



UNITED STATES  
NUCLEAR REGULATORY COMMISSION

REGION II  
SAM NUNN ATLANTA FEDERAL CENTER  
61 FORSYTH STREET, SW, SUITE 23T85  
ATLANTA, GEORGIA 30303-8931

July 13, 2006

Tennessee Valley Authority  
ATTN: Mr. K. W. Singer  
Chief Nuclear Officer and  
Executive Vice President  
6A Lookout Place  
1101 Market Street  
Chattanooga, TN 37402-2801

SUBJECT: BROWNS FERRY NUCLEAR PLANT UNIT 1 RECOVERY - NRC INSPECTION  
REPORT 05000259/2006012

Dear Mr. Singer:

On June 2, 2006, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection associated with recovery activities at your Browns Ferry Unit 1 reactor facility. The enclosed inspection report documents the inspection results, which were discussed on June 2, 2006, with Mr. M. Bajestani and other members of your staff.

This inspection examined activities conducted under your Unit 1 license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license and also with fulfillment of Unit 1 Regulatory Framework Commitments. The inspection focused on the Special Program for Fire Protection. The inspectors reviewed selected procedures and records, observed activities, walked-down facilities, and interviewed personnel. Based on the results of this inspection, no violations or findings of significance were identified. However, the report includes one unresolved item related to the intended use of an extensive number of local operator actions during implementation of fire response procedures.

Additionally, this report contains the final disposition of the May 12, 2006, cable installation and separation inspection. The inspection identified a non-cited violation of 10 CFR 50, Appendix B, Criterion III for failure to assure that the design change measures for relocating 480 Volt Diesel Auxiliary Board B Division II cables met divisional separation requirements. However, because the violation was entered into your corrective action program, the NRC is treating the violation as an NCV consistent with Section VI.A of the NRC Enforcement Policy. If you contest any non-cited violation or finding in the enclosed report, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the United States Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington DC 20555-0001; with copies to the Regional Administrator, Region II; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Senior Resident Inspector at the Browns Ferry Nuclear Plant.

TVA

2

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Sincerely,

**/RA/**

D. Charles Payne, Chief  
Engineering Branch 2  
Division of Reactor Safety

Docket No. 50-259  
License No. DPR-33

Enclosure: Inspection Report 05000259/2006012  
w/Attachment: Supplemental Information

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cc w/encl:

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Sincerely,

**/RA/**

D. Charles Payne, Chief  
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w/Attachment: Supplemental Information

cc w/encl: (See page 2)

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**U.S. NUCLEAR REGULATORY COMMISSION**

REGION II

Docket No: 50-259

License No: DPR-33

Report No: 05000259/2006012

Licensee: Tennessee Valley Authority (TVA)

Facility: Browns Ferry Nuclear Plant (BFNP), Unit 1

Location: Corner of Shaw and Nuclear Plant Roads  
Athens, AL 35611

Dates: May 30 - June 2, 2006

Inspectors: G. MacDonald, Senior Reactor Inspector Region II (RII) -  
Team Leader  
R. Bernhard, Senior Reactor Analyst, RII  
R. Gallucci, Senior Fire Probabilistic Risk Assessment  
Engineer, Office of Nuclear Reactor Regulation (NRR)  
L. Mellen, Senior Project Engineer, Browns Ferry Unit 1  
Restart, RII  
P. Qualls, Fire Protection Engineer, NRR  
N. Staples, Reactor Inspector, RII

Approved by: D. Charles Payne, Chief  
Engineering Branch 2  
Division of Reactor Safety

## EXECUTIVE SUMMARY

Browns Ferry Nuclear Plant, Unit 1  
NRC Inspection Report 05000259/2006012

This inspection included aspects of licensee engineering activities associated with the Unit 1 Recovery Special Program for Fire Protection and the Special Program for Cable Installation and Separation. The inspection program for the Unit 1 Restart Program is described in NRC Inspection Manual Chapter 2509. Information regarding the Browns Ferry Unit 1 Recovery and NRC Inspections can be found at <http://www.nrc.gov/NRR/OVERSIGHT/ASSESS/bf1-recovery.html>.

