

EXPIRES 04/30/98

## 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: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND 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.

FACILITY NAME (1)

Clinton Power Station

DOCKET NUMBER (2)

05000461

PAGE (3)

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TITLE (4)

Design of Diesel Generator Ventilation Subsystems Outside Design Basis as a Result of Failure to Include Minimum and Maximum Outside Air Temperature Extremes Due to Design Error

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
09	29	86	97	022	00	09	22	97	None	05000
									FACILITY NAME	DOCKET NUMBER
									None	05000
OPERATING MODE (9)			THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)							
4			20.2201(b)		20.2203(a)(2)(v)		<input checked="" type="checkbox"/> 50.73(a)(2)(i)		50.73(a)(2)(viii)	
POWER LEVEL (10)			20.2203(a)(1)		20.2203(a)(3)(i)		<input checked="" type="checkbox"/> 50.73(a)(2)(ii)		50.73(a)(2)(x)	
000			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)		<input checked="" type="checkbox"/> OTHER	
			20.2203(a)(2)(iii)		50.36(c)(1)		<input checked="" type="checkbox"/> 50.73(a)(2)(v)		Specify in Abstract below or in NRC Form 366A	
			20.2203(a)(2)(iv)		50.36(c)(2)		<input checked="" type="checkbox"/> 50.73(a)(2)(vii)			

NAME

M. M. Gandhi, Engineering Projects Engineer

LICENSEE CONTACT FOR THIS LER (12)

TELEPHONE NUMBER (Include Area Code)

(217) 935-8881, Extension 4082

## 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)

EXPECTED  
SUBMISSION  
DATE (15)

MONTH DAY YEAR

☒ YES

NO

11 17 97

(If yes, complete EXPECTED SUBMISSION DATE).

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

The diesel generator (DG) room ventilation system was designed for an outside air temperature range of -2 degrees Fahrenheit (F), winter minimum temperature, and 96 degrees F, summer maximum temperature. The Updated Safety Analysis Report (USAR) identifies temperature extremes of -22 degrees F and 112 degrees F based on surrounding area temperature data. Analysis determined that the DG ventilation system is unable to maintain DG room temperature within the design limit during temperature extremes identified in the USAR. The cause for the DG ventilation system being inadequate is design engineers oversight. During the investigation, DC annunciator power supplies were identified as not meeting Class 1E qualification. The cause for this condition has not been determined. Corrective actions for this event include revising procedures, evaluating components for increased room temperatures, installing a temporary modification to reduce temperature inside a control panel, evaluating design changes to prevent DC power supplies from tripping due to high temperature, reviewing other ventilation systems, correcting the USAR, correcting the DC DC annunciator power supply Class 1E deficiency, and evaluating low outside air temperature extremes. This condition is reportable under 10CFR21.

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## DESCRIPTION OF EVENT

On July 24, 1997, the plant was in Mode 4 (COLD SHUTDOWN) for the sixth refueling outage (RF-6). Reactor (RCT) coolant temperature was being maintained within a band of 100 to 120 degrees Fahrenheit (F) and pressure was zero pounds per square inch. Engineers were investigating condition report (CR) 1-97-06-302 which identified an issue involving increased Emergency Diesel Generator Room Heating, Ventilating, and Air Conditioning (HVAC) system (VJ) fan (FAN) horsepower consumption during low outside ambient temperature conditions.

At about 0745 hours, during the investigation, questions were raised about the design of the diesel generator room ventilation subsystems. The room ventilation subsystems are designed for an outside air temperature range of minus 2 degrees F, winter minimum temperature, and 96 degrees F, summer maximum temperature, based on the 1 percent and 99 percent temperature extremes for Central Illinois. The diesel generator ventilation system was designed in accordance with the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Fundamentals Handbook chapter on weather data and design conditions. However, the Clinton Power Station (CPS) Updated Safety Analysis Report (USAR) identifies surrounding area extremes of minus 22 degrees F (Springfield, IL) and 112 degrees F (Springfield, IL). Actual Clinton Power Station extremes documented in the USAR are minus 19.8 degrees F and 95.4 degrees F. Therefore, due to the design limitations, it was determined the diesel generator room ventilation subsystems may not be adequate to support operability of the diesel generators during extreme outside temperatures that exceed the recommended levels in the ASHRAE Fundamentals Handbook.

