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

APPROVED BY OMB NO. 3150-0104

EXPIRES 04/30/98

LICENSEE EVENT REPORT (LER)

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

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
CRYSTAL RIVER UNIT 3	05000302	1 OF 13

TITLE (4)

Personnel Error Causes Testing Deficiencies Resulting in a Condition Prohibited by Technical Specifications

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
01	31	97	97	-- 003 --	03	06	12	97	FACILITY NAME	DOCKET NUMBER

OPERATING MODE (9)	N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)							
			20.2201(b)		20.2203(a)(2)(v)	X	50.73(a)(2)(i)		50.73(a)(2)(viii)
POWER LEVEL (10)	000		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)
W. J. Leonard, Sr. Licensing Engineer	(352) 795-6486

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
X	YES (If yes, complete EXPECTED SUBMISSION DATE).		NO		08	15	97

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

With Florida Power Corporation's Crystal River Unit 3 in MODE 5 (COLD SHUTDOWN) during an outage which began September 2, 1996, contractor personnel were performing a comparison of schematic diagrams against plant surveillance procedures in response to GL 96-01, "Testing of Safety Related Logic Circuits." Testing deficiencies were determined to be violations of Technical Specification Surveillance Requirements. Separate deficiencies were identified on January 31, 1997, February 11, 1997, March 17, 1997, April 28, 1997, and May 21 through 23, 1997.

The cause was cognitive human error based on personnel not fully identifying all components that should be tested. Corrective actions include initiating Technical Specification Required Actions, procedure revisions, surveillance testing, and completion of the program established to perform the reviews requested by GL 96-01. Subsequent deficiencies, if discovered during GL 96-01 reviews, will be reported in a supplement to this report. This report is submitted in accordance with 10 CFR 50.73(a)(2)(i)(B) for operation or condition prohibited by the plant's Technical Specifications.

EVENT DESCRIPTION

GL 96-01 requests licensees to perform a comparison of electrical schematic drawings and logic diagrams for the Reactor Protection System [RPS], Emergency Diesel Generator [EK,DG](EGDG) load shedding and sequencing, and actuation logic for the Engineered Safeguards Actuation System (ESAS) against plant surveillance test procedures. This comparison ensures that all portions of the logic circuitry, including the parallel logic, interlocks, bypasses and inhibit circuits, are adequately covered in the surveillance procedures to fulfill the Improved Technical Specifications (ITS) requirements.

During the Crystal River Unit 3 (CR-3) outage which began on September 2, 1996, contractor personnel were performing a review of required logic circuitry test procedures. On January 31, 1997, deficiencies were identified in the testing of the Loss of Power Start (LOPS) logic circuitry. On February 11, 1997, deficiencies were identified in the testing of the Emergency Feedwater Initiation and Control [JB](EFIC) Automatic Actuation logic circuitry. On March 17, 1997, two separate deficiencies were identified in the testing of the ESAS Instrumentation. The first deficiency involved the testing of the Reactor Coolant System [AB](RCS) Pressure Low and Low-Low logic circuitry. The second deficiency involved the automatic reset logic circuitry for the EGDG load blocks 4 and 6 timers. On April 28, 1997, deficiencies were identified in the testing of the EFIC Automatic Actuation Vector Valve Enable logic. On May 21 through 23, 1997, deficiencies were identified in the testing of the Reactor Protection System (RPS) [RP] trip functions.

The LOPS testing deficiencies constituted a violation of the ITS Surveillance Requirement 3.3.8.1, which requires a CHANNEL FUNCTIONAL TEST be performed once per 31 days, and Surveillance Requirement 3.3.8.2, which requires a CHANNEL CALIBRATION be performed once per 24 months. The CHANNEL CALIBRATION requires performance of a CHANNEL FUNCTIONAL TEST.

The EFIC testing deficiencies constituted a violation of the ITS Surveillance Requirement 3.3.13.1 which requires a CHANNEL FUNCTIONAL TEST be performed once per 31 days.