### Inspection Results - Engineering

- A Severity Level IV non-cited violation (NCV) of 10 CFR 50, Appendix B, Criterion III was identified for failure to assure that the design change measures, for relocating 480 Volt Diesel Auxiliary Board B Division II cables to a separate terminal block six inches from Division I cables, were correctly translated into work instructions. This resulted in the as-built configuration for cables PL2817-II and PL2824-II (in the plant) deviating from design drawings. Due to the need to inspect additional examples for external and internal separations, additional inspections will be required to determine if this Special Program is being implemented satisfactorily. (Section E1.4)
- The team reviewed the Browns Ferry Nuclear Plant (BFNP) licensing basis for 10 CFR 50, Appendix R, Section III.G.2 post-fire operator manual actions (OMAs) to accomplish safe shutdown (SSD) in Section III.G.2-designated fire areas. No exemption requests were granted for Section III.G.2 post-fire OMAs so the licensee should consider the OMAs as compensatory measures and follow the clarifications regarding OMAs as delineated in the March 6, 2006 Federal Register Notice. BFNP has identified those post-fire SSD OMAs which are performed outside the main control room (MCR) in Section III.G.2 fire areas for BFNP Units 1, 2 and 3 and placed them in the corrective action program (CAP). Therefore, unresolved item (URI) 05000259/2005016-01 is closed. (Section E1.1)
- The team determined that BFNP had performed a risk evaluation of the fire areas employing 10 CFR 50, Appendix R, post-fire operator manual actions (OMAs) outside the MCR to achieve SSD using the guidance of NRC IMC 0609, Appendix F, Fire Protection Significance Determination Process. The risk evaluation was not complete as it did not address the risk contribution of transient combustible fires, the risk impact of potential fire induced spurious equipment operation, or consider the potential for common OMAs (i.e., the same or very similar OMAs used in multiple fire areas, or in the same fire area, but in response to different fire initiators) to be risk significant. The team determined that the risk evaluation also needed to document the deviations from the fire protection SDP process. Problem Evaluation Report (PER) 104418 was initiated for tracking the incomplete risk evaluation. (Section E1.2)

- Until Tennessee Valley Authority revises their procedural attachments, and provides and implements an analytically-based definition of the start time for operator manual actions (OMAs), the team could not reach a conclusion on the feasibility and reliability of post-fire 10 CFR 50 Appendix R, Section III.G.2 Operator Manual Actions in fire area/fire zones. This is identified as URI 05000259/2006012-01, Feasibility of Local Operator Manual Actions to Achieve Safe Shutdown. PER 104575 was initiated for tracking and resolution of this issue. (Section E1.3)

## REPORT DETAILS

### II. Engineering

#### **E1 Conduct of Engineering**

##### **E1.1 Review of Browns Ferry Nuclear Plant Post-Fire Operator Manual Actions for Safe Shutdown in 10 CFR 50, Appendix R, Section III.G.2 Fire Areas (37550)**

###### **a. Inspection Scope**

The team reviewed the BFNP Fire Protection design and licensing basis documents to determine if post-fire OMAs to achieve Safe Shutdown (SSD) for a fire in 10 CFR 50, Appendix R, Section III.G.2 fire areas were approved by the NRC. NRC URI 05000259/2005016-01, Use of Local Operator Actions to Achieve Safe Shutdown, was reviewed. The team reviewed the BFNP operating license relative to the Unit 1 Fire Protection Program and examined the actions Browns Ferry has taken regarding fire protection OMAs. Documents reviewed are listed in the Attachment.

###### **b. Observations and Findings**

The team determined that BFNP still relied on OMAs to accomplish post-fire SSD for fires in Appendix R, III.G.2 fire areas for Units 1, 2, and 3. BFNP has identified the post-fire SSD OMAs performed outside the main control room (MCR) in Section III.G.2 fire areas for BFNP Units 1, 2, and 3. The Section III.G.2 post-fire SSD OMAs performed outside MCR have been entered into the BFNP site corrective action program (CAP) as PER 101631, Appendix R Section III.G.2 Operator Manual Actions.

Through a review of BFNP Fire Protection licensing basis documents, the team determined that no exemption requests for Section III.G.2 post-fire SSD OMAs outside the MCR were submitted or approved for BFNP Units 1, 2, or 3. NRC Safety Evaluation Report (SER), Safety Evaluation Of Post-Fire Safe Shutdown Capability And Issuance Of Technical Specification Amendments For The Browns Ferry Nuclear Plant Units 1, 2 and 3 dated November 2, 1995, described manual actions both inside and outside the MCR necessary for SSD of Units 2 and 3 for a fire in any location except fire area 16 (a 10 CFR 50, Appendix R, Section III.G.3 area). While the November 2, 1995, SER described the principal post-fire OMAs necessary for SSD in Section III.G.2 fire areas for combined operation of BFNP Units 2 and 3, the OMAs outside the MCR are still considered unapproved because no exemption requests have been granted to accept these actions. A Federal Register Notice (FRN) dated March 6, 2006, discusses use of unapproved post-fire local OMAs for SSD in Section III.G.2 fire areas. The FRN indicates that unapproved post-fire OMAs, which are feasible and reliable, should be considered as compensatory measures and do not comply with Section III.G.2. The FRN discusses enforcement discretion regarding the Section III.G.2 OMAs, and outlines that licensee's must identify the Section III.G.2 OMAs, place them in the CAP within six months of the FRN date and implement an approved Section III.G.2 SSD method within three years of the FRN date, (March 6, 2006).

