NON-PUBLIC?: N
ACCESSION #: 9111250170
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Browns Ferry Unit 2 PAGE: 1 OF 6

DOCKET NUMBER: 05000260

TITLE: Failure to Open the Generator Exciter Field Breaker After Manual Turbine Trip Resulted in a Reactor Scram Required by Technical Specifications
EVENT DATE: 10/18/91 LER #: 91-018-00 REPORT DATE: 11/15/91

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: N POWER LEVEL: 008

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(i) & 50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: Steven W. Austin, Compliance TELEPHONE: (205) 729-2070
Licensing Engineer

COMPONENT FAILURE DESCRIPTION:
CAUSE: SYSTEM: COMPONENT: MANUFACTURER:
REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT:

On October 18, 1991 at 0458 hours, during a controlled shutdown, Browns Ferry Unit 2 reactor was manually scrammed from approximately eight percent thermal power due to unexpected equipment responses.

The root cause of this event was inappropriate personnel action. A plant operator failed to follow the procedure for turbine generator shutdown when he did not open the exciter field breaker after the manual turbine generator trip. This action caused unexpected equipment responses including actuation of the generator reverse power relay and subsequent tripping of the reactor recirculation pumps.

The reverse power relay was tested. The evaluation and testing of the recirculation pump boards was completed. Operations personnel will

receive live-time training on the event. TVA will change the plant design to include automatic tripping of the generator field breaker when the turbine generator is tripped. The Browns Ferry simulator will be upgraded to match plant conditions.

END OF ABSTRACT

I. PLANT CONDITIONS

Unit 2 was undergoing a controlled shutdown and was at approximately eight percent power (Power Operations). Units 1 and 3 were shutdown and defueled.

II. DESCRIPTION OF EVENT

A. Event:

On October 18, 1991 at 0458 hours, during a controlled shutdown, Browns Ferry Unit 2 was manually scrammed from approximately eight percent thermal power due to unexpected equipment responses.

On October 17, 1991 at approximately 2000 hours, TVA initiated a controlled shutdown on Unit 2. On October 18, 1991 at 0447 hours, due to high vibration, the main turbine TA! was tripped and the generator power circuit breaker opened. However, the generator exciter field breaker was not opened as required by plant procedures.

On October 18, 1991 at 0456 hours, a generator reverse power abnormal alarm was received and 12 seconds later a second reverse power abnormal alarm was received. Subsequently, 19 seconds later the reverse power relay actuated causing breakers feeding unit service transformers 2A and 2B FK! to open. Upon loss of power from the unit service transformers, all required electrical boards with exception of the 2A and 2B recirculation system pump boards automatically transferred to their alternate supply resulting in a trip of the reactor recirculation AD! system pumps.

At 0458 hours, with the mode switch in the rim position, the unit operator (utility, licensed) UO! initiated a manual scram of the reactor.

As a result of the manual scram, TVA reports this event in accordance with 10 CFR 50.73(a)(2)(iv) as an event or condition that resulted in manual or automatic actuation of any engineered safety feature (ESF), including the reactor protection system. The loss of the reactor recirculation pumps with the mode switch in the "RUN" position is reportable in accordance with 10 CFR 50.73(a)(2)(i)(A) as the completion of any nuclear plant shutdown required by the plant's technical specifications.

B. Inoperable Structures, Components, or Systems that Contributed to the Event:

None

C. Dates and Approximate Times of Major Occurrences:

October 18, 1991 at 0447 CST The main turbine was manually tripped and generator power circuit breaker verified open.

October 18, 1991 at 0456 CST Main control room received reverse power abnormal alarms and subsequent opening of the breakers feeding service transformers. The 4kV reactor recirculation pump boards fail to transfer and reactor recirculation pumps trip.

October 18, 1991 at 0458 CST UO initiated a manual scram of the reactor.

October 18, 1991 at 0530 CST The SOS initiated a notification of Unusual Event as required by 10 CFR 50.72(a)(3) and cited the emergency classification as "HU14" (conditions exist

warranting increased awareness of plant operating staff, state or local government, or involve other than a controlled shutdown).

D. Other Systems or Secondary Functions Affected:

Reactor recirculation pump boards 2A and 2B did not auto transfer during the event. This resulted in recirculation pumps 2A and 2B tripping.

E. Method of Discovery:

The event was immediately known to the control room operator upon receiving alarms indicating generator reverse power abnormal and tripping of the reactor recirculation pumps.

