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February 26, 1992  
C311-92-2024

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

Dear Sir:

Subject: Three Mile Island Nuclear Station, Unit 1 (TMI-1)  
Operating License No. DPR-50  
Docket No. 50-289  
LER 91-004-01

Attached is GPU Nuclear Licensee Event Report (LER) No. 91-004-01 which revises the LER No. 91-004-00, dated November 7, 1991. This revision reflects the GPUN response to Inspection Report 91-27 and the associated Notice of Violation. This revision provides a more complete discussion of the personnel errors which led to this event and the long term corrective actions which apply not only to this event but also to other infrequently performed evolutions.

Sincerely,

T. G. Broughton  
Vice President and Director, TMI-1

GMG

Attachment

cc: Region I Administrator  
TMI-1 Senior Project Manager  
TMI Senior Resident Inspector

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## LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)										DOCKET NUMBER (2)										PAGE (3)																					
THREE MILE ISLAND, UNIT 1										0 5 0 0 0 2 8 9										1 OF 0 8																					
TITLE (4) MOVEMENT OF IRRADIATED FUEL ASSEMBLY WITHOUT CONTAINMENT ISOLATION DUE TO PERSONNEL ERRORS AND PROCEDURAL INADEQUACY																																									
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)																	
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OPERATING MODE (9)						THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5. (Check one or more of the following) (11)																																			
POWER LEVEL (10) 0 0 0						20.402(b)						20.406(e)						60.73(a)(2)(iv)						73.71(b)																	
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						20.406(a)(1)(ii)						60.36(a)(2)						60.73(a)(2)(vi)						OTHER (Specify in Abstract below and in Text, NRC Form 306A)																	
						20.406(a)(1)(iii)						60.73(a)(2)(i)						60.73(a)(2)(vii)(A)																							
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20.406(a)(1)(v)						60.73(a)(2)(iii)						60.73(a)(2)(ix)																													
LICENSÉE CONTACT FOR THIS LER (12)																																									
NAME															TELEPHONE NUMBER																										
G. M. GURICAN, CORPORATE LICENSING ENGINEER															AREA CODE 2 0 1 3 1 6 - 7 9 7																										
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)																																									
CAUSE		SYSTEM		COMPONENT		MANUFACTURER		REPORTABLE TO NRC		CAUSE		SYSTEM		COMPONENT		MANUFACTURER		REPORTABLE TO NRC																							
SUPPLEMENTAL REPORT EXPECTED (14)															EXPECTED SUBMISSION DATE (15)					MONTH DAY YEAR																					
YES (if yes, complete EXPECTED SUBMISSION DATE)																				<input checked="" type="checkbox"/> NO																					

On October 8, 1991, TMI-1 was in refueling shutdown. Licensed operators were performing 1303-11.4, "Refueling Systems Interlocks" test of the Main Fuel Bridge hoist. This test is normally performed in conjunction with 1505-1, "Fuel and Control Component Shuffles." Section 6.3.3.1, of 1303-11.4 requires fuel movement; however, it also requires, by reference, that no movement of fuel take place until the prerequisites of 1505-1 were complete. In this event, the Bridge Crew did not adequately prepare for the evolution about to take place and moved fuel to test the hoist interlocks without having verified containment isolation. All of the 1505-1 prerequisites for containment isolation were completed, except for the open Reactor Building personnel and emergency airlock doors [NH/AL]. Technical Specification 3.8.6 requires that at least one door in each airlock be closed when moving irradiated fuel in the Reactor Building. This event was caused by: personnel error, due to a lack of understanding that the test involved fuel movement; and, procedural inadequacy, because 1303-11.4 did not clearly caution the operators that containment isolation was required prior to test of the interlocks. The causes of the event were reviewed with all fuel handling personnel prior to the commencement of the fuel shuffle. 1303-11.4 was revised to strengthen the procedure, provide prerequisites, and add warnings to prevent recurrence of this event.

This event is reportable per 10 CFR 50.73(a)(2)(i)(B).