Enclosure



Because the BFNP Section III.G.2 post-fire OMAs are not approved within the BFNP licensing basis, URI 05000259/2005016-01 will be closed with no violation as BFNP will be able to follow the industry-wide post-fire OMA guidance in the March 6, 2006, FRN notice regarding discretion for resolution of Section III.G.2 post-fire OMAs.

The current BFNP fire protection program describes compensatory measures to be implemented for fire protection program impairments. The current approved compensatory measure is a fire watch. The FRN indicates that the Section III.G.2 post-fire SSD OMAs should themselves be considered compensatory measures, if shown to be feasible and reliable. The BFNP fire protection program needs to be revised to allow the use of OMAs as an approved compensatory measure.

c. Conclusions

The team reviewed the BFNP licensing basis for Appendix R, Section III.G.2 post-fire OMAs to accomplish SSD in Section III.G.2 fire areas. BFNP has identified the post-fire SSD OMAs performed outside the MCR in Section III.G.2 fire areas for BFNP Units 1, 2 and 3 and placed them in the CAP. No exemption requests have previously been granted for III.G.2 post-fire OMAs. Thus the licensee needs to treat the OMAs as compensatory measures and follow the clarifications regarding OMAs provided in the March 6, 2006, Federal Register Notice. URI 05000259/2005016-01 is closed.

E1.2 Review of Significance Determination Process (SDP) Evaluation of Fire Scenarios in 10 CFR 50 Appendix R, Section III.G.2 Areas at Browns Ferry Nuclear Plant Units 1, 2 and 3 (37550)

a. Inspection Scope

The team reviewed the BFNP risk assessment of Section III.G.2 fire areas which utilized post-fire OMAs outside the MCR to achieve SSD, to determine if the risk evaluation was performed pursuant to the guidance of NRC Inspection Manual Chapter (IMC) 0609, Appendix F, Fire Protection Significance Determination Process. Fire areas/fire zones 1-1, 1-5, and 25 were selected for review. The team performed walkdowns of the three selected fire areas and reviewed the risk assessment methodology, assumptions and data. Documents reviewed are listed in the Attachment.

b. Observations and Findings

The team determined that BFNP performed the risk evaluations in accordance with the guidance of NRC IMC 0609, Appendix F, with some deviations. The licensee's evaluation concluded that all the areas evaluated appeared to be of very low risk significance.

The team concluded that the risk evaluation was not complete because it did not address the risk contribution of transient combustible fires and did not address the risk impact of potential fire-induced spurious equipment actuation. Additionally, the evaluation did not consider the potential for common OMA (i.e., the same or very similar OMA used in multiple fire areas, or in the same fire areas, but in response to different fire initiators) to be risk significant. The team noted that the risk evaluation also needed to document the deviations from the fire protection SDP process. These deviations included: the basis for excluding some of the fixed combustible sources from the ignition frequencies; the cabinet counting method used in ignition frequency calculations; the comparison of BFNP conditional core damage probabilities (CCDPs) to the CCDPs based on the NRC SDP Notebook; and the conservatism of the use of a cable damage probability of 0.5 as a surrogate for the probability of non-suppression in the SDP. BFNP initiated PER 104418 for tracking of the incomplete risk assessment of the fire areas with Section III.G.2 OMA.

c. Conclusions

The team determined that BFNP had performed a risk evaluation of the fire areas employing 10 CFR 50, Appendix R, Section III.G.2. post-fire OMA outside the MCR to achieve SSD using the guidance of NRC IMC 0609, Appendix F. The risk evaluation was not complete as it did not address the risk contribution of transient combustible fires, the risk impact of potential fire induced spurious equipment operation, or consider the potential for common OMA (i.e., the same or very similar OMA used in multiple fire areas, or in the same area, but in response to different fire initiators) to be risk significant. The team determined that the risk evaluation also needed to document the deviations from the fire protection SDP process. PER 104418 was initiated for tracking of the incomplete risk assessment.

1.3 Review of the Feasibility of Post-Fire 10 CFR 50, Appendix R, Section III.G.2 Operator Manual Actions (37550)

a. Inspection Scope

The team reviewed the BFNP feasibility and reliability of post-fire, Section III.G.2 OMA in fire area/fire zones 1-1, 1-5, and 25. The inspection included a timed walkdown of all OMA that were required to be completed in less than 25 minutes. The team also reviewed the licensee's analytical basis for the required completion time for OMA. The team examined MCR staffing for selected dates to ensure sufficient staff availability to implement SSD using the Safe Shut-down Instructions (SSIs). Documents reviewed are listed in the Attachment.

