	0 5 0 0 0 3 0 4

OPERATING MODE N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (CHECK ONE OR MORE OF THE FOLLOWING)				
POWER LEVEL	20.402(b)	20.405(e)	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 (Specify in Abstract below and in Text, NRC Form 366A)	
	20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)		
	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	
NAME Neil M. Brennan, Regulatory Assurance, Ext. 2380	TELEPHONE NUMBER AREA CODE 8 4 7 7 4 6 - 2 0 8 4

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT									
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS

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

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

During an October 1995 survey taken to identify potentially significant issues, a Design Engineer discovered that a single failure of the non-safety related blackout detection control circuit would prevent the automatic sequencing of the 4KV and 480V safe shutdown loads during a Loss of Offsite Power (LOOP). However, the single failure would not prevent the 4kv safe shutdown loads from autostarting on their process demand signals. The circuitry responsible for responding to a LOOP coincident with a Safety Injection signal is safety related, redundant, and single failure proof. It is not affected by the above mentioned single failure in the blackout detection circuitry.

The blackout detection circuitry was part of the original plant design. It was previously perceived to be acceptable because it utilized non-safety related components which are not subject to the single failure requirements in the FSAR. As a result, this issue was prioritized to be resolved in accordance with other plant work and was not deemed to require immediate attention. A subsequent, more conservative evaluation of this issue in response to the concerns raised by the Design Engineer, determined that the original plant design should be modified such that automatic sequencing of the safe shutdown loads would not be prevented in the event of a single failure in the blackout detection circuitry.

An operability assessment was prepared to demonstrate that failure of the existing blackout detection control circuit logic will allow safe shutdown of either unit, and therefore, the affected components are capable of performing their safety functions. Shift personnel were appraised of the situation. The condition in Unit 1 has been corrected; Unit 2 circuitry will be modified in the September 1996 outage. The safety impact is minimal.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME <div style="text-align: center;">ZION NUCLEAR POWER STATION UNIT 1</div>	DOCKET NUMBER <div style="text-align: center;">0 5 0 0 0 2 9 5 9 6 - 0 2 2 - 0 0</div>	LER NUMBER <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">YEAR</td> <td style="width: 33%;">SEQ.</td> <td style="width: 33%;">REV.</td> </tr> <tr> <td style="text-align: center;">0 2</td> <td style="text-align: center;">2</td> <td style="text-align: center;">0 0</td> </tr> </table>	YEAR	SEQ.	REV.	0 2	2	0 0	PAGE <div style="text-align: center;">0 2 OF 0 6</div>
YEAR	SEQ.	REV.							
0 2	2	0 0							

(LX) Energy Industry Identification System (EIIIS) codes are identified in the text as [XX]

A. PLANT CONDITIONS PRIOR TO EVENT

Various

B. DESCRIPTION OF EVENT

In October of 1995, Corporate Engineering requested that Zion survey the engineering staff to proactively identify potentially significant issues that may require management attention. The subject design issue was first documented in response to this survey.

The Blackout Detection Control Circuit Logic combines the undervoltage signals (from CV-7 relays) for the non-safety-related 4KV Service Buses (Buses 142, 143 and 144) to detect a loss of offsite power. Upon actuation, and following restoration of power by the Diesel Generators(DG) [EK], output relay contacts from this circuit reclose the 4KV feed breakers to the 480V ESF buses and initiate the safe shutdown sequence timers. A single failure of this non-safety-related circuit would prevent reclosing of the feed breakers to all three ESF 480V buses and sequencing of the safe shutdown loads. However, the single failure would not prevent the 4kv safe shutdown loads from autostarting on their process demand signals, such as low header pressure and low steam generator level. This concern does not exist if the loss of offsite power occurs concurrent with a Safety Injection (SI)[BQ] signal.

The blackout detection control circuit is comprised of non-safety related components and was part of the original plant design. The output of this control circuit performs the required automatic safe shutdown functions by utilizing redundant, safety-related components. There is no description in the Updated Final Safety Analysis Report (UFSAR), the Safety Evaluation Report (SER), or the Final Safety Analysis Report(FSAR) on how blackout detection is accomplished or its dependence on non-safety-related components. It was historically assumed that the non-safety-related portion of the blackout detection scheme was not required to be redundant and that its ability to cope with a single failure was not part of the Zion design basis.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME ZION NUCLEAR POWER STATION UNIT 1	DOCKET NUMBER 0 5 0 0 0 2 9 5	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="3">LER NUMBER</th> </tr> <tr> <td style="width: 33%;">YEAR</td> <td style="width: 33%;">SEQ.</td> <td style="width: 33%;">REV.</td> </tr> <tr> <td>9 6 -</td> <td>0 2 2 -</td> <td>0 0</td> </tr> </table>	LER NUMBER			YEAR	SEQ.	REV.	9 6 -	0 2 2 -	0 0	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="2">PAGE</th> </tr> <tr> <td>0 3</td> <td>OF 0 6</td> </tr> </table>	PAGE		0 3	OF 0 6
LER NUMBER																
YEAR	SEQ.	REV.														
9 6 -	0 2 2 -	0 0														
PAGE																
0 3	OF 0 6															

