NRC FORM 366 (4-95) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES 04/30/98

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.

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

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TITLE (4)

Automatic Actuation of Emergency Diesel Generator 32 Due to an Undervoltage Condition on 480 Volt Bus 6A Caused by Personnel 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
									N/A	50000
05	28	1998	1998	-- 003 --	00	06	26	1998	FACILITY NAME: N/A	DOCKET NUMBER: 05000

OPERATING MODE (9)	N
POWER LEVEL (10)	100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)

20.2201(b)	20.2203(a)(2)(v)	50.73(a)(2)(i)	50.73(a)(2)(viii)
20.2203(a)(1)	20.2203(a)(3)(i)	50.73(a)(2)(ii)	50.73(a)(2)(x)
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)	OTHER
20.2203(a)(2)(iii)	50.36(c)(1)	50.73(a)(2)(v)	Specify in Abstract below or in NRC Form 366A
20.2203(a)(2)(iv)	50.36(c)(2)	50.73(a)(2)(vii)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Anthony Vitale, Maintenance Manager	(914)736-8632

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
A	ED	SWGR	WI20	Y					

SUPPLEMENTAL REPORT EXPECTED (14)			EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE).	X	NO				

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

On May 28, 1998, with reactor power at 100 percent, the normal supply breaker to 480 volt bus 6A opened. The loss of voltage on bus 6A initiated a non-safety injection (SI) blackout signal which started Emergency Diesel Generator (EDG) 32. EDG 32 automatically connected to bus 6A. Equipment operated as expected except that flow control valve (FCV) 625, in the component cooling water (CCW) system, closed and a circuit breaker feeding motor control center (MCC) 36D opened and de-energized the MCC. The circuit breaker was designed to remain closed. MCC 36D supplies power to EDG 32 support equipment not immediately required for EDG operability. The event was caused by a personnel error. A contract worker erecting scaffolding inadvertently bumped a control switch on the EDG control panel that controls the supply breaker for bus 6A. Corrective actions included counseling of the individuals involved, discussion of the event with maintenance support staff, and briefing the maintenance and construction services department of the event and lessons learned. There was no significant effect on public health and safety.

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

Note: The Energy Industry identification system Codes are identified within the brackets {}

DESCRIPTION OF EVENT

On May 28, 1998, at approximately 1004 hours, with reactor power at approximately 100 percent, the normal supply breaker {BKR} to 480 volt {ED} bus {BU} 6A opened. The loss of voltage on bus 6A initiated a Non-Safety Injection (SI) Blackout signal {JE} which caused Emergency Diesel Generator (EDG) {EK} 32 to start. EDG 32 successfully started and automatically connected to bus 6A. Bus loads were automatically shed and required loads sequenced back onto the bus. Major equipment which lost power included the 33 Charging {CB} Pump {P}, Pressurizer Modulating Heaters, 35 Fan Cooler Unit {BK}, 32 Motor Generator Set {AA}, 33 Component Cooling Water {CC} Pump, 33 and 36 Service Water {BI} Pumps, Motor Control Center (MCC) 37 and MCC 36D {ED}. At approximately 1005 hours, the 33 motor and 32 steam driven Auxiliary Feedwater (AFW) {BA} pumps, the 36 SW pump, and the 33 CCW pump automatically started. Operators manually started the 31 Charging pump, the 35 SW pump, and opened flow control valve (FCV)-625. Control room operators observed multiple alarms {ALM} due to the undervoltage condition on bus 6A and the resultant shedding of loads. There were no systems or components that were inoperable at the start of the event that contributed to the event.

Operators initiated a recovery of bus 6A using Off Normal Operating Procedure (ONOP) EL-4, "Loss of Offsite Power," for guidance. There was no procedure available specifically for recovery from loss of a 480 volt bus. Equipment operated as expected in response to the event except that FCV-625 in the CCW system closed and the supply breaker to MCC 36D opened. Closure of FCV-625 resulted in isolation of CCW return flow from the thermal barrier heat exchanger {HX} for each reactor coolant {AB} pump (RCP). The control circuitry in the switchgear {SWGR} containing the supply breaker for MCC 36D was designed to ensure the breaker remained connected to bus 6A on an undervoltage condition or SI signal. The de-energization of MCC 36D caused the loss of equipment that supports operation of EDG 32 (e.g., EDG 32 room ventilation {VJ} fans {FAN} 316 and 317, the engine {ENG} crankcase exhauster, and the fuel oil transfer pump {P}).

At approximately 1021 hours, operators observed a high temperature alarm {TA} for the 32 EDG room and initiated an investigation. Operators discovered the 32 EDG room ventilation exhaust fans were not operating due to a lack of power. At approximately 1048 hours, operators unloaded the 32 EDG from bus 6A and returned bus 6A to its normal power supply.