b. Observations and Findings

The team determined that BFNP had identified the post-fire SSD OMA required to be performed outside the main control room in Section III.G.2 fire area/fire zones 1-1, 1-5, and 25. However, the licensee provided three different definitions of the starting time for these OMA - at the entry into the procedure, when the reactor tripped, or when the

procedural attachments were handed out. For the purposes of the NRC walkdown, the team started the clock for the OMAs from a location directly outside the main control room. The team noted that this start time will need to be adjusted for the analytically-based start time that TVA later determines to be correct. Regardless, using this starting time, the licensee was unable to demonstrate that all of these actions could be completed within the procedurally required times

The team also found many labeling issues associated with OMAs. Additionally, the team identified several minor problems with the procedural instructions for OMAs.

c. Conclusions

Until TVA revises their procedural attachments, and provides and implements an analytically-based definition for the start time for OMAs, the team could not reach a conclusion on the feasibility and reliability of post-fire 10 CFR 50, Appendix R, Section III.G.2 OMAs in the selected fire area/fire zones. This is identified as URI 05000259/2006012-01, Feasibility and Reliability of Local Operator Manual Actions to Achieve Safe Shutdown. PER 104575 was initiated for tracking and resolution of this issue.

E1.4 Special Program Activities - Cable Installation and Cable Separation (37550 and 37551)

a. Inspection Scope

The programs for investigating and resolving the issues of cable installation and cable separation are described in TVA's letter to the NRC dated May 10, 1991. This letter describes programs as essentially the same as described in the Browns Ferry Nuclear Performance Plan which outlined the corrective actions to be implemented before restart of Unit 2, and repeated for restart of Unit 3. NRC IMC 2509, Browns Ferry Unit 1 Restart Project Inspection Program, endorses the licensee Special Programs utilized on Units 2 and 3 as sufficient to address corresponding issues on Unit 1, if implemented in the same manner. BFN-50-728, Physical Independence of Electrical Systems, was reviewed to verify design requirements for the physical and electrical separation of electrical equipment and circuits for those systems whose operation is essential to the safe shutdown and isolation of the reactor.

This inspection focused on the corrective actions that were being implemented by TVA to resolve the cable separations of concern for the Unit 1 Restart. This inspection included a review of BFN 50-728 and separation issues addressed in EDQ 0999-910078 External Cable Separation Analysis and EDQA 19992-003061, Internal Cable Separation Analysis. EDQ 0999-910078 primarily pertains to cables routed in cable raceways, conduits, and cable trays. EDQA 19992-003061 primarily pertains to separation issues related to cables and wires located within panels.

The inspection was conducted by reviewing work order records, design basis documents, corrective actions, exceptions, and drawings, and by conducting walkdown inspections of methods used for achieving divisional separation or functional redundancy for Unit 1. Documents reviewed are listed in the Attachment.

b. Observations

External Issues:

TVA identified instances where the electrical separation requirements have not been met at BFNP. These discrepancies were discovered while implementing design changes and conducting reviews as part of the BFNP Unit 2 restart effort and have been documented by the issuance of Licensee Event Report (LER) No. 05000259, 05000260, 05000296/1988-032-00, dated October 21, 1988, and subsequent Condition Adverse to Quality reports. During this inspection, selected Design Change Notices (DCN) related to Engineered Safeguards (ES), Core Spray (CS) and Residual Heat Removal (RHR) systems were reviewed. The inspectors also reviewed closure of PERs pertaining to cable separation for appropriate resolution.

The inspectors reviewed Design Criteria Document BFN-50-728, calculations, and walkdown reports of areas in the cable vault and tunnel, auxiliary instrument room, and MCR focusing on external cable separation. The inspectors reviewed criteria for spatial separation, functional redundancy, and other construction requirements to verify that as-built configurations were consistent with standards and requirements for cables, cable routes, and cable trays. The inspectors verified that field installations met divisional separation or functional redundancy separation, and maintained compliance with the single failure criteria in accordance with design criteria. The inspectors also verified that cables/circuits which did not meet divisional separation requirements, nor complied with functional redundancy separation, were appropriately dispositioned. This included a review of exceptions and any supporting information that formed the acceptance criteria for the exceptions. The exceptions reviewed were EX-BFN-728-33 and EX-BFN-50-728-37.

The inspectors also reviewed exception EX-BFN-50-728-34, which established the deviation for field installations of raceways, to verify if some cable trays that have less than the required thickness (as defined in BFN-50-728) were conservatively protected. Cable trays affected by this deviation were primarily located in the MCR and auxiliary instrument room. The inspectors verified that design basis events had been considered and were conservatively accounted for in the justification for the deviation. The inspectors performed walkdowns of selected abandoned, rerouted, retagged, and newly pulled cables to verify that implementation was in accordance with the respective DCN. The DCNs selected for the review were: 51211, 51216, and 51081.