The ESAS Instrumentation testing deficiencies constituted a violation of the ITS Surveillance Requirement 3.3.5.2 which requires a CHANNEL FUNCTIONAL TEST to be performed once per 31 days.

The EFIC Automatic Actuation Vector Valve Enable logic circuitry testing deficiencies constituted a violation of the ITS Surveillance Requirement 3.3.13.1 which requires a CHANNEL FUNCTIONAL TEST to be performed once per 31 days.

The RPS function testing deficiencies constituted a violation of the ITS Surveillance Requirement 3.3.1.4, Table 3.3.1-1, Functions 2, 3, 4, 5, 6, 7, 9, and 10, which requires a CHANNEL FUNCTIONAL TEST to be performed once per 45 days on a STAGGERED TEST BASIS. The RPS function testing deficiencies also constituted a violation of the ITS Surveillance Requirement 3.3.1.5, Table 3.3.1-1, Functions 1 and 8, which requires a CHANNEL CALIBRATION including a CHANNEL FUNCTIONAL TEST to be performed once per 92 days.

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

This report is submitted in accordance with 10 CFR 50.73(a)(2)(i)(B) for operation or condition prohibited by the plant's Technical Specifications.

Loss of Power Start Testing Deficiencies

On January 31, 1997, CR-3 was in MODE 5 (COLD SHUTDOWN). EGDG-1A was inoperable for scheduled maintenance and modification; EGDG-1B was operable. In MODE 5, one EGDG is required to be operable in accordance with ITS Limiting Condition for Operation 3.8.2. In order for an EGDG to be operable, its associated LOPS logic circuitry is required to be operable.

During the review of the EGDG LOPS logic circuitry, it was determined that six contacts in the Second Level Undervoltage Relays (SLUR) portion of the LOPS logic circuitry for each EGDG were not individually tested during the required once per 31 day CHANNEL FUNCTIONAL TEST Surveillance Requirement 3.3.8.1, nor during the required once per 24 months CHANNEL CALIBRATION Surveillance Requirement 3.3.8.2.

Engineered Safeguards (ES) equipment is powered from one of two ES Buses. Each ES bus is normally powered from an off-site source with backup supply from an EGDG. The LOPS circuits protect ES equipment from damage due to sustained undervoltage conditions and provide for rapid re-energization of the ES buses by the EGDGs in the event of a total loss of voltage or sustained degraded voltage. There is one LOPS logic circuit for each of the two ES Buses. In the event of LOPS actuation, the affected ES Bus is automatically powered by its associated EGDG.

The LOPS logic consists of First Level Undervoltage Relays (FLUR) and SLUR. The FLUR logic detects a complete loss of voltage on an ES Bus. The SLUR logic detects sustained degraded voltage conditions on an ES Bus.

Three ES Bus 'A' SLUR relays (27B-A, 27B-B, and 27B-C) sense voltage on the three ES 'A' bus phases. If all three SLUR relays sense degraded voltage for 5 seconds, SLUR relay 27BY actuates the FLUR logic circuit after a 13 second time delay. If there is an ESAS actuation during the 13 second time delay, relay 27BES bypasses the 13 second time delay and immediately actuates the FLUR logic. Relay 27BY and 27BES contacts are in parallel in the FLUR circuit. An identical circuit is provided for ES Bus 'B'.

An annunciator is provided in the Control Room to monitor the status of the SLUR 'A' relays (27B-A, 27B-B, and 27B-C). The annunciator is actuated if one or more of the three SLUR relays is actuated. Three parallel contacts from the SLUR 'A' relays actuate the ES Degraded 'A' Voltage annunciator. An identical circuit is provided for ES Bus 'B'.