TEXT Energy Industry Identification System (EIIS) codes are identified in the text as [XX]

B. DESCRIPTION OF EVENT (Continued)

A subsequent, more conservative evaluation of this issue in response to the concerns raised by the Design Engineer, determined that the original plant design should be modified such that automatic sequencing of the safe shutdown loads would not be prevented in the event of a single failure in the blackout detection circuitry. This determination was made on August 25, 1996. Pursuant to 10 CFR 50.72 (b)(1)(ii) a one-hour ENS notification was made. Zion implemented a modification which revises the ESF bus undervoltage/degraded voltage control circuit. The modification allows sequencing of the 4KV and 480V safe shutdown loads and reclosing of the ESF 480V feed breakers automatically after loss of voltage on each ESF 4KV bus followed by restoration of power by the emergency diesel generator. The existing 2 out of 3 non-ESF 4KV bus undervoltage scheme will no longer be required.

The modified control circuit will no longer depend upon non-safety-related components, and as a result, the required safe shutdown functions can be accomplished automatically assuming a single failure.

C. CAUSE OF EVENT

The original plant design did not meet the single failure criteria in that it utilized non-safety-related components in the blackout detection circuitry.

D. SAFETY ANALYSIS

This event is reportable pursuant to 10 CFR 50.73 (a)(2)(ii)(B) which requires a thirty-day written report when any event or condition resulted in the nuclear power plant being in a condition outside the design basis of the plant.

Failure of the blackout detection circuitry is not safety significant because it does not prevent the ability to safely shutdown the plant in the event of a loss of offsite power.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME	DOCKET NUMBER	LER NUMBER			PAGE		
ZION NUCLEAR POWER STATION UNIT 1		YEAR	SEQ.	REV.			
	0 5 0 0 0 2 9 5	9 6 -	0 2 2 -	0 0	0 4	OF	0 6

TEXT Energy Industry Identification System (EIIIS) codes are identified in the text as [XX]

D. SAFETY ANALYSIS (Continued)

Following a loss of offsite power and restoration of voltage to the 4KV buses by their respective Diesel Generators(DG), the 4KV safe shutdown loads are capable of starting either manually or automatically through their process signals (i.e., low header pressure for the Service Water(SW) [BI] and component Cooling Water (CC) [CC] Pumps and low-low Steam Generator level for the Auxiliary Feedwater (AFW) [BA] Pump). Although there are time delays associated with autostarting through the process demand signals, these delays are less than those assumed in the Chapter 15 Accident Analysis for Auxiliary Feedwater. In addition, the Turbine Driven Auxiliary Feedwater Pump is not affected by this failure and is available to immediately start.

The accident analysis does not identify an immediate need for Service Water or Component Cooling Water. Service Water is used for cooling the DGs, and EOP ECA-0.0, "Loss of All AC Power" warns that the DG should not be run more than 5 minutes without cooling. The process signal would, however, start the Service Water Pumps well before exceeding the 5 minute limit. In addition, since the postulated single failure of the subject control circuit would only affect a single unit, Service Water and Component Cooling Water will be available from the unaffected unit.

Following the process signal time delays, the Service Water, Auxiliary Feedwater, and Component Cooling Water Pumps could start simultaneously. While the DGs were not intended to start these loads simultaneously (i.e., block start), their capability to do so was previously demonstrated from the analysis of an event which inadvertently block started LOCA loads, as opposed to just the shutdown loads, without exceeding the generator thermal limits. The LOCA loading is approximately 70% greater than the safe shutdown loading. The analysis did not predict the voltage and frequency response of the generator during this block start, however, it states that the 4KV motors would operate adequately, with perhaps minor delays in initiation of flow. The starting of 480V system loads and operation of the 120V control and distribution circuits are not an issue since power is not available to the 480V switchgear at the time of the block start.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME ZION NUCLEAR POWER STATION UNIT 1	DOCKET NUMBER 0 5 0 0 0 2 9 5 9 6 - 0 2 2 - 0 0	LER NUMBER <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">YEAR</td> <td style="width: 33%;">SEQ</td> <td style="width: 33%;">REV.</td> </tr> <tr> <td>9 6 -</td> <td>0 2 2 -</td> <td>0 0</td> </tr> </table>	YEAR	SEQ	REV.	9 6 -	0 2 2 -	0 0	PAGE 0 5 OF 0 6
YEAR	SEQ	REV.							
9 6 -	0 2 2 -	0 0							

