UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W., SUITE 2900
ATLANTA, GEORGIA 30323-0199

August 17, 1995

Report Nos.: 50-259/95-42, 50-260/95-42, and 50-296/95-42

Licensee: Tennessee Valley Authority
6N 38A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Docket Nos.: 50-259, 50-260, and 50-296

License Nos.: DPR-33, DPR 52, and DPR-68

Facility Name: Browns Ferry 1, 2 and 3

Inspection Conducted: July 17-21, 1995

Inspector: Wade T. Loo 8/10/95
W. T. Loo Date Signed

Approved by: William H. Rankin 8/14/95
W. H. Rankin, Chief Date Signed
Facilities Radiation Protection Section
Radiological Protection and Emergency Preparedness Branch
Division of Radiation Safety and Safeguards

SUMMARY

Scope:

This special, announced inspection reviewed Area Radiation Monitoring System operations associated with Unit 3 restart to include a review of the licensee's Area Radiation Monitors, Continuous Air Particulate Monitors, and status of specific NUREG-0737 Three Mile Island Action Items. In addition, issues associated with the Radiological Control Unit 3 Restart Punch List were reviewed.

Results:

Based on interviews with licensee personnel, records review and observations of specific Area Radiation Monitoring Systems, the inspector found that the licensee continued to conduct work activities to complete the installation, testing and calibration of area radiation monitors and continuous air particulate monitors for Unit 3 restart. In addition, the licensee continued to monitor the progress of work activities associated with the installation of containment high range monitors. At the time of the onsite inspection, the licensee had completed the installation, testing and calibration of Unit 3 area radiation monitors while continuous air particulate monitor work activities were still ongoing. The licensee had received two of the

9508280257 950817
PDR ADOCK 05000259
Q PDR

containment high range monitors ready for installation in Unit 3 drywell while waiting for the other two instruments to be repaired, calibrated and tested from an outside vendor. The licensee continued to complete work activities associated with the Radiological Control Unit 3 Restart Punch List. At the time of the onsite inspection the licensee had completed eight of the twelve items on the Punch List. The licensee appeared to be on schedule for completing the installation, testing and calibration of radiation monitors associated with Unit 3 restart as well as those items on the Punch List. Also, the inspector reviewed the licensee's equipment and instrument inventory and found the licensee's inventory to be adequate to support Unit 3 restart.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

*D. Burrell, Lead Electrical Engineer
A. Burzese, Technical Training Instructor, Training
*R. Coleman, Radiation Protection Manager, RadCon
J. Corey, Radiological Control and Chemistry Manager
*C. Crane, Assistant Plant Manager
*T. Dexter, Training Manager
*R. Gilbert, Operations
R. Givens, Systems Engineer, Technical Support
*J. Gomez, Principal Electrical Engineer
*B. Kerstetler, Operations
*R. Machon, Site Vice-President
*P. Salas, Licensing Manager
*R. Shadrick, Maintenance
*T. Shriver, Nuclear Assurance and Licensing Manager
*R. Simpkins, Radiation Protection Supervisor, RadCon
F. Spivey, ALARA Supervisor, RadCon
*D. Stinson, U3 Recovery Manager
J. Wallace, Compliance Engineer, Licensing
*S. Wetzel, Acting Compliance Manager, Licensing
*H. Williams, Engineering and Material Manager

Other licensee employees contacted during the inspection included technicians, maintenance personnel and administrative personnel.

Nuclear Regulatory Commission

*P. Fillion, Reactor Inspector
*A. Fresco, Research Engineer, Brookhaven National Laboratory
*J. Munday, Resident Inspector
*R. Musser, Resident Inspector
*G. Wiseman, Reactor Inspector

*Attended July 21, 1995 Exit Meeting

Abbreviations and Acronyms used throughout this report are defined in the last paragraph.

2. Radiation Monitoring Systems (83727)

Section 7.13, titled "Area Radiation Monitoring System" of the Browns Ferry Nuclear Plant FSAR, Amendment No. 12, provides the ARMS design bases, descriptions, inspection and test requirements, system characteristics, and monitoring and power supply design conditions.

Section 7.13.5.2, titled "Power Generation Design Basis" of the Browns Ferry Nuclear Plant FSAR, Amendment No. 12, requires, in part, that additional Area Monitoring Systems provide operations personnel with alarms locally and in the Main Control Room of the presence of radiation levels in excess of pre-established limits based on the particular system design. Additional Area Monitoring Systems include Air Particulate Monitoring Subsystems, Local Radiation Subsystems, Personnel Contamination Monitor Subsystems, Portal Monitoring Subsystems, and Door Access Control Subsystems.