The LOPS logic circuits are tested once per 31 days by Surveillance Procedures SP-907A, "Monthly Functional Test of 4160V ES Bus 'A' Undervoltage and Degraded Grid Relaying," and SP-907B, "Monthly Functional Test of 4160V ES Bus 'B' Undervoltage and Degraded Grid Relaying." SP-907A and SP-907B did not independently test the parallel 27BES and 27BY relay contacts in the FLUR

logic. SP-907A and SP-907B also did not independently test parallel SLUR logic relay contacts which actuate the Control Room annunciator for ES Bus Degraded Voltage.

The LOPS relays are tested once per 18 months by SP-904A, "Calibration of 4160 Volt ES 'A' Bus Undervoltage and Bus Degraded Grid Relays," and SP-904B, "Calibration of 4160 Volt ES 'B' Bus Undervoltage and Bus Degraded Grid Relays." SP-904A and SP-904B did not independently test the parallel 27BES and 27BY relay contacts in the FLUR logic. However, SP-904A and SP-904B did independently test the parallel SLUR logic relay contacts which actuate the Control Room annunciators for ES Bus Degraded Voltage.

Emergency Feedwater Initiation and Control Automatic Actuation Logic Circuitry Testing Deficiencies

On February 11, 1997, CR-3 was in MODE 5 (COLD SHUTDOWN). The EFIC system is not required to be operable in MODEs 4 and 5. It is required to be operable in MODES 1, 2, and 3.

During the review of the EFIC logic circuitry, it was determined that four relays were not tested during the required once per the 31 day CHANNEL FUNCTIONAL TEST Surveillance Requirement 3.3.13.1.

The Emergency Feedwater System (EFW) is designed to provide adequate flow to one or more steam generators for decay heat removal. The principal function of EFW is to remove decay heat from the Reactor Coolant System upon the unavailability of the normal feedwater supply. EFW consists of two pumps (EFP-1 and EFP-2) and associated valving. For EFW to function, isolation of the Main Steam lines and Main Feedwater lines is required. The EFIC automatic actuation circuitry automatically initiates the EFW pumps, aligns valves, and isolates the Main Steam lines and Main Feedwater lines.

Relays 3EFWA-1 and 3EFWA-2 are interposing relays between the electronic portion and the relay actuation matrix portion of the 'A' EFIC Automatic Actuation logic which controls the EFW system pumps. Relays 3EFWB-1 and 3EFWB-2 are the comparable interposing relays for the 'B' EFIC Automatic Actuation logic.

The EFIC logic circuitry is tested by Surveillance Procedures SP-146A, "EFIC Monthly Functional Test, During Modes 1, 2, and 3," and SP-146B, "EFIC Monthly Functional Test, During Plant Shutdown Conditions." SP-146A and 146B tested the output of the EFIC Automatic Actuation electronics but did not test relays 3EFWA-1, 3EFWA-2, 3EFWB-1, and 3EFWB-2.

ESAS Instrumentation RCS Pressure Logic Circuitry Testing Deficiency

On March 17, 1997, CR-3 was in MODE 5 (COLD SHUTDOWN) with Reactor Coolant System temperature at 86 degrees Fahrenheit (F) and pressure at 46 pounds per square inch gage (psig). The ESAS RCS Pressure Low and Low-Low logic is not required to be operable with RCS pressure less than 1700 psig and 900 psig, respectively. The RCS Pressure Low logic circuitry is required to be operable when RCS pressure is greater than or equal to 1700 psig. The RCS Pressure Low-Low logic circuitry is required to be operable when RCS pressure is greater than or equal to 900 psig.

During the review of the High Pressure Injection (HPI)[BQ] ESAS Instrumentation logic circuitry, it was determined that 12 contacts in each actuation train were not independently tested during the required once per 31 day CHANNEL FUNCTIONAL TEST Surveillance Requirement 3.3.5.2.