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 RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAIDWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
THREE MILE ISLAND, UNIT 1	0 5 0 0 0 2 8 9 9 1	—	0 0 4	—	0 1 0 2	OF 0 8	

TEXT (If more space is required, use additional NRC Form 305A's) (17)

MOVEMENT OF IRRADIATED FUEL ASSEMBLY WITHOUT CONTAINMENT ISOLATION DUE TO  
PERSONNEL ERRORS AND PROCEDURAL INADEQUACY

I. PLANT OPERATING CONDITIONS BEFORE THE EVENT

TMI-I was in refueling shutdown with the Fuel Transfer Canal flooded. Preparations were underway to commence fuel handling. The entire core was scheduled to be off-loaded for the 10 year inspection of the reactor vessel. Prerequisites for fuel handling were being accomplished in accordance with Refueling Procedure (RP) 1505-1 "Fuel and Control Component Shuffles." A Reactor Building (RB) Purge was in progress with one (1) purge exhaust fan running (the second fan was out-of-service for maintenance). No purge supply fans were operating, so that air flow was into the reactor building through the open personnel and emergency airlock doors.

II. STATUS OF STRUCTURES, COMPONENTS OR SYSTEMS THAT WERE INOPERABLE AT THE START OF THE EVENT AND THAT CONTRIBUTED TO THE EVENT.

There were no inoperable structures, components, or systems which contributed to this event.

III. EVENT DESCRIPTION

Preparations were underway to commence fuel handling. Prerequisites for fuel handling were being accomplished in accordance with RP 1505-1 "Fuel and Control Component Shuffles." The prerequisites were completed with the following exceptions:

- Data Sheet 1, Step 1.4 - Requires that the hatches in the reactor building be secured.
- Data Sheet 1, Step 1.9 - Requires direct communications between all refueling stations.
- Data Sheet 1, Step 1.14 - Done within 8 hours of commencing fuel handling. Involves water inventory and chemistry. (Although incomplete, it is not related to this event.)

A Senior Reactor Operator (SRO) and Control Room Operator (CRO) were assigned as the Bridge crew to complete Surveillance Procedure (SP) 1303-11.4, "Refueling System Interlocks" (already in progress) on the day shift. The specific surveillance being performed was .on 6.3.3.1 on the Main Fuel Bridge in the Reactor Building, which checks the fuel hoist over the reactor core.

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

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FACILITY NAME (1)  THREE MILE ISLAND, UNIT 1	DOCKET NUMBER (2)  0 5 0 0 0 2 8 9 9 1 —	LER NUMBER (6)			PAGE (3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
		9 1 —	0 0 4 —	0 1	0 3	OF	0 8

TEXT (If more space is required, use additional NRC Form 365A's) (17)

SP 1303-11.4 is written in such a way that it contains many independent test sections. The sections are completed as plant needs and conditions permit. For example, the spent fuel bridge interlock section is normally performed prior to the outage to reduce the amount of testing required during the outage. However, this event has brought attention to the inadequacy of the procedure with respect to the sequential order in which the test sections are performed.

During the performance of this surveillance, several minor problems were encountered, which required the assistance of the Stearns Factory Representative. While waiting resolution of these problems, the Bridge crew worked on communications equipment problems. At this point, the Bridge crew established communications with a control room CRO. The crew then proceeded with the surveillance in Section 6.3.3.1. This section requires the actual grappling of a fuel assembly and monitoring the slow zones during the assembly withdrawal. Section 6.3.3.1 contained a NOTE which stated that "the following steps should be performed just prior to initiating the fuel shuffle per RP 1505-1." The Bridge crew believed that the fuel shuffle was imminent and therefore the current sequence of steps to be taken in the procedure was appropriate and in accord with the NOTE. However, the NOTE constituted a major procedural weakness in that it did not clearly warn the operators that the following procedural steps would involve fuel movement, nor did it require that all of the prerequisites of RP 1505-1 be completed prior to such fuel movement (including the setting of containment isolation).