Another aspect of the inspection focused on criteria for the "top hat" region of panels (1-PNLA-009-0015, 0017, 0042, 0043) in the auxiliary instrument room. The top hat region is an enclosed area, located in the upper region of the panels used for cable ingress and egress. The top hat region of panels and associated divisional and non-divisional

Enclosure

cables were inspected and reviewed for compliance with the requirements of BFN-50-728. Requirements for cables in the top hat region are not clearly defined in BFN-50-728, but the licensee conservatively addressed the top hat region in the external separations section in BFN-50-728. The inspectors verified that the top hat region maintains compliance of raceway criteria as defined for the cable trays.

The inspectors performed additional walkdowns and sample checks via the Integrated Cable and Raceway Design System (ICRDS) to verify that no conditions existed which would allow cables from opposite divisions to violate spatial requirements in the top hat region. The cables reviewed for the external issues section of BFN-50-728 are listed in the Attachment.

#### Internal Issues:

BFNP's initial design for internal panel circuitry failed to observe divisional separation within panels. This was documented in response to Atomic Energy Commission questions and a functional redundancy evaluation performed during 1972-1973. The initial evaluation in 1972-1973 was for Unit 1 and reviewed approximately 42 panels or boards. Prior to Unit 1 restart, verification of the existing original installed equipment and a new baseline effort for internal panel separation was undertaken. The new baseline effort was documented in Electrical Calculation EDQ1999 19992-003061. The Unit 1 internal separation analysis reviewed approximately 106 panels or boards that contained redundant divisional intruder cables. Also, included in the evaluation were the Primary Containment Isolation Valve circuits.

The inspectors reviewed criteria for spatial separation, connection details, and other construction requirements to verify that as-built configurations were consistent with standards and requirements for wires, cable routing, and panels. The inspectors conducted walkdown inspections of panels 1-PNLA-009-0015, 1-PNLA-009-0017, 1-PNLA-009-0023, 1-PNLA-009-0032, 1-PNLA-009-0033, 1-PNLA-009-0042, and 1-PNLA-009-0043, to verify that the separation requirements in the as-found configuration were consistent with calculations, design criteria and drawings. The inspectors selected the referenced DCN packages to assess the adequacy of the licensee's internal cable separations program. The cables reviewed for the internal issues section of BFN-50-728 are listed in the Attachment.

The inspector identified a violation of 10 CFR 50, Appendix B, Criterion III, Design Control for a failure to assure that the design change measures, for relocating Division II cables to a separate terminal block six inches from Division I cables in panel 1-PNLA-009-0023, were correctly translated into work instructions. This resulted in the as-built configuration for cables PL2817-II and PL2824-II deviating from design drawings. BFN-50-728 specifies, in part, that divisional separation for cables located within panels would be maintained by a minimum spatial separation of six inches. The cables, located in panel 1-PNLA-009-0023, Bay 8, in the MCR for the 480V Diesel Auxiliary Board B Division II cables were to be removed from the existing terminal block, routed in flexible conduit, and terminated onto a different terminal block located a minimum six inches from the Division I cables. The inspectors found that installed Division II cables PL2817-

II and PL2824-II were not terminated onto a different terminal block six inches from Division I cables, PL2816-I and PL2823-I as illustrated on wiring drawings. The design change to relocate cables PL2817-II and PL2824-II was originally issued in DCN 51090, Stage 73, on 08/07/03. The licensee separated stage 73 into four separate stages in PIC No. 65340 to DCN 51090, consisting of stages 81, 82, 83, and 84. Stages 83 and 84 were issued on 11/02/05, and added design guidance for routing cable PL2817-II in flexible conduit and relocating the wires to a separate terminal block six inches from Division I cables. The licensee used PIC No. 65340, Work Orders (WO) 04-720414-52 and -53 to incorporate the changes on 03/06/06, for Stages 83 and 84 respectively.

The craft correctly implemented WO 04-720414-52 which reinstalled the cables in conduit. However, the craft did not correctly implement WO 04-720414-53, which relocated the cables onto a separate terminal block that was a minimum of six inches away from the Division I cables within panel 1-9-23 Bay 8. The licensee later closed DCN 51090, Stages 83 and 84, on 03/07/06, on the basis that the WO and PIC were completed. The inspectors identified cable PL2817-II for a walkdown review to verify that the as-found installation matched the drawings and documents of DCN 51090. After the cables were identified for inspection by the NRC, the licensee performed a pre-walkdown of the cables and determined that the as-found installations were not consistent with the drawings. The licensee issued PER 101868 to document the finding. The inspectors performed an independent walkdown to verify that the as-built configuration was not consistent with the as-constructed drawing Wiring Diagram 0-55N627-5. Subsequently, the licensee performed an extent of condition evaluation (PER 102752). This effort identified five similar discrepancies between as found installations and plant records.