The ESAS Instrumentation initiates ES systems, based on values of RCS pressure and Reactor Building pressure, to protect core design and reactor coolant pressure boundary limits and to mitigate accidents. The ES systems initiated by the ESAS are High Pressure Injection (HPI)[BQ], Low Pressure Injection [BP], Reactor Building Isolation and Cooling [JM], Reactor Building Spray [BE], Emergency Diesel Generator, Control Complex Ventilation [VI], and Emergency Feedwater.

The HPI ESAS consists of two actuation trains. Each train is initiated by a trip of 2 out of 3 logic channels. Each logic channel is initiated by opening one or more of three series contacts from the RCS Pressure Low, the RCS Pressure Low-Low, or the Reactor Building Pressure High instrumentation channel.

The HPI ESAS Instrumentation logic circuitry is tested by surveillance procedure SP-130, "Engineered Safeguards Monthly Functional Test." In each of the three logic channels in both actuation trains, SP-130 did not independently test the two series contacts from the RCS Pressure Low and the RCS Pressure Low-Low instrumentation channels.

ESAS Instrumentation Load Block Auto Reset Logic Circuitry Testing Deficiency

On March 17, 1997, CR-3 was in MODE 5 (COLD SHUTDOWN) with Reactor Coolant System temperature at 86 degrees F and pressure at 46 psig. The ESAS Instrumentation logic circuits for the Reactor Building High and High-High functions are not required to be operable in MODEs 4 or 5. The ESAS Instrumentation logic circuits for the RCS Pressure Low and Low-Low functions are not required to be operable with RCS pressure less than 1700 psig and 900 psig, respectively.

During the review of the HPI ESAS Instrumentation logic circuitry, it was determined that two parallel contacts in each of the three HPI logic channels in each actuation system were not tested independently during the required once per 31 day CHANNEL FUNCTIONAL TEST Surveillance Requirement 3.3.5.2. The parallel contacts are in the auto reset of ES load blocks 4 & 6 sequencing timers circuit.

The ESAS Instrumentation initiates ES systems to protect core design and reactor coolant pressure boundary limits and to mitigate accidents. The ES systems initiated by the ESAS are High Pressure Injection, Low Pressure Injection, Reactor Building Isolation and Cooling, Reactor Building Spray, Emergency Diesel Generator, Control Complex Ventilation, and Emergency Feedwater. The load block sequencing timers control the loading sequence of ES components onto the EGDG. The auto reset function is required 1.) if offsite power is lost after an ES actuation, or 2.) if an EGDG trips and then restarts after an ES actuation.

The ESAS consists of two actuation trains. Each train is initiated by a trip of 2 out of 3 logic channels. The ESAS Instrumentation logic circuitry is tested by surveillance procedure SP-130, "Engineered

Safeguards Monthly Functional Test." SP-130 tested the auto reset function of load blocks 4 & 6 sequencing timers but did not independently test two parallel contacts in the circuit.

EFIC Automatic Actuation Vector Valve Enable Logic Circuitry Testing Deficiencies

On April 28, 1997, CR-3 was in MODE 5 (COLD SHUTDOWN). The EFIC system is not required to be operable in MODEs 4 and 5. It is required to be operable in MODES 1, 2, and 3.
During the review of the EFIC Vector Valve Enable logic circuitry, it was determined that the output "NOR" gate in the both the A and the B logic circuitry was not tested during the required once per 31 day CHANNEL FUNCTIONAL TEST Surveillance Requirement 3.3.13.1.

The Emergency Feedwater System (EFW) is designed to provide adequate flow to one or more steam generators for decay heat removal. The principal function of EFW is to remove decay heat from the Reactor Coolant System upon the unavailability of the normal feedwater supply. EFW consists of two pumps (EFP-1 and EFP-2) and associated valving. The EFIC automatic actuation circuitry automatically initiates the EFW pumps, aligns valves, and isolates the Main Steam lines and Main Feedwater lines. The EFIC Vector Valve Enable logic circuitry enables the vector valve logic to generate open or close signals to the EFW valves feeding the two Once Through Steam Generators (OTSG) depending on the relative values of OTSG pressures.