F. Operator Actions:

Operators initiated actions to restart the reactor recirculation pumps; however, due to an influx of water into the bottom of the vessel after the scram, a temperature differential exceeding plant administrative limits for recirculation pump operation had formed between the vessel dome and bottom head. In order to eliminate this problem, natural circulation was established. After the temperature differential between the vessel dome and bottom drain was brought within an acceptable range, the reactor recirculation pumps were started.

G. Safety System Responses:

None

III. CAUSE OF THE EVENT

A. Immediate Cause:

The immediate cause of this event was failure of the operator to open the generator exciter field breaker after the manual turbine trip.

B. Root Cause:

The root cause of this event was inappropriate personnel action in that the operator (utility, licensed) failed to follow the procedure for turbine generator shutdown when he did not open the exciter field breaker after the manual turbine generator

trip. This action caused unexpected equipment responses including the actuation of the reverse power relay and subsequent tripping of the reactor recirculation pumps.

C. Contributing Factors:

1. Inadequate design which requires operator actions to manually trip the field breaker after a turbine trip.

2. Inadequate training. During simulator training the consequences of not tripping the field breaker after a turbine trip are not identified during manual turbine trip simulation.

IV. ANALYSIS OF THE EVENT

A. Safety Analysis:

The reverse power relay protects the main turbine and generator should steam to the turbine be lost and the generator output breaker remain closed. The relay initiates a trip breaker to separate the turbo-generator from the switchyard. During the event, the generator output breaker and main turbine were tripped without tripping the generator field breaker. Therefore, as the turbo-generator coasted down, the generator continued to produce a voltage at a declining frequency. This resulted in the inadvertent actuation of the reverse power relay.

The reactor recirculation pumps are not required for safe shutdown of the plant and loss of the pumps at low power level is an analyzed condition. The manual scram of the reactor following the loss of the reactor recirculation pumps was a requirement of plant technical specifications.

All safety-related plant components operated as expected during the trip. The safety of the plant, its personnel, and the public was not compromised.

V. CORRECTIVE ACTIONS

A. Immediate Corrective Actions:

1. The reverse power relay was tested with no deficiencies

identified.

2. Testing of the reactor recirculation pump boards was performed. The results of the testing could not identify a cause for boards to failure to transfer during the event. Maintenance history on these boards has not indicated any adverse trends in performance. TVA will continue to monitor equipment performed through the Preventative Maintenance Program.

3. Operations personnel responsible for the plant restart were trained on the event.

B. Corrective Actions to Prevent Recurrence:

1. Operations personnel will receive live-time training on the event.

2. TVA will change the plant design to include automatic tripping of the exciter field breaker when the turbine-generator is tripped.

3. Simulation of the exciter field breaker operation on the Browns Ferry simulator will be reviewed. The simulator will be revised to match plant conditions.

VI. ADDITIONAL INFORMATION

A. Failed Components:

None

B. Previous LERs on Similar Events:

VII. Commitments

1. Operations personnel will receive live-time training on the event. This will be completed by January 17, 1992.

2. TVA will change the plant to include automatic tripping of the exciter field breaker when the turbine-generator is tripped. This will be completed prior to restart following the Unit 2 Cycle 6 refueling outage.

3. Simulation of the exciter field breaker operation on the Browns Ferry simulator will be reviewed. The simulator will be revised to match plant conditions. This will be completed by January 17, 1992.

Energy Industry Identification System (EIIS) codes are identified in the text as XX!.

TVA

Tennessee Valley Authority, Post Office Box 2000, Decatur, Alabama 35609

O. J. "Ike" Zeringue
Vice President, Browns Ferry Operations

NOV 15 1991

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Dear Sir:

TVA - BROWNS FERRY NUCLEAR PLANT (BFN) UNIT 2 - DOCKET NO. 50-260 - FACILITY OPERATING LICENSE DPR-52 - LICENSEE EVENT REPORT LER-50-260/91018

The enclosed report provides details concerning a manual reactor scram due to unexpected equipment responses following a failure to open the generator exciter field breaker after a manual turbine trip. This report is submitted in accordance with 10 CFR 50.73(a)(2)(i) and 10 CFR 50.73(a)(2)(iv).

Sincerely,

O.J. Zeringue

Enclosure
cc: see page 2

U.S. Nuclear Regulatory Commission

NOV 15 1991

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