The Operations Shift Supervisor was notified about this issue at 0830 hours and he directed that Engineering perform further evaluations.

The diesel generator room ventilation subsystems were designed to limit the temperature in the diesel generator room to 130 degrees F with the diesel generator operating and between 65 degrees F and 104 degrees F when the diesel generator is not operating. However, the engineers determined that when outside temperatures are below 5 degrees F or above 102.7 degrees F for the Divisions 1 and 2 diesel generator rooms, and below 5 degrees F or above 104 degrees F for the Division 3 diesel generator room, the DG HVAC system may not maintain the temperature in these rooms within design limits. Further evaluation of the effects of the area extreme low temperature is in progress.

CR 1-97-07-250 was initiated to investigate and track the extreme temperature issue. On July 25, 1997, at approximately 0051 hours, an operability determination completed by the Operations Shift Supervisor concluded that the outside ambient temperature band required for proper operation of the Diesel Generator Room HVAC system is 5 degrees F to 102.7 degrees F for the Divisions 1 and 2 diesel generator rooms, and 5 degrees F to 104 degrees F for the Division 3 diesel generator room.

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The Operations Shift Supervisor implemented interim actions to ensure continued operability of the emergency diesel generators. On July 25, 1997 surveillance procedures CPS 9000.01D001, "Control Room Surveillance Log - Mode 1, 2, 3," and CPS 9000.01 D002, "Control Room Operator Surveillance Log - Mode 4, 5 Data Sheet," were revised to require monitoring of outside air temperature. If outside ambient temperature for the respective diesel generator was not within the required temperature range (5 to 102.7 degrees F for Divisions 1 and 2, or 5 to 104 degrees F for Division 3), appropriate actions in accordance with CPS Technical Specifications for the inoperable diesel generator(s) were to be taken. On August 4, 1997, CPS surveillance procedures 9000.01 D001 and 9000.01 D002 were revised again to require actions in accordance with CPS administrative procedure 1014.06, "Operability Determination," and the CPS Technical Specifications for the inoperable diesel generator(s).

Further analysis showed that temperatures higher than 102.7 degrees F are acceptable for Division I and II diesel generator rooms; however, to ensure conservative operation, CPS procedures were not revised to reflect the higher temperature. For long-term solutions, Engineering is evaluating all diesel generator supporting components to ensure they are operable for temperatures up to 140 degrees F. This is based on the results of an engineering evaluation showing that the rooms can be maintained below 140 degrees F for outside air temperatures up to the area extreme high temperature of 112 degrees F.

On August 21, 1997, at about 1730 hours, during investigation of CR 1-97-07-250, engineers determined that the Division 3 diesel generator would not be operable when outside air temperature was greater than 91 degrees F. The basis for this determination was a postulated 23 degrees F temperature differential between the Division 3 diesel generator room temperature and the Division 3 diesel generator control panel. An annunciator power supply [JX] within the Division 3 diesel generator control panel was not qualified for temperatures above 140 degrees F. Overheating of the annunciator power supply could result in a low impedance fault. The result of such a fault could cause the control power [JC] circuit breaker [BKR] in the DG Direct Current (DC) Distribution Panel to open, shutting down the diesel generator. CR 1-97-08-204 was initiated to investigate and track this issue. The original operability determination was revised as a result of this finding and a temporary modification was initiated to remove the control panel doors to equalize room temperature and control panel temperature. This temporary modification restored the Division 3 diesel generator to an operable status.

Investigation of the DC annunciator power supplies on Division 1 and Division 2 diesel generators on August 29, 1997, found that they too were only qualified to 140 degrees F. These power supplies are located in control panels similar to Division 3 where temperatures inside the panel could be 23 degrees higher than room temperature. A low impedance fault on the DC power supplies in these diesels could also result in DG shutdown.