The EFIC Vector Valve Enable logic circuitry is tested by Surveillance Procedures SP-146A, "EFIC Monthly Functional Test, During Modes 1, 2, and 3," and SP-146B, "EFIC Monthly Functional Test, During Plant Shutdown Conditions." SP-146A and 146B did not test the logic circuit's output "Nor" gate.

RPS Trip Function Testing Deficiencies

On May 21 through 23, 1997, CR-3 was in MODE 5 (COLD SHUTDOWN) with all Control Rod Drive (CRD) trip breakers in the open position and the Control Rod Drive Control System (CRDCS) not capable of rod withdrawal. RPS Trip Functions 2 through 10 are not required to be operable in MODE 5. RPS Trip Function 1 is required to be operable in Mode 5 during shutdown bypass operation with any CRD trip breaker in the closed position and the CRDCS capable of rod withdrawal.

During review of the RPS Main Turbine Trip circuitry, it was determined that the RPS trip bistable contacts in the RPS Trip channels were not tested during the required once per 45 day on a STAGGERED TEST BASIS CHANNEL FUNCTIONAL TEST Surveillance Requirement 3.3.1.4 or during the required once per 92 day CHANNEL CALIBRATION Surveillance Requirement 3.3.1.5.

The RPS initiates a reactor trip (i.e., full insertion of all CONTROL RODS) to protect against violating core fuel design limits and the RCS pressure boundary during anticipated operational occurrences. By tripping the reactor, the RPS also functions, in conjunction with the ES systems, to mitigate accidents.

The RPS consists of four separate redundant protection channels that receives input from critical plant parameters. Each channel is composed of measurement channels, a reactor trip module (RTM), and

CRD trip devices. An RPS measurement channel measures a critical plant parameter and compares it to the applicable setpoint. If the setpoint is exceeded, two contacts of the measurement channel output relay open, tripping the RPS channel RTM. If the RTMs in two-out-of-four RPS channels trip, a full insertion of all CONTROL RODS will occur.

The RPS Trip Functions not tested, as specified in Technical Specifications Table 3.3.1-1, Reactor Protection System Instrumentation, are:

Function No.	Function Description
1.	Nuclear Overpower
2.	RCS High Outlet Temperature
3.	RCS High Pressure
4.	RCS Low Pressure
5.	RCS Variable Low Pressure
6.	Reactor Building High Pressure
7	Reactor Coolant Pump Power Monitor
8.	Nuclear Overpower RCS Flow and Measured AXIAL POWER IMBALANCE
9.	Main Turbine Trip (Control Oil Pressure)
10	Loss of Both Main Feedwater Pumps (Control Oil Pressure)

The RPS Trip Function circuitry is tested by Surveillance Procedures SP-110A (B) (C) (D) "A (B) (C) (D) Channel Reactor Protection System Functional Testing." For ITS Table 3.3.1-1 Functions 1 through 10, SP-110A (B) (C) (D) confirmed that each Function measurement channel output bistable tripped but did not test the two bistable output series contacts in the RPS channel changed state. Thus, there was no confirmation that the associated RTM tripped.

EVENT EVALUATION

Loss of Power Start Testing Deficiencies

The LOPS logic circuitry is important to the mitigation of most plant transients and accidents because it ensures the availability of an adequate supply of AC power to ES systems.

The SLUR relay contacts not tested during the CHANNEL FUNCTIONAL TESTs have not been tested independently by any plant surveillance procedure. However, the contacts have been satisfactorily tested together during past performance of SP-907A and B, assuring that at least one of the two parallel contacts functioned in each circuit. When tested independently for the immediate corrective action for this report, the contact testing was satisfactory.