TEXT Energy Industry Identification System (EIIS) codes are identified in the text as [XX]

D. SAFETY ANALYSIS (Continued)

The Reactor Containment Fan Coolers(RCFC) [BK], however, which are also sequenced on by the shutdown timers, will not be automatically started. These fans are powered from the 480V bus and, therefore, would not operate until the 480V buses are energized. The Emergency Operating Procedures(EOP), which guide the operators through the necessary steps to verify a safe and orderly shutdown of the reactor on a reactor trip, include verification that the RCFC Fans are operating early in the shutdown process. Following EOP E-0 (Reactor Trip or Safety Injection) and ES-0.1 (Reactor Trip Response), the operators verify a reactor trip and then assess the support systems, which includes verification that the SW, CC and AFW Pumps and the RCFC Fans are running. During these steps, the operators will find that the RCFC Fans are not operating and take the necessary action to close the necessary 4KV and 480V switchgear breakers.

The absence of the RCFC Fans during this period is not safety significant. The heat removal and pressure reduction functions of the RCFC Units are not critical considerations for a safe shutdown following a loss of offsite power.

There are also some support equipment associated with the shutdown loads that are powered from the ESF 480V Buses. As discussed below, however, the temporary loss of this support equipment is not safety significant. This equipment will be available once the 480V ESF buses are energized. This support equipment includes the following:

- DG Fuel Oil Transfer Pump
- DG Room Ventilation Fan
- Auxiliary Feedwater (AF) Pump Aux. Lube Oil Pump

The fuel transfer pumps transfer fuel from the DG Oil Storage Tank to the Day Tank at a rate of 7 gpm. The DG fuel consumption rate will be less than this rate, therefore, the 500 gallon Day Tank would contain at least a 70 minute supply of fuel oil by which time 480V power will be restored.

The DG Ventilation Fan is designed to automatically start when the DG is running. Without the fan running to remove heat, the room temperature will rise. The temperature will eventually reach the high temperature alarm setpoint and initiate a DG Room Ventilation Panel trouble Alarm at Panel OCB05. Per the Alarm Response Manual for this panel, the operators have one hour to respond to the alarm. 480V power will be restored during this time.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME ZION NUCLEAR POWER STATION UNIT 1	DOCKET NUMBER 0 5 0 0 0 2 9 5	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="3">LER NUMBER</th> <th colspan="3">PAGE</th> </tr> <tr> <td style="width: 10%;">YEAR</td> <td style="width: 10%;">SEQ.</td> <td style="width: 10%;">REV.</td> <td style="width: 10%;"> </td> <td style="width: 10%;"> </td> <td style="width: 10%;"> </td> </tr> <tr> <td>9 6</td> <td>- 0 2 2</td> <td>- 0 0</td> <td>0 6</td> <td>OF</td> <td>0 6</td> </tr> </table>	LER NUMBER			PAGE			YEAR	SEQ.	REV.				9 6	- 0 2 2	- 0 0	0 6	OF	0 6
LER NUMBER			PAGE																	
YEAR	SEQ.	REV.																		
9 6	- 0 2 2	- 0 0	0 6	OF	0 6															

TEXT Energy Industry Identification System (EIIIS) codes are identified in the text as [XX]

D. SAFETY ANALYSIS (Continued)

The AF Pump Aux. Lube Oil Pump is a back-up pump to the shaft driven pump. Based on the FW System Zion Operability Determination Manual (ZODM), loss of this auxiliary lube oil pump does not make the AF Pump inoperable.

Based on the above, failure of the subject blackout control circuit will not have a significant adverse affect on the safe shutdown of either unit during a loss of offsite power.

E. CORRECTIVE ACTIONS

1. An operability assessment was conducted and determined that the affected components are capable of performing their safety functions.
2. Shift personnel were made aware that the 480V breakers on the ESF buses will not automatically reclose following a loss of offsite power if the blackout detection control circuit were to fail.
3. A modification was issued to ensure that safe shutdown equipment will automatically operate with a single failure of the blackout detection logic. The modification has been completed in Unit 1 and is scheduled to be performed in Unit 2 during the September 1996 outage.

F. PREVIOUS EVENTS SEARCH AND ANALYSIS

No similar events were found in Zion's Nuclear Tracking System.

G. COMPONENT FAILURE DATA

None.