10 CFR 50, Appendix B, Criterion III, Design Control, requires that measures be established to ensure that applicable regulatory requirements and the design basis are correctly translated into specifications, drawings, procedures, and instructions. Contrary to the above, on April 5, 2006, measures were not adequate to assure that the design changes (PIC 65340) for routing cables in flexible conduit and relocating the cables to a separate terminal block six inches from Division I cables were correctly translated into work instructions. As a result, DCN 51090, Stages 83 and 84, and PIC 65340 were incorrectly implemented and closed, and the as-constructed drawings issued, without the criteria for divisional separation being met. A Severity Level IV Violation was identified against the criteria in Supplement II, Facility Construction, of the NRC Enforcement Policy. This violation is being treated as an NCV, consistent with Section VI.A of the NRC Enforcement Policy, NCV 05000259/2006012-02, Measures Were Not Adequate to Assure that Cables for 480-V MOV Boards 1A and 1B in Panel 1-9-23 Bay 8 Were Separated. This issue was documented by the licensee in PER 101868.

c. Conclusions

A Severity Level IV NCV was identified for failure to comply with 10 CFR 50, Appendix B, Criterion III, in that, measures were not adequate to ensure that the design change output documents for relocating Division II cables to a separate terminal block six inches from Division I cables in Panel 1-9-23 Bay 8 were correctly translated into

Enclosure

work instructions. This resulted in the as-built terminal block configuration of the plant deviating from design drawings. Based on the above violation, in addition to the small sample of completed activities in these areas, additional inspections will be required to determine if the Cable Separation Issues Special Program is being implemented satisfactorily.

#### Corrective Actions

The inspectors performed walkdowns related to the following PERS: 102771 (Cable jacket damage and LB conduit) and 102329 (Cable installation on improper side).

The inspectors identified no significant examples in which the corrective action program has not been effective at identification and resolution of issues related to cable separation issues.

### **V. Management Meetings**

#### **X1 Exit Meeting Summary**

On May 12, 2006, the inspectors presented the cable installation and separation inspection results to Mr. Phil Gilbert and other members of his staff, who acknowledged the results presented.

On June 2, 2006, the lead inspector presented the remaining inspection results to Mr. M. Bajestani and other members of the BFNP and TVA staff, who acknowledged the findings.

The inspectors confirmed that proprietary information which was examined during the inspection was not retained and is not included in this inspection report.

## SUPPLEMENTAL INFORMATION

### KEY POINTS OF CONTACT

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M. Bennett, Quality Engineer, TVA  
C. Boschetti, BFNP U2/3 Design Engineering Electrical / Instrumentation & Controls  
J. Boykin, Quality Engineer, TVA  
D. Burrell, BFNP, U1 Electrical Engineering Lead  
J. Burton, BFNP U2/3 Design Engineering  
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R. Chadwell, BFNP Operations Superintendent  
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### INSPECTION PROCEDURES USED

IP 37550 Engineering  
 IP 92701 Followup

### LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

#### Opened

05000259/2006012-01	URI	Feasibility and Reliability of Local Manual Operator Actions to Achieve Safe Shutdown (Section E1.3)
05000259/2006012-02	NCV	Measures Were Not Adequate to Assure that Cables for 480-V MOV Boards 1A and 1B in Panel 1-9-23 Bay 8 Were Separated (Section E1.4)

#### Closed

05000259/2005016-01	URI	Use of Local Manual Operator Actions to Achieve Safe Shutdown (Section E1.1)
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### LIST OF DOCUMENTS REVIEWED

#### Licensing Bases Documents

SERs dated December 8, 1988; March 6, 1991; March 31, 1993; November 2, 1995; and SER Supplement dated November 3, 1989  
 Browns Ferry Nuclear Plant Units 2 and 3 Fire Protection Report, Volume 1, Rev. 31  
 Browns Ferry Nuclear Plant Units 1, 2, and 3 draft Fire Protection Report, draft Rev. 31  
 Safe Shutdown Analysis Section 3 (Rev. 35 draft) for fire zones 1-1,1-5, fire area 25I and 25II

#### Procedures

Emergency Plan Implementing Procedures (EPIP)  
 EPIP-17, Fire Emergency Procedure, Rev. 29  
 Safe Shutdown Instructions (SSI)

0-SSI-001, Safe Shutdown Instructions, Rev. 0000B  
 0-SSI-1-1, Unit 1 Reactor Building Fire El. 519 through 565 West of Column Line R4, Rev.000B  
 0-SSI-1-5, Unit 1 Reactor Building Fire El.621 and 639 North of Column Line R, Rev.0000B  
 0-SSI-25II, Turbine Building, Cable Tunnel, Intake Pumping Station and Radwaste Building,  
 Rev. 000B