The SLUR annunciator contacts not tested during the CHANNEL FUNCTIONAL TESTs have been satisfactorily tested during performance of procedures SP-904A, "Calibration of 4160 Volt ES 'A' Bus Undervoltage and Bus Degraded Grid Relays," and SP-904B, "Calibration of 4160 Volt ES 'B' Bus Undervoltage and Bus Degraded Grid Relays." This test is performed on an 18 month frequency in

accordance with Technical Specification Surveillance Requirement 3.3.8.2. Proper functioning of the relay contacts was demonstrated but not at the required CHANNEL FUNCTIONAL TEST frequency.

Therefore, this testing deficiency did not compromise the health and safety of the general public.

EFIC Logic Circuitry Testing Deficiencies

Even though not tested completely during the required CHANNEL FUNCTIONAL TEST, the actuation circuits for EFP-1 and EFP-2, including their interposing relays, are initiated when tested in accordance with Surveillance Requirement 3.7.5.2 once per 45 days on a STAGGERED TEST BASIS using surveillance procedures SP-349A, "EFP-1 and Valve Surveillance," and SP-349B, "EFP-2 and Valve Surveillance."

Satisfactory performance of the CHANNEL FUNCTIONAL TESTS in conjunction with SP-349A and SP-349B has demonstrated the operability of the EFIC actuation circuits.
Therefore, this testing deficiency did not compromise the health and safety of the general public.

ESAS Instrumentation RCS Pressure Testing Deficiency

The ESAS Instrumentation logic circuitry is important to the mitigation of many plant accidents because it initiates ES systems.

Even though the series contacts for ESAS RCS Pressure Low and RCS Pressure Low-Low have not been tested independently, they have been tested in accordance with Surveillance Requirement 3.3.5.2 at the required once per 31 day CHANNEL FUNCTIONAL TEST frequency, in accordance with procedure SP-130, "Engineered Safeguards Monthly Functional Test." This has provided assurance that at least one of the two series contacts functioned in each circuit.

If the failed contact in two logic channels were the 1500 psig contact the RCS Pressure initiation of the HPI system during a Small Break Loss of Coolant Accident (SBLOCA) would be delayed until 500 psig. In this unlikely event, the ES initiation function would be assured by two defense in depth considerations. First for some SBLOCA accident scenarios, an independent ESAS HPI actuation signal, Reactor Building Pressure High, would function to initiate ES systems. Secondly, Emergency Operating Procedures (EOP) require operators to manually initiate ES systems, when required, should automatic actuation fail.

Because 1.) some testing was conducted, 2.) inadequate testing does not cause circuit failures, 3.) these circuits are inherently reliable, 4.) multiple failures would have to be postulated for a loss of function, and 5.) alternative methods of initiating the ES systems exist, this testing deficiency did not compromise the health and safety of the general public.

ESAS Instrumentation Load Block Auto Reset Testing Deficiency

The ESAS automatic reset of the ES blocks 4 & 6 timers logic circuitry is important to the mitigation of accidents when the Loss of Offsite Power (LOOP) occurs after the timers have cycled.

Although the independent functioning of two parallel contacts in the logic has not been verified, the auto reset function of ES load blocks 4 and 6 sequencing timers has been tested satisfactorily in accordance with Surveillance Requirement 3.3.5.2 at the required once per 31 day CHANNEL FUNCTIONAL TEST frequency, in accordance with procedure SP-130, "Engineered Safeguards Monthly Functional Test." This has provided assurance that at least one of the two parallel contacts functioned in each channel.

Even if the auto reset circuits malfunction, proper ES load sequencing would be accomplished if the LOOP occurs before or simultaneously with ES actuation. If the LOOP occurs after ES actuation, proper ES load sequencing would still be accomplished except in the unlikely event that:

1. Block 4 and 6 loads start to load on the ES Bus in the absence of a LOOP and a LOOP occurs during the 10 second interval while the loading is in progress, and,
2. One contact in two logic channels is failed and not detected, and,
3. The combination of contact failures is such that the automatic reset does not occur until after the Block 6 timer actuates.