The Bridge crew verified with the control room CRO the core location of the first assembly to be removed and then positioned the main bridge over that location (E-14) and lowered the mast onto the assembly. During the lowering of the mast, one of the zone lights did not come on as expected. However, the bridge crew verified that the mast actually traveled at the proper speed. The control room CRO was notified of the light problem and in turn notified the Shift Supervisor. The Shift Supervisor determined the light problem to be minor and indicated the surveillance could continue.

As the Bridge crew proceeded with the surveillance, they grappled onto the irradiated fuel assembly and requested the control room to monitor source range counts. At approximately 1040 hours, the assembly was withdrawn from the core completely into the fuel mast. The SRO on the bridge was aware of Technical Specification requirements for refueling, but he did not consider the interlock checks per SP 1303-11.4 to constitute refueling operations. After the fuel assembly was withdrawn, the Bridge SRO realized that all the prerequisites for the commencement of the fuel shuffle in accordance with RP 1505-1 were not complete; and therefore, the last step of the interlocks test section of SP 1303-11.4 being worked could not be accomplished. This failure of the Bridge crew to confirm the condition of the plant prior to start of the testing evolution was a major contributor to the event.



LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 500 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P&30), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, 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)

THREE MILE ISLAND, UNIT 1

0 5 0 0 0 2 8 9 9 1 — 0 0 4 — 0 1 0 4 OF 0 8

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

Realizing that the plant was not ready for the start of refueling activities, the Bridge SRO notified the control room CRO that he was going to reinsert the assembly and asked the control room CRO to have the Nuclear Engineers monitor source range counts during the insertion. This request was not carried out in the control room, for reasons which were unclear but believed to be related to both poor communications and inadequate supervision by control room personnel.

At the start of reinsertion, the operators received an Underload light which required realignment of the assembly before it could be fully inserted. Once the fuel assembly was realigned it was fully inserted into the core without incident. The Bridge SRO notified the control room CRO that the assembly hung up prior to being placed in the fully inserted position. The control room CRO in turn notified the Shift Supervisor.

The Shift Supervisor then realized that a Technical Specification violation had occurred, i.e., movement of an irradiated fuel assembly without the establishment of containment isolation. When the Shift Supervisor communicated again with the Bridge SRO, the assembly was already fully reinserted into the core. The Shift Supervisor then notified the Director, Operations and Maintenance, who in turn called for a Plant Review Group (PRG) meeting to review the incident. The Director Operations and Maintenance also directed that no fuel movement would occur until the event could be reviewed with each refueling crew.

TMI-1 Technical Specification (T. S.) 3.8.6 requires that at least one door on each airlock be closed when moving irradiated fuel in the Reactor Building. T.S. 3.8.8 provides an action statement in case the above requirement is not met, which requires fuel movement to be halted and restoration of containment isolation before resuming movement of irradiated fuel.

At 1110 hours, October 8, 1991, a PRG meeting was held to review this event. Based on the above event description, the PRG concluded that containment isolation had not been established prior to beginning irradiated fuel movement as required by T. S. 3.8.6, and the event was reportable under 10 CFR 50.73(a)(2)(i)(B) as a 30 day report.

In summary, inadequate preparation of the personnel involved and procedural inadequacies resulted in the occurrence of this event.

The personnel errors involved:

- Inadequate preparation by the licensed operators assigned as the Bridge Crew to perform the fuel handling interlock checks (SP 1303-11.4) leading to a lack of understanding that the test involved fuel movement.
- Inadequate oversight and supervision by CR personnel of the Bridge crew, as the interlock checks were being performed, which was exacerbated by poor communications.

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 500 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)  THREE MILE ISLAND, UNIT 1	DOCKET NUMBER (2)  0 5 0 0 0 2 8 9 9 1	LER NUMBER (6)			PAGE (3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
		9 1	— 0 0 4	— 0 1 0 5	OF 0 8		

TEXT (If more space is required, use additional NRC Form 306A-2) (17)

- Failure of the Bridge Crew to confirm the surrounding plant conditions and to ensure that all prerequisites were completed prior to engaging and handling the fuel assembly.