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At approximately 1050 hours, control room operators closed the supply breaker to MCC 36D restoring power to EDG 32 support equipment. At 1053 hours, operators shut down EDG 32 and returned the control switch for EDG 32 to automatic.

Engineering's investigation of why the supply breaker to MCC 36D opened determined that there was a load shedding interlock on the breaker control circuit for both MCC 36D and MCC 36E. Engineering notified operations of their finding and the potential operability concern with the EDGs. At approximately 1335 hours, operations determined that the condition could cause the loss of the support equipment for the 32 and the 33 EDG during an SI or blackout and impact the operability of both EDGs. Operations directed that a Nuclear Plant Operator (NPO) be stationed by the 480 volt switchgear to ensure the MCC supplying EDG support loads was energized. An Operations Shift Order was issued to provide guidance for operation of the EDGs with the supply breakers to MCC 36D and MCC 36E in a degraded condition. Engineering performed an assessment of the operability of EDG 32 as a result of the loss of EDG 32 support equipment. At 1845 hours, operations determined, with input from engineering, that EDG 32 and EDG 33 were operable.

An Engineering investigation of the MCC 36D supply breaker condition determined that a modification installed in August 1997 failed to disconnect an SI/Blackout load shedding interlock {IEL} that is prewired into spare/future cubicles in 480 volt switchgear. This modification added two MCCs (MCC 36D, MCC 36E) and supply breakers (52/MCC6D, 52/MCC6E) to realign the power supplies for EDG auxiliary support equipment. The modification changed the design so that the auxiliary support equipment associated with a particular EDG is powered by its own EDG. The power supplies for the new MCCs were taken from 480 volt bus 6A for MCC 36D and 480 volt bus 5A for MCC 36E. A spare compartment on each switchgear bus was converted for the new MCC supply breakers. The intended design was to have the supply breaker supply power to auxiliary equipment from the normal power source and remain closed on an SI and/or Blackout signal. Post modification testing consisted of continuity testing and a functional test of the installed circuits but was not extensive enough to disclose the existing interlock.

Prior to installation of the modification, designers had checked that what was shown on the new schematic drawings for the breaker controls was on the wiring diagrams. They did not verify that what was shown on the wiring diagrams was also shown on the new schematic diagram.

The switchgear internal wiring diagrams, which were part of the modification, showed the SI/Blackout load shedding interlocks. The schematic drawings for the new breaker control circuits did not show the interlocks.

To restore the design, a design change was developed which disconnected the SI/Blackout load shedding interlocks. On May 29, 1998, at approximately 1530 hours, implementation of the design change and testing was satisfactorily completed. The cause of the design deficency was personnel error. Personnel responsible for the modification failed to provide adequate design review and testing.

The closure of FCV-625 and bus loss that powered Charging Pump 33 resulted in a loss of RCP seal cooling for approximately one minute. Operators restored RCP seal injection by manually starting Charging Pump 31 and restored cooling flow by opening FCV-625 within approximately one minute of the event.

CAUSE OF EVENT

The cause of the event was a cognitive personnel error due to poor work practices. A contract worker inadvertently bumped a control switch on the EDG control panel that controls the supply breaker for bus 6A. The worker was erecting scaffolding in the EDG 32 room adjacent to the EDG control panel. The worker failed to apply adequate self-checking to ensure his intended actions were appropriate. Operations was promptly notified of the inadvertent mispositioning of the breaker control switch. The worker had received a pre-job briefing and was aware of the trip hazard and caution area around the panel. A pre-job walkdown had been performed that defined the scope of the work and the precautions required.

The investigation into the cause of the inadvertent actuation of EDG 32 concluded the current processes and capabilities to prevent inadvertent equipment operation were appropriate.

CORRECTIVE ACTIONS

The following corrective actions have been performed to address the cause of the event:

- The individuals involved were counseled by the Maintenance Department Building and Grounds General Supervisor.
- A meeting was conducted with the maintenance support staff to discuss the event and reinforce the need to be alert and aware of trip hazards.
- The Maintenance and Construction Services Departments were briefed of the event and the lessons learned.

There are other areas of the plant which contain equipment that pose a trip hazard and are vulnerable to inadvertent actuation. These other areas were previously evaluated and determined to have been appropriately marked and designated with signs indicating their respective trip hazard.

As an enhancement, the Authority is evaluating the feasibility of providing protective covers for the control switches on the EDG control panel.

ANALYSIS OF EVENT

The event is reportable under 10 CFR 50.73 (a) (2) (iv). The licensee shall report any event or condition that resulted in a manual or automatic actuation of an Engineered Safety Feature (ESF).

This event meets the reporting criteria because the loss of the normal feed to bus 6A caused an undervoltage condition which initiated a Non-Safety Injection Blackout signal and resulted in an automatic actuation of EDG 32. EDG 32 started and loaded onto its assigned bus 6A. In response to the event two Auxiliary Feedwater (AFW) pumps automatically started and were subsequently secured by 1021 hours. At 1320 hours, operations notified the NRC of an ESF actuation.