Through discussions with licensee representatives and a review of applicable records, the inspector reviewed the licensee's FSAR commitments for U3 ARMS. Through those discussions, reviews and observations, the inspector determined that the licensee maintained personnel contamination monitors and exit portal monitors at different locations throughout the licensee's facility for monitoring personnel contamination. Based on further discussions with licensee representatives, the inspector noted that these additional ARMS were not designed to alarm in the Control Room such as the U3 ARMs and CAMs. This appeared inconsistent to the FSAR description but consistent with industry practice. Licensee representatives stated that the FSAR commitment needed clarification with regards to what ARMS alarmed in the Control Room. As a result, the licensee initiated a Problem Evaluation Report, No. BFPER950873, to clarify in the FSAR what additional ARMS should alarm in the Control Room. This clarification will adequately address the inspector's observations.

Through further discussions with licensee representatives and reviews of applicable records, the inspector determined that the licensee had completed the installation, testing and calibration for 31 ARMs associated with U3 Reactor and Turbine Buildings. The inspector conducted a tour of the U3 Reactor and Turbine Building and observed that ARMs had been adequately installed in various locations of the buildings. For those ARMs observed the inspector reviewed the calibration records and determined that the ARMs had been calibrated by licensee personnel as documented in licensee Work Order No. 94-10393-00. Also, the inspector noted that eight of the nine CAMs for U3 had completed installation, testing and calibration; however, licensee representatives informed the inspector that one CAM had an outstanding work order. The inspector informed licensee representatives that the adequacy of installation and operability for those CAMs would be reviewed during future inspections of RadCon issues for U3 restart.

No violations or deviations were identified in this area.

3. TMI Action Plan Item II.F.1.2.c (Containment High Range Monitors)

NUREG-0737, TMI Action Plan Item II.F.1.2.c, Attachment 3, titled "Containment High-Range Radiation Monitor," requires, in part, that the licensee install two containment radiation-level monitors with a maximum range of 10^8 rads per hour, physically separated, and developed and qualified to function in an accident environment.

NUREG-1435, TMI Action Plan Item II.F.1, titled "Accident Monitoring," requires, in part, that the licensee have the capability to monitor accident conditions and install accident monitoring instruments to include containment high range monitoring for beta/gamma: 1 to 10^8 rad/hr, or gamma only: 1 to 10^7 roentgen per hour.

During discussions with licensee representatives and from a review of applicable records, the inspector determined that two of the four CHRMs had been received by the licensee since the last onsite NRC inspection of this program area as documented in IR No. 50-259, 260, and 296/95-33, dated July 6, 1995. Through discussions with licensee representatives, the inspector was informed that the two CHRMs, Serial Nos. 6,583,698 and 6,583,699, would be installed in the U3 drywell. The inspector reviewed applicable calibration records for the two CHRMs and determined that they had been sent to an outside vendor for testing to ensure that they met the TSs as outlined in the manufacturer's "Operation and Maintenance Instruction" for Gamma Sensitive Ion Chamber 237X731G010. The vendor's "Test Data Report," dated June 1, 1995, indicated the test results for the following:

- Insulation Resistance - collector to case, high voltage to case and high voltage to collector;
- Capacitance - collector to case and high voltage to case;
- Gamma Sensitivity; and
- Withstand Voltage.

The inspector reviewed the vendor's test data and determined that the results met the manufacturer's TSs for the two CHRMs. In addition, the inspector reviewed the vendor's graph depicting Current Versus High Voltage for specific gamma field strengths and determined that they met the manufacturer's similar graph for the ion chambers at a similar gamma flux. The inspector concluded the monitors meet the required specification of $1x10^7$ roentgens per hour for gamma only. During further discussions with licensee representatives, the inspector was informed that the other two CHRMS would be installed in U3 upper containment. Licensee representatives stated that all four CHRMs would

be installed, tested and source checked by the end of August, 1995. The inspector informed licensee representatives that the completion of CHRM installations would be reviewed during future inspections prior to U3 restart.

No violations or deviations were identified in this area.

4. RadCon Unit 3 Restart Punch List (83727)

Through discussions with licensee representatives and a review of various records available at the time of the onsite inspection, the inspector determined that the licensee continued to address those items associated with the RadCon U3 Restart Punch List. During those discussions and reviews the inspector noted that the licensee had revised the original list and divided the items into two areas. One area identified items that RadCon had direct responsibility for completion for U3 restart. The other area identified items where other organizations had work activities that indirectly impacted areas of RadCon concern. Of those seven items that RadCon had direct responsibility for, five had been completed as noted below:

- U3 TS and FSAR Review (RadCon Related)

  Licensee representatives reviewed U3 TSs and FSAR commitments and determined that the FSAR was descriptive of site processes and not unit specific; therefore, specific revisions were not necessary to accommodate U3 restart since the FSAR commitments applied to all three units which included U2, an operating unit.

- Ensure Adequate Instrument and Equipment Inventory

  The licensee completed an inventory of RadCon instruments and equipment available for use. Previously