The procedural inadequacies involved:

- The Section 6.3.3.1 NOTE gave no clear indication that the performance of the procedural steps which followed would in fact involve fuel movement.
- The procedure did not specifically require that the prerequisites of RP 1505-1 be completed prior to fuel movement, including establishment of containment isolation, which is a Technical Specification requirement.
- The Sections within the procedure were not ordered sequentially to require performance of the Fuel Hoist Fast and Slow Zones interlock checks (Section 6.3.3.1) as the last test to be performed in conjunction with fuel movement.

IV. COMPONENT FAILURE DATA

There were no component failures associated with this event.

V. AUTOMATIC OR MANUAL INITIATED SAFETY SYSTEM RESPONSES

There were no Safety System Actuations associated with this event.

VI. ASSESSMENT OF THE SAFETY CONSEQUENCES AND IMPLICATIONS OF THE EVENT

All of the requirements to establish containment isolation had been completed with the exception of closing the doors at the two airlock entrances. The doors (4 total - 2 per airlock) were operable and capable of being closed immediately in the event of a fuel handling accident. Additionally, a Reactor Building purge was in progress such that air was drawn into the Reactor Building through the open doors and then exhausted through the purge valves. If there had been a fuel handling accident during this event, the Reactor Building Purge Exhaust would ensure that air flow would have been into the containment through the open airlock doors and out through the purge filters.

Subsequently, upon actuation of the interlock on high radiation by the purge exhaust radiation monitor (RM-A-9), the purge valves would have shut, which would stop the purge exhaust flow. Air flow would then be into the Reactor Building through the open emergency hatch airlock door and exhausted through the personnel hatch airlock door into the Fuel Handling Building, and through its Ventilation Exhaust Filters.

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 500 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)  THREE MILE ISLAND, UNIT 1	DOCKET NUMBER (2)  0 5 0 0 0 2 8 9 9 1	LER NUMBER (6)			PAGE (3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
		—	0 0 4	—	0 1	0 6 OF 0 8	

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

During this event, the Bridge SRO was in communication with the Control Room. Therefore, if any problems had occurred, the Control Room could have immediately evacuated the Reactor Building and directed that the airlock doors be closed.

VII. PREVIOUS EVENTS OF A SIMILAR NATURE

None.

VIII. CORRECTIVE ACTIONS TAKEN

## 1. To Address the Incident and the Operator Errors:

- (a) Immediately following the incident, the Director, Operations and Maintenance, acting as the "Outage Manager," halted all fuel handling activities.
- (b) The Director Operations and Maintenance personally discussed the event with the operators who were directly responsible for the incident. Initially, the focus was on determining why the fuel assembly had been moved. When it was determined that the operators had focused solely on the performance of the surveillance, without taking into account existing plant conditions and the overall affect of their actions on the plant, the importance of maintaining cognizance of the overall plant status was addressed, and the need to determine the potential affect pending actions could have on a component, system, or the entire facility prior to the performance of physical manipulations was emphasized.
- (c) The incident was reviewed and discussed with all operators involved in fuel handling activities, and a Plant Incident Report was prepared.
- (d) All licensed operators received a subsequent briefing on the importance of reviewing and understanding the total impact of a surveillance to be performed, prior to commencing the surveillance, with emphasis on consideration of the current plant conditions. This is particularly relevant for an infrequently performed surveillance procedure with which operators are not currently familiar.
- (e) A training action item has been generated to ensure that this event will be included in the Lesson Plan for "Fuel Handling and Outage Incident Review and Responses."