A review of the past two years of Licensee Event Reports (LER) for events that involved ESF actuations due to personnel error identified the following: LER 97-009, 97-008.

SAFETY SIGNIFICANCE

This event had no significant effect on the health and safety of the public. There were no actual safety consequences for the event because off site power was available and powered the redundant 480 volt safety buses (buses 5A and 2A/3A). EDG 32 started and energized its assigned 480 volt bus 6A. There was no actual event requiring mitigation with the emergency onsite AC power source (EDGs) since the undervoltage on bus 6A was due to a mispositioned switch. Operators were alerted to the loss of EDG room ventilation by a high temperature alarm in the 32 EDG room and responded in accordance with established procedures. Operator investigation of the alarm condition determined the 32 EDG room ventilation exhaust fans failed to operate due to a loss of power. Operators closed the supply breaker to MCC 36D restoring power to EDG 32 auxiliary equipment.

The potential safety consequences of this event, including a failure of EDG 32 and EDG 33, were considered under postulated design basis accident conditions; a loss of coolant accident (LOCA) coincident with a loss of offsite power (LOOP) and a random single failure to the remaining EDG 31. A probablistic risk assessment (PRA) was performed which resulted in a base increase in the core damage frequency (CDF) of 1.88E-4 per year without operator action. Further assessment applied a non-recovery factor to evaluate the impact of corrective actions that could be taken. The resultant increase in CDF was determined to be 2.26E-5 per year.

However, the assessment is conservative because the analysis assumed failure of both the 32 EDG and 33 EDG due to loss of EDG support equipment at the start of a postulated event. Engineering determined the loss of EDG support equipment would not have prevented the EDGs from starting and accepting load, as demonstrated by the event, but could result in the loss of an EDG sometime later if no operator action was taken.

Operations judged that they have adequate training, procedures and necessary equipment to detect the degraded condition of MCC 36D and E and respond before an EDG loss. These conclusions were reached after a review of emergency operating procedure (EOP) E-0, "Reactor Trip or Safety Injection," and an assessment by operations management. EOP E-0 at step 3 contains a requirement to verify power to 480 volt buses. Operators would have recognized that the EDGs were supplying the safeguards buses and an operator would have been dispatched to verify proper operation in accordance with the appropriate system operating procedure. It is a management expectation and an operations department practice that operational personnel be directed to the EDGs after they automatically start.

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Procedure LOOP-1, "Loss of Offsite Power After SI," is entered at the discretion of the Shift Manager (SM) or Control Room Supervisor (CRS). LOOP-1 at step 1 requires verification of power to the 480 volt buses and the dispatch of a Nuclear Plant Operator to monitor the EDGs. LOOP-1 at step 9 requires review of procedure RO-1, "BOP Operator Actions During Use of EOPs," to determine if equipment should be restarted on the EDGs to include aligning MCCs in accordance with system operating procedure SOP-EL-15 prior to reset. RO-1 is entered from E-0 as directed by the CRS and at step 1 requires the BOP operator to monitor control room alarm status to include the 480 volt safeguards bus undervoltage alarm. If the undervoltage alarm can not be cleared then the CRS is to be informed that the alarm response procedure (ARP) must be implemented.

Operations personnel would be expected to recognize any abnormal condition during verification of EDG operation. There is local indication of power available to the EDG room ventilation fans and an EDG room temperature alarm that will alert control room operators to the loss of power condition. Alarm Response Procedure ARP-15, "Panel SMF Safety Injection," includes alarm "Diesel Generator Set 32 High Temperature," and requires alarm verification by dispatching an NPO to check EDG room temperature and exhaust fan operation. The procedure requires starting non-running fans and a determination and correction of the cause of the fan auto start failure. The local engine gauge panel provides a crankcase exhauster indicator light. There is a local indicator for fuel oil level, an alarm and a category alarm and indication in the control room for alarms on the local panel. The existing procedures would have guided operators to off normal conditions thereby allowing identification of an open supply breaker to MCC 36D or E. There is indication in the control room of the position of the supply breaker for MCC 36D/E (open/closed). Operators have the ability to close the supply breakers from the control room as demonstrated on May 28, 1998.

For a LOOP and loss of EDGs the plant is bounded by the analysis for a station blackout (SBO). As discussed in FSAR Section 8.2.3, the plant is designed to cope with a loss of all AC power (SBO). An alternate onsite power source is available from the Appendix R Diesel Generator and procedures exist for its use. The Appendix R Diesel Generator can power SBO shutdown loads within one hour. A review of the availability of the Appendix R Diesel Generator during the time the condition existed showed a 24 month rolling cycle unavailability of 4.26 percent.