Also on August 29, 1997, engineers discovered the annunciator power supplies for Division 1 and Division 2 diesel generators were not Class 1E qualified. These power supplies do not perform a safety related function, however, they are connected to the Class 1E DC diesel generator electrical distribution system. Section 8.3.1.4.1.4 of the USAR requires Non-Class 1E, non-division associated components, be electrically isolated from Class 1E systems by an acceptable Class 1E isolation device or have an adequate justification and



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analysis for Non-Class 1E isolation. Engineering determined that Division 1 and Division 2 diesel generator annunciator power supplies did not have Class 1E isolation and no justification existed for Non-Class 1E isolation. At this time both Division 1 and Division 2 diesel generators were inoperable. A Limiting Condition for Operation, 3.8.2, was entered to ensure that the Non-Class 1E power supply issue and the high temperature issue for Division 1 and 2 diesel generators are corrected prior to declaring the Division 1 and Division 2 diesel generators operable.

The design of the diesel generator room ventilation subsystems is not in accordance with the licensing basis of the plant. The design deficiency in the diesel generator ventilation subsystems has existed since initial plant operation on September 29, 1986, when the plant was in Mode 5 (REFUELING) for initial fuel loading. At that time, reactor coolant temperature was ambient and pressure was atmospheric. The Non-Class 1E DC annunciator power supplies for Division 1 and 2 DG are also not in accordance with the licensing basis of the plant. It has not been determined how long this condition has existed.

No automatic or manually initiated safety system responses were necessary to place the plant in a safe and stable condition. No other equipment or components were inoperable at the start of this event to the extent that their inoperable condition contributed to this event.

## CAUSE OF EVENT

The cause for the diesel generator ventilation system being inadequate during extreme ambient temperatures was due to design engineers' oversight. Why the DC annunciator power supplies for Division 1 and 2 diesel generators do not meet Class 1E qualification has not been determined and is under investigation.

## CORRECTIVE ACTION

Surveillance procedures CPS 9000.01D001 and CPS 9000.01 D002 have been revised to monitor outside air temperature, and if temperature is not within the minimum and maximum (5 to 102.7 degrees F or 5 to 104 degrees F) design operating range for the respective diesel generator, appropriate actions will be taken in accordance with CPS administrative procedure 1014.06, "Operability Determination", and the CPS Technical Specifications for the inoperable diesel generator(s). However, further evaluation for area maximum high and low outside air temperatures remains to be completed to determine impact on the operability of the diesel generators. Based on the results of the evaluation, appropriate actions will be taken to ensure equipment operability. IP will revise this LER to include the results of the evaluations for area high and low temperature extremes. IP expects to issue the revision by November 17, 1997. Additional corrective actions include the following:

A Temporary Modification was installed on Division 3 control panel to remove the panel doors allowing the temperature inside the panel to equalize with DG room temperature.

Design changes will be initiated and implemented to provide protective isolation for the DC power supplies to prevent the DC distribution panel from tripping.

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Other safety related HVAC systems with very high outside air flow rates and/or low thermal inertia with short air changes will be reviewed to identify issues similar to those discussed in this event.

The CPS USAR will be revised to accurately identify the diesel generator room temperature limitations.

Design changes will be initiated and implemented for the DC annunciator power supplies in Division I and II to ensure Class 1E compliance in accordance with USAR Section 8.3.1.4.1.4.

The cause for the improper Class 1E DC annunciator power supplies for Division 1 and Division 2 diesel generators is under investigation. The results of this investigation will determine if other corrective actions are required. It will include the cause for the improper power supplies and any additional corrective actions in the revision to this LER.