Because of the assurance given by the testing which was conducted, the fact that inadequate testing does not cause circuit failures, the fact that these circuits are inherently reliable, and that a very unlikely scenario which would have to be postulated in conjunction with multiple undetected circuit failures to conclude a loss of a safety function, this testing deficiency did not compromise the health and safety of the general public.

EFIC Vector Valve Enable Logic Circuitry Testing Deficiencies

The safety function of the EFIC Vector Valve Enable logic circuitry would only be jeopardized if the "NOR" gates failed in both the "A" and the "B" logic circuitry.

Even though not tested during the required CHANNEL FUNCTIONAL TEST, the EFIC Vector Valve Enable Logic Circuitry has been tested satisfactorily at a Refueling interval in accordance with surveillance procedure SP-416, "Emergency Feedwater Automatic Actuation." In addition, while not stated as an acceptance criteria, it is expected that a failure of the EFIC Vector Valve Enable logic circuitry would be observed by plant operators when EFW is tested in accordance with Surveillance Requirement 3.7.5.2 once per 45 days on a STAGGERED TEST BASIS using surveillance procedures SP-349A, "EFP-1 and Valve Surveillance," and SP-349B, "EFP-2 and Valve Surveillance."

Because of the assurance given by the testing which was conducted, the fact that inadequate testing does not cause circuit failures, the fact that these circuits are inherently reliable, and that multiple

undetected circuit failures would have to occur to cause a loss of a safety function, this testing deficiency did not compromise the health and safety of the general public.

RPS Trip Function Testing Deficiencies

The safety function of the RPS is to protect against violating core fuel design limits and the RCS pressure boundary during anticipated operational occurrences (AOO) and, in conjunction with ES systems, to mitigate accidents.

The RPS bistable contacts not tested during the CHANNEL FUNCTIONAL TESTs have not been tested by any plant surveillance procedure. However, the safety function of the RPS Trip function would only be jeopardized if both measurement channel output relay contacts failed to function in more than two RPS channels. In the unlikely event that undetected failure of both contacts for a bistable were to occur in more than two channels and an RPS trip was required, a failure to trip the reactor would occur. This is an unlikely event.

Reactor trips are events which have occurred at CR-3. The reliability of the RPS system has been demonstrated by the fact that it has always functioned when required.

The safety impact of a failure to trip the reactor has been assessed for CR-3. Emergency Operating Procedures (EOP) are in place and operators have been trained to recognize and cope with a failure to trip the reactor.

This testing deficiency did not compromise the health and safety of the general public because:

1. Inadequate testing does not cause circuit failures.
2. RPS circuits are inherently reliable.
3. Multiple undetected circuit failures would have to occur to cause a failure to trip the reactor.
4. RPS trips are events which have occurred and have always been successful at CR-3.
5. Operators are prepared to cope with a failure to trip the reactor.

CAUSE

The cause of these testing deficiencies was cognitive human error based on personnel responsible for designing circuits and implementing the testing procedures for safety related logic circuits not understanding testing requirements and fully identifying all components that should have been tested.

IMMEDIATE CORRECTIVE ACTION

Loss of Power Start Testing Deficiencies

Technical Specification 3.3.8 Required Actions B.1 and C.1 were initiated.

SP-907A and SP-907B were revised and performed. The relay contacts in question were tested satisfactorily. Technical Specification 3.3.8 Required Actions B.1 and C.1 were exited.

EFIC Logic Circuitry Testing Deficiencies

A MODE 4 restart restraint was created to prevent entry into Technical Specification Limiting Condition of Operation (LCO) Action 3.3.13.B.

ESAS Instrumentation Logic Circuitry Testing Deficiencies

A MODE 4 restart restraint was created to prevent entry into Technical Specification LCO Action 3.3.5.C.

EFIC Vector Enable Logic Circuitry Testing Deficiencies

A MODE 4 restart restraint was created to prevent entry into Technical Specification LCO Action 3.3.13.B.