#### Miscellaneous

Significance Determination Process Evaluation of Fire Scenarios for Appendix R III.G.2  
 Areas at Browns Ferry Nuclear Plant Unit 1, 2 and 3  
 ED-Q0999-2003-0048, Units 1, 2, and 3 Appendix R Manual Action Requirements, Rev. 2  
 NRC Inspection Procedure 71111.05T Fire Protection Triennial  
 BFNP Operations Log Shift Roster for Day Shift for 04/01/06 and 05/29/06  
 Federal Register Notice Vol 71, No. 43, Monday March 6, 2006, 11169, (NRC 10CFR50 RIN  
 3150 AH54 Fire Protection Program - Post-Fire Operator Manual Actions)

#### Problem Evaluation Reports

101631, Appendix R III.G.2 Operator Manual Actions  
 104418, Significance Determination Process Evaluation of Fire Scenarios for Appendix R  
 10475, URI 05000259/2006012-01 Operator Manual Action Feasibility and Reliability

#### Correspondence

TVA Letter, Browns Ferry Nuclear Plant (BFNP) - Units 1, 2 and 3 Fire Protection Program -  
 Post-Fire Operator Manual Actions, dated April 24, 2006

#### Section E1.4: Special Program Activities - Cable Installation and Cable Separation

#### External Issues

Cables Reviewed: 1PC202, 1PC236-I, 1PC436-II, 1PL3851, 1ES3926-II, 1ES3966-II,  
 1PC86-IIA, 1PC161-IIB

#### Internal Issues

Wires Reviewed: AA48, AA49, AA64, AA65, AA52, AA53, AA72, AA73  
 Cables Reviewed: PL2817-II, PL2824-II, 1ES5915-I, 1ES5917-I, 1ES5789-I, 1ES5790-II,  
 1PC518-II, 1ES-5152, 1CR2215, 1R4025, 1R4026, 1ES55608I, 1PP9872, 0PP1883,  
 0PP1885, AS6854, 0ES6064-I, 0ES6065-I 0PP1882, 1ES5243-I, 1ES5245-I, 1ES5604-  
 I, 1ES-5790-II, 1ES5917-I, 1PC5171, 1PC518-II, 1ES1434-I, 1ES181-IS2, 1ES2411-I,  
 1ES24II-I, 1ES2532-II, 1ES3450-II, 1ES4455-II

#### Procedures and Standards

BFN-50-728, DCD Physical Independence of Electrical Systems, Rev. 16  
 BFN-50-758, Power, Control, and Signal Cables for Use in Class 1 Structures, Rev. 15  
 BFN-50-7001, DCD Main Steam System, Rev. 19  
 BFN-50-7064D, DCD Primary Containment Isolation System, Rev. 11  
 G-38, Installation, Modification and Maintenance of Insulated Cables Rated up to 15,000 Volts,  
 Rev. 20

G-40, Installation, Modification and Maintenance of Electrical Conduit, Cable Trays, Boxes, Containment Electrical Penetrations, Electric Conductor Seal Assemblies, Lighting and Miscellaneous Systems, Rev. 15  
 MAI-3.2, Cable Pulling for Insulated Cables Rated up to 15KV Units 1, 2, and 3, Rev. 41  
 MAI-1.3, General Requirements for Modification, Rev. 21

#### Work Order Packages

04720414-53, Lift/Reland Diesel Auxiliary Board "B", Transfer SW Normal Feeder Control Circuit Cable PL2824 and Replace Associated Internal Wiring  
 04-720414-51, Replace Control Circuit Cable for the Normal Feeder Breaker on the A Diesel Auxiliary Board, System 82, and Associated Internal Wiring  
 03-004725-06, Determinate Existing Cables, Re-label as Abandoned, Terminate New Cables, and Label New Cables to Panel 1-LPNL-925-32 for the Unit Preferred 120V AC, System 252  
 03-005963-047, Installation of Conduits and Junction Boxes  
 02-011686-09, complete final cable terminations to Primary Containment Isolation System (PCIS), in MCR Panel 1-LPNL-9-3A, Channel A, System 64D  
 02-016202-53, pull, install, and terminate cables in Panels 25-45A, 45B, and 45C for Core Spray, System 75

#### Calculations

EDQ199920030061, Appendix G - Board/Panel Separation Analysis  
 EDQ199920030061, Appendix A - PCIS Isolation Valve List  
 EDQ199920030061, Appendix C Control Board List , Rev. 0  
 EDQ199920030061, Appendix D Control Board List , Rev. 0  
 EDQ199920030061, Appendix F Control Board List , Rev. 0  
 EDQ0999910078, External Cable Separation Analysis, Rev. 8  
 EDQ0999910078, Attachment 235 External Cable Separation Analysis, Rev. 8