## ANALYSIS OF EVENT

This event is reportable under several criteria or provisions of 10CFR50.73. The event is reportable under the provisions of 10CFR50.73(a)(2)(ii)(B) because the design of the diesel generator room ventilation subsystems, and the design of the Division 1 and 2 DC annunciator power supplies, are not in accordance with the design requirements of the plant. The diesel generators are required to mitigate the consequences of an accident. Failure of the DC annunciator power supplies could have prevented the diesel generators from fulfilling their safety function, therefore this event is reportable under 10CFR50.73(a)(2)(v). This event is also reportable under the provisions of 10CFR50.73(a)(2)(vii) because a single condition caused the three subsystems of the emergency diesel generator HVAC system to become inoperable. Finally, due to the previously unrecognized potential for the diesel generators to be rendered inoperable from the effects of high temperature on required equipment in the diesel generator rooms (when outside air temperatures exceed levels that are not improbably high), this event is also reportable under the provisions of 10CFR50.73(a)(2)(i)(B) as a condition or operation prohibited by the Plant Technical Specifications. This is based on the fact that, to date, there have been many occasions or periods of time when outside air temperatures exceeded 91 degrees F. During those times, all three diesel generators were inoperable (but were not declared inoperable since the condition was unknown). Having three diesel generators inoperable at the same time requires entry into Technical Specification (TS) 3.0.3. A condition or operation requiring entry into TS 3.0.3 constitutes a condition or operation prohibited by the plant Technical Specifications.

An assessment of the safety consequences and implications of this event identified that this event has potential nuclear safety significance. The failure of the diesel generator room ventilation subsystems to perform their design functions during outside air temperature extremes could cause common mode failure of the divisional emergency diesel generators to perform their functions of supplying sufficient power to safety-related equipment. Specifically, extremely high outside air temperatures could increase the diesel generator room temperature to above the design limits and cause a power supply failure and

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subsequent trip of the DC main feed circuit breaker to the diesel generator control panel. A loss of power to the control panel could prevent the diesel generator from performing its design function.

## ADDITIONAL INFORMATION

No equipment or components failed as a result of this event.

Clinton Power Station has not reported similar events regarding inadequate HVAC design and failure to provide proper Class 1E electrical isolation in recent history.

For further information regarding this event, contact M. M. Gandhi, Engineering Projects Engineer, at (217) 935-8881, extension 4082.

10CFR21 Report 21-97-036

On July 24, 1997, during investigation of condition report (CR) 1-97-06-302 which identified an issue involving increased Diesel Generator Room Heating, Ventilating, and Air Conditioning system fan horsepower consumption at low temperature and the effect on diesel generator loading and electrical load distribution system, questions were raised about the design of the HVAC system. These questions resulted in an evaluation of the DG ventilation system for adequacy during extreme high and low outside ambient air temperatures. Due to design limitations on the diesel generator room ventilation subsystems, it was determined adequate cooling capacity may not be available to support operability of the diesel generators if outside temperatures exceed levels that are not improbably high for the summer season. This issue was determined to be potentially reportable under 10CFR21. IP has completed an evaluation of this issue and concludes that it is reportable under the provisions of 10CFR, Part 21.

IP is providing the following information in accordance with 10CFR21.21(c)(4). Initial notification of this matter will be provided by facsimile of this letter to the NRC Operations Center in accordance with 10CFR21.21(c)(3) within 2 days of the date the responsible officer approves this report.

- (i) Wayne D. Romberg, Assistant Vice President of Illinois Power Company, Clinton Power Station, Highway 54, 6 Miles East, Clinton, Illinois, 61727, is informing the NRC of a condition reportable under the provisions of 10CFR21 by means of this report.
- (ii) The basic component involved in this report is the design of the diesel generator room ventilation subsystems.
- (iii) The design for the diesel generator room cooling subsystems was supplied by Sargent & Lundy.



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- (iv) As discussed in the DESCRIPTION OF EVENT portion of this report, the nature of the defect is the diesel generator room ventilation subsystems are not designed to address the temperature extremes of the area surrounding CPS and may not perform their design functions during those extremes.

As discussed in the ANALYSIS OF EVENT portion of this report, failure of the ventilation subsystems to perform their design functions during temperature extremes could cause failure of the diesel generators to perform their functions of supplying sufficient power to safety-related equipment.

- (v) On July 24, 1997, IP identified that the diesel generator room ventilation subsystems may not be designed to include the temperature extremes of the area surrounding CPS and IP determined that this issue was potentially reportable under 10CFR21.
- (vi) This issue affects the design of the diesel generator room ventilation subsystems for the Divisions 1, 2, and 3 emergency diesel generators. IP is not aware of other facilities that would be affected by this issue.
- (vii) The corrective action that IP is taking for this event is discussed in the CORRECTIVE ACTION section of this report.
- (viii) IP has no additional information to offer.