RPS Trip Function Testing Deficiencies

Technical Specification LCO Action 3.3.1.G was initiated.

A MODE 4 restart restraint was created to prevent entry into Technical Specification LCO Action 3.3.1.D.1 and Action D.1 and referenced in Table 3.3.1-1 for each function not properly tested.

ADDITIONAL CORRECTIVE ACTION

EFIC Logic Circuitry Testing Deficiencies

Prior to exiting the restart restraint due to entry into Technical Specification 3.3.13.B, SP-146A and B will be revised and appropriate testing will be performed to satisfy Surveillance Requirement 3.3.13.1.

ESAS Instrumentation Logic Circuitry Testing Deficiencies

Prior to exiting Restart Restraint for Technical Specification Required Action 3.3.5.C, SP-130 will be revised and appropriate testing will be performed to satisfy Surveillance Requirement 3.3.5.2.

EFIC Vector Enable Logic Circuitry Testing Deficiencies

Prior to exiting Restart Restraint for Technical Specification Required Action 3.3.13.B, SP-146 A and SP-146 B will be revised and appropriate testing will be performed to satisfy Surveillance Requirement 3.3.13.1.

RPS Trip Function Testing Deficiencies

Prior to exiting Restart Restraint for Technical Specification Required Action 3.3.1.H, SP-110A, B, C, D, will be revised and appropriate testing will be performed to satisfy Surveillance Requirement 3.3.1.4 for Table 3.3.1-1 Functions 2, 3, 4, 5, 6, 7, 9, and 10 and Surveillance Requirement 3.3.1.5 for Table 3.3.1-1 Functions 1 and 8.

ACTION TO PREVENT RECURRENCE

FPC has committed to completing the reviews and corrective action requested in Generic Letter 96-01. The corrective action will include revising and performing procedures as necessary. The corrective action will also ensure that appropriate testing requirements are established for systems being modified during the current outage. This activity is being tracked as a CR-3 Restart Issue R-1 for the current outage.

The reviews requested by Generic Letter 96-01 are scheduled to be complete by the end of July 3, 1997. At the completion of reviews, the extent of condition of deficiencies in the CR-3 program for logic testing of safety related circuits will be fully known. FPC commits at that time to fully evaluate the root causes of the extent of condition and develop and implement appropriate controls to maintain the capability to perform complete CHANNEL FUNCTIONAL TEST requirements to comply with Technical Specifications. Specific details and schedules will be reported in a supplement to this LER.

PREVIOUS SIMILAR EVENTS

There have been several previous reports involving testing of safety related logic Circuits. LERs 96-011-00 and 96-025-00 were similar to this LER in that they reported logic system testing deficiencies identified by FPC's preliminary investigations in response to GL 96-01.

ATTACHMENT

Attachment 1 -Abbreviations, Definitions and Acronyms

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

ATTACHMENT 1 - ABBREVIATIONS, DEFINITIONS AND ACRONYMS

EFIC	Emergency Feedwater Initiation and Control
EFP	Emergency Feedwater Pump
EFW	Emergency Feedwater
EGDG	Emergency Diesel Generator
ESAS	Engineered Safeguards Actuation System
FLUR	First Level Undervoltage Relaying
GL 96-01	Generic Letter 96-01, Testing of Safety Related Logic Circuits
LOOP	Loss of Offsite Power
LOPS	Loss of Power Start
LPI	Low Pressure Injection
MODE FIVE	COLD SHUTDOWN
MODE FOUR	HOT SHUTDOWN
RCS	Reactor Coolant System
RPS	Reactor Protection System
RTM	Reactor Trip Module
SLUR	Second Level Undervoltage Relaying

NOTES: ITS defined terms appear capitalized in LER text {e.g. MODE ONE}

Defined terms/acronyms/abbreviations appear in parenthesis when first used {e.g. Reactor Building (RB) }.

EIIS codes appear in square brackets {e.g. Engineering Safeguards [ES] }