#### DCNs

51016, Modify U1 R.R., Core Spray Initiation and Load Shed Logic  
 51194, Unit 1 Recovery Reactor Building Mechanical Lead System 069  
 51211, BFNP U1 Restart-Electrical Lead DCN-System 001  
 51216, LPCI MG Set Normal Supply Cable Spared  
 51216, LPCI MG Set Normal Supply Cable Abandoned  
 51223, BFNP U1 Restart-Electrical Lead DCN-System 075  
 51081, By-Pass Steam3 Line Low Pressure Cable Reroute, Stage 01, 03  
 51082, I&C Lead DCN - System 261 - Unit 1 ICS and Plant Computer Installment  
 51090, BFNP U1 Restart-Electrical Lead DCN-System 57-4-480V Electrical Distribution (CB Bldg), Stage 15

#### Problem Evaluation Reports Reviewed

76950, Relay CB63-73-3 To be Enclosed for Division Separation  
 76251, Cable ES125-1 (RHR 1A power feed) cannot be routed as designed  
 99297, Cable Bend Radius Violation  
 99464, Cable Jacket Damage  
 100642, Conduit Installations are not per Design Output Documents  
 101215, MAI-3.2 Does not Provide Clear, Precise Information for Cable Pullbys  
 101310, Cable Tray Siderail Edge Protection Missing

100860, Cable Pullby Without Authorization  
 102771, Cable jacket damage and pulling through LB  
 102329, Cable installation on improper side

Post Issuance Change (PIC):

65340, Completed 11/03/05,  
 65201, Completed 01/17/06  
 66347, Completed 02/06/06

Problem Evaluation Reports

101868, DCN 51090 Stages 83, 84 Separations  
 102752, Extent of Condition  
 102929, Closed to PER 76950

02-012185-000, 50.59 Review for Unit 1 DCN 51099 which was Prepared and Reviewed  
 10/01/02

Drawings

0-55N627-1, Wiring Diagram Diesel Generators C & D Main Control Board Panel 8 DCA 51090-654, Rev. 06  
 0-55N627-4, Wiring Diagram Diesel Generators C & D Main Control Board Panel 8 DCA 51090-653, Rev. 00  
 0-55N627-5, Wiring Diagram Diesel Generators C & D Main Control Board Panel 8 DCA 51090-653, Rev. 04  
 0-55N627-5, Wiring Diagram Diesel Generators C & D Main Control Board Panel 8 DCA 51090-658, Rev. 04  
 0-55N627-5, Wiring Diagram Diesel Generators C & D Main Control Board Panel 8, Rev. 4  
 1-791E342-3, DCA 51016-30 Rev. 0  
 1-730E920-7, DCA 51016-52, Rev. 6  
 1-791E343-3, DCA 51016-105, Rev. 0  
 45N1641-3, DCA 51081-346, Rev. RC AC  
 45W1686-5, DCA 51076-092, Rev. 7  
 1-45N1671-3, DCA 51076-094, Rev. 1  
 1-45N1671-3, DCA 51081-158, Rev. R1 CC  
 1-45N1668, DCA 51081-156, Rev. R0 CC  
 1-45N1668, DCA 51081-136, Rev. R0 CC  
 1-45N1671-4 DCA 51081-347, Rev. R2 CC

Miscellaneous Documents

EX-BFN-728-33, Physical Independence of Electrical Systems Exception, Rev. 1  
 EX-BFN-728-37, Physical Independence of Electrical Systems Exception, Rev. 1  
 EX-BFN-728-43, Physical Independence of Electrical Systems Exception, Rev. 1  
 IEEE Std. 279-1971, Criteria for Protection Systems for Nuclear Power Generating Stations  
 LER 88-032-01, Electrical Separation Requirements Violated Due to Inadequate DesignControl

Regulatory Guide 1.75, Criteria for Independence of Electrical Safety Systems, Rev. 3  
 Inspection Report 259/2004-07  
 Inspection Report 259/2004-09  
 Inspection Report 259/2005-08  
 Inspection Report 259/2005-09

### ACRONYMS

10 CFR 50	Title 10, Part 50 of the Code of Federal Regulations
BFNP	Browns Ferry Nuclear Plant
CAP	Corrective Action Program
CCDP	Conditional Core Damage Probabilities
CS	Core Spray
DCN	Design Change Notice
DRS	Division of Reactor Safety
EB	Engineering Branch
EPIP	Emergency Plan Implementing Procedures
FRN	Federal Register Notice
ICRDS	Integrated Cable and Raceway Design System
IMC	Inspection Manual Chapter
LER	Licensee Event Report
MCR	Main Control Room
NCV	Non-Cited Violation
NRC	United States Nuclear Regulatory Commission
NRR	Nuclear Reactor Regulation
OMA	Operator Manual Action
PER	Problem Evaluation Report
RHR	Residual Heat Removal
RII	Region II
SDP	Significant Determination Process
SER	Safety Evaluation Report
SSD	Safe Shutdown
SSI	Safe Shut-down Instructions
TVA	Tennessee Valley Authority
URI	Unresolved Item
V	Volts
WO	Work Order