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 500 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-30), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (315-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1):

DOCKET NUMBER (2):

LER NUMBER (6):

PAGE (3):

THREE MILE ISLAND, UNIT 1

7 5 0 0 0 2 8 9 9 1 -- 0 0 4 -- 0 1 0 7 OF 0 8

TEXT (If more space is required, use additional NRC Form 306A's) (17)

VIII. CORRECTIVE ACTIONS TAKEN (continued)

## 2. To Address the Procedural Inadequacy:

A Temporary Change Notice to Surveillance Procedure 1303-11.4 was issued to incorporate the following changes:

- (a) An additional precaution was added in Section 3.0, Limits and Precautions, which requires that a fuel assembly shall not be handled unless all refueling prerequisites are met and signed off, including containment isolation.
- (b) At the beginning of Section 6.3.3.1, the NOTE was revised to clarify that this section of the procedure will require actual movement of fuel and that this section should be scheduled to be done immediately prior to the actual fuel shuffle activities.
- (c) Following the note, a WARNING was added which states that this test requires the actual movement of a fuel assembly. The SRO in charge of fuel handling should ensure that all the prerequisites for fuel movement are met prior to proceeding with this test.
- (d) Immediately before Step 6.3.3.1.h, which calls for grappling onto a fuel assembly, a WARNING was added which states that the following steps actually grapple and withdraw a fuel assembly from the core. Ensure compliance with refueling Technical Specifications and RP 1505-1 prerequisites.
- (e) The changes made in Section 6.3.3.1 for the Main Bridge were also made in Section 6.4.6 for the Auxiliary Bridge.

As a result of the corrective steps taken above, there was a renewed awareness on the part of all operators that certain prerequisites must be satisfied prior to fuel handling and that a fuel handling problem could have a significant impact on the plant. The remainder of SP 1303-11.4 and the remainder of the refueling operations were completed without incident.

IX. CORRECTIVE ACTION PLANNED

## 1. To Prevent Operator/Human Error

Each licensed operator will receive training prior to the 10R refueling outage and at each subsequent refueling outage which will include a discussion of this incident. The training will include a discussion of the details of the event and will address the following factors which could have prevented such an event from occurring:



LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 300 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)  THREE MILE ISLAND, UNIT 1	DOCKET NUMBER (2)  0 5 0 0 0 2 8 9 9 1 —	LER NUMBER (8)			PAGE (3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
		0 0 4	—	0 1	0 8	OF 0 8	

TEXT (if more space is required, use additional NRC Form 306A's) (17)

IX. CORRECTIVE ACTION PLANNED

## 1. To Prevent Operator/Human Error (continued)

- (a) The responsibility of supervisors to (1) ensure proper preparation of personnel and understanding of the planned evolution prior to commencement, and (2) provide increased oversight during the performance of infrequently accomplished or complex tasks.
- (b) The responsibility of all personnel to understand the details of tasks to be performed, as well as the expected outcome and potentially adverse affects of actions to be taken when physical manipulations are performed during infrequently accomplished or complex tasks.
- (c) The need to be alert to indications of a potential problem or misunderstanding, and the importance of being able to act or respond to potential problems as they are identified, i.e., to ask the right questions and receive meaningful, and appropriate responses.

## 2. To Upgrade and Improve Procedures:

- (a) SP 1303-11.4 will be revised to clarify specified requirements and to incorporate human factors recommendations. The procedure will be permanently revised to include the changes described above for the Temporary Change Notice, and the sequence of testing will be changed so that the required interlock checks which involve actual handling of fuel will be performed at the end of the interlock checks, and after all prerequisites for fuel handling in containment have been met. The procedure revision is expected to be completed by March 31, 1992. This date is adequate since the procedure is used only during refueling outages; the next refueling outage is scheduled for September, 1993.
- (b) Other surveillance procedures which are infrequently performed and which could result in potentially significant adverse consequences will be identified and reviewed as a special task. Each selected procedure (including SP 1303-11.4) will be reviewed by a team including: an individual knowledgeable in the technical area; an individual from the group which performs the procedure; and, an individual knowledgeable in the area of human factors/procedure writing techniques. The selected procedures will be revised as necessary based on the committee review. Procedure revisions identified by these reviews will be completed prior to the next refueling outage scheduled for September, 1993.

\* The Energy Industry Identification System (EIIS), System Identification (SI) and Component Function Identification (CFI) Codes are included in brackets, "[SI/CFI]", where applicable, as required by 10 CFR 50.73(b)(2)(ii)(F).