NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/85

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Oconee Nuclear Station, Unit 1	0 5 0 0 0 2 6 9	1 OF 0 6

TITLE (4)

Core Geometry Changes When The Core Subcritical Neutron Flux Monitor NI-1 was Inoperable

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 3	1 2	8 6	8 6	— 0 0 4	— 0 0	0 4	1 0	8 6	Oconee, Unit 2	0 5 0 0 0 2 7 0
									Oconee, Unit 3	0 5 0 0 0 2 8 7

OPERATING MODE (9)	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
0	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
POWER LEVEL (10) 0 1 0 0	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)	X 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)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	50.73(a)(2)(i)(B)
	20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
	AREA CODE
Ali Haghi, Licensing	7 0 4 3 7 3 - 4 0 6 0

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 (If yes, complete EXPECTED SUBMISSION DATE)	X NO				

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

On March 12, 1986, at 1330 hours, with Unit 1 shutdown and refueling activities in progress, the Refueling Senior Reactor Operator discovered that the Nuclear Instrumentation channel NI-1 was not operating. This event, which began at 1115 hours, constitutes a violation of Technical Specification 3.8.2, which requires continual monitoring of core subcritical neutron flux by at least two neutron flux monitors whenever core geometry is being changed. Contrary to this requirement, eight fuel assemblies were inserted into the core while NI-1 was inoperable.

Upon the discovery of the loss of signal from NI-1, refueling activities were immediately stopped. Subsequent corrective actions included an assessment of core geometry changes while NI-1 was inoperable, a determination of the cause of the loss of NI-1 signal, and action to return NI-1 to service. Refueling activities were resumed after the Refueling Reactor Operator had been reinstructed on proper adherence to the refueling procedure requirements.

The cause of this event was determined as personnel error because the Refueling Reactor Operator failed to maintain full requirements of the refueling procedure while instructing the execution of fuel movement procedure steps.

The health and safety of the public were not affected by this incident.

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

BACKGROUND

Technical Specification 3.8 applies to fuel loading and refueling operations. Specification 3.8.2 states, "Core subcritical neutron flux shall be continuously monitored by at least two neutron flux monitors each with continuous indication available, whenever core geometry is being changed. When core geometry is not being changed, at least one neutron flux monitor shall be in service".

Nuclear Instrumentation NI-1 and NI-2 are core subcritical (Source Range) neutron flux monitors. One of the two is normally connected for input to the Control Room Source Range Recorder for indication and alarm. During refueling operations, the output of both flux monitors is additionally connected to scaler/timers, strip charts, audible speakers, or a varied combination of these output devices. These refueling operations subcritical neutron flux indicators are located in a temporary setup, referred to as the "refueling booth" which is the work station for the Refueling Reactor Operator.

DESCRIPTION OF OCCURRENCE

On March 12, 1986, Unit 1 was at refueling shutdown conditions with core reloading in progress. The core reloading sequence was controlled by procedures for refueling assigned to the Reactor Operator stationed within the refueling booth.

At approximately 1330 hours, while the Refueling Senior Reactor Operator was making supervisory observations of the refueling activities within the refueling booth, the lack of an output signal from neutron flux monitor NI-1 was discovered. Upon the discovery of the lack of flux indication from NI-1, refueling activities were immediately stopped. Within the refueling both, the neutron flux detector output signals from NI-1 and NI-2 were connected to a two pin strip chart recorder with the individual signals additionally connected to an audible speaker (NI-1) and to a scaler/timer (NI-2).

The Refueling Senior Reactor Operator requested assistance from the Control Room operators to determine the cause of NI-1 being inoperable. The NI-1 operating voltage display meter located on the detector power supply module within the Reactor Protective System Channel 'A' cabinet was checked for indication o voltage. The meter needle was observed to be downscale at zero voltage indication. The reset toggle switch on the detector's power supply module was operated to the reset position which restored operating voltage (2100 volts) to the NI-1 detector.

at 1/2 decade above stable count rate. There were no significant increases in the count rate during this time as evidenced by both the refueling booth and Control Room strip charts, and the NI-2 high flux alarm setpoint did not require any adjustment. Additionally, each insertion of the eight fuel assemblies were located in the core quadrant closest to the location of NI-2, thereby providing a more accurate measure of reactivity as the core changes were made.

Upon the restoration of operating voltage to NI-1 detector, the NI-1 pin on the refueling booth strip chart recorder responded upscale to a count rate plot that was comparable to NI-2 count rate plot, and the "clicker" was audible.

The inoperability of NI-1 is not reportable to the Nuclear Plant Reliability Data System (NPRDS) because the Nuclear Instrumentation channel was tripped by the designed undervoltage feature and did not constitute a component failure. Since a component failure was not involved, NPRDS was not searched for generic information.

CORRECTIVE ACTION

As an immediate corrective action the refueling activities were stopped when the unexpected decrease in count rate from NI-1 was discovered.

Supplemental corrective actions taken were:

NI-1 was returned to service by restoring operating voltage to the detector. This was accomplished through operating the reset switch on the detector power supply module.

The cause of the unexpected decrease in count rate from NI-1 was evaluated.

The fuel movements that had been completed while NI-1 was inoperable were evaluated.

The refueling booth strip chart recorder was repositioned from a work surface which was located behind the Refueling Reactor Operator to the work surface which was located in front of the Refueling Reactor Operator.

The construction work adjacent to the refueling booth was halted.

Barriers to control general traffic were installed in the corridor separating the refueling booth from the Control Room.

The Refueling Reactor Operators checked the neutron flux monitor outputs within the refueling booth. They observed NI-1 indicating a stable count rate on the strip chart recorder and by the speaker "clicks". Also, NI-2 was continually indicating a stable count rate on the strip chart recorder and on the scaler/timer digital display.

The time trace check of the marked chart indicated that the NI-1 pin on the strip chart had been downscale at zero for approximately 2 1/2 hours. A review of the refueling procedure fuel movement steps was compared to the time when NI-1 was inoperable to determine what core geometry changes had been made. The refueling procedure steps had progressed from 1055 hours through 1330 hours, and eight fuel assemblies had been added to the core while NI-1 was inoperable.

The loss of NI-1 output signal time coincided with the time when a manipulation of the power supply to the vital bus KU had caused a power transient which tripped several breakers to Control Room service panels. This power transient was on electrical feeders for Reactor Protective System Channel 'A' and was evaluated to be sufficient in voltage variance to cause the actuation of the undervoltage trip circuit on the NI-1 detector power supply module.

At 1341 hours, with the two neutron flux monitors providing proper output signals at a stable count rate, the refueling activities continued.

CAUSE OF OCCURRENCE

The root cause of this incident was the failure of Refueling Reactor Operators to actually verify from the strip chart recorder plot that a stable count rate of a source range signal was indicated prior to instructing the disengagement of the fuel assembly which was inserted into the core during the time that NI-1 was inoperable.

This incident is classified as Personnel Error because Refueling Reactor Operators did not follow the written refueling procedure.

The contributing causes to this incident were the poor human factors arrangement of the flux indication devices within the refueling booth and the large amount of construction work noise and traffic during the loss of NI-1 signal.

The probable cause of the loss of NI-1 output was evaluated to be the power transient on the vital power bus. The strip chart time check of the downscale plot coincided with 1055 hours when the Control Room experienced the loss of several service panels. The fuel movements which occurred while NI-1 was inoperable were monitored continually by Nuclear Instrumentation NI-2. It included a scaler/timer output, available to the Refueling Reactor Operator, and a Control Room alarm setpoint properly set

Personnel access to the refueling booth was restricted to an as-needed basis.

Refueling Reactor Operators were counseled and reinstructed by management on adherence to the refueling procedure requirements.

The immediate corrective action of suspending all refueling activities when the unexpected decrease in neutron flux count was discovered provided assurance that refueling operations would not additionally contribute to an improperly monitored subcritical neutron flux.

The supplemental corrective actions of restoring operating voltage to the NI-1 detector and evaluating the cause and effect of the loss of NI-1 output signal returned the detector to proper operation and provided assurance that an unsafe level of neutron flux had not occurred during the time while core geometry changes were made with only one flux monitor operable. The actions taken to rearrange the location of the flux indicator devices within the refueling booth and to reduce the noise and traffic adjacent to the refueling booth provided an improved work environment to the Refueling Reactor Operators.

The supplemental corrective actions of counseling the individuals that made the personnel error made them aware of the failure-to-follow-procedure mistake, and it should prevent recurrence. The reinstruction of the Refueling Reactor Operators by management on assuring that two flux monitors are operable when instructing core geometry changes provided a reiteration of the refueling procedure's objective to assure that fuel loading operations are performed in a responsible manner.

SAFETY ANALYSIS

Irradiated and spent fuel assemblies are handled entirely underwater. Before refueling, the reactor coolant and fuel transfer canal water above the reactor are increased in boron concentration so that, with all control rods removed, the reactivity of the core is maintained subcritical. Under this condition, a criticality accident during refueling is not considered credible. Mechanical damage to the fuel assemblies during transfer operations is possible but improbable. The mechanical damage type of accident is considered the maximum potential source of activity release during refueling operations. The mechanical damage of a single fuel assembly handling accident is analyzed in FSAR 15.11.

Boric acid is used in the Reactor Coolant System to control excess reactivity. The refueling procedure requires the fuel transfer canal water to be maintained at greater than 1900 ppm boron concentration. The normal source of dilution water is supplied to the Reactor Coolant System by the High Pressure Injection System. During refueling when the reactor head has been removed, the sources of dilution water to the letdown storage tank, and therefore to the Reactor Coolant System, are controlled by procedure, and the high pressure injection pumps are not operating. The moderator dilution type of accident is not considered credible and is analyzed in FSAR 15.4.

The Source Range (subcritical) Nuclear Instrumentation (NI) requirements of the refueling procedure are specified to maintain redundant count rate channels to provide control console indication (visible and audible alarms) to warn the operator if an unexpected increase in neutron flux count rate occurs.

During the time while NI-1 was inoperable, NI-2 was operable and responding to the core's subcritical neutron flux. The output signal of NI-2 was connected to the Control Room strip chart recorder which provides a count rate plot and has the high flux alarm setpoint controls. The high flux alarm setpoint was properly set on the strip chart recorder at 1/2 decade above the stable count rate. NI-2 was providing a continual monitoring of the core's neutron flux count rate while the eight fuel assemblies were inserted into the core. If an increase in the core neutron flux count rate had occurred during these reactivity additions to the core, the automatic alarm feature for high flux was capable to performing its designed function of alerting the operator and actuating the Reactor Building Evacuation Alarm System. There was no mechanical damage to the fuel assemblies, no moderator boron concentration variations, no unusual increases in core subcritical neutron flux, and the automatic alarm features were functional. Therefore, the health and safety of the public were not affected by this incident.

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April 10, 1986

Document Control Desk
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Washington, D. C. 20555

Subject: Oconee Nuclear Station, Units 1, 2, & 3
Docket Nos. 50-269, -270, -287
LER 269/86-04

Gentlemen:

Pursuant to 10 CFR 50.73 Sections (a) (1) and (d), attached is Licensee Event Report 269/86-04 concerning core geometry changes when the core subcritical neutron flux monitor NI-1 was inoperable.

This report is submitted in accordance with §50.73(a)(2)(i)(B). This event was considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

Hal B. Tucker

Hal B. Tucker

MAH:slb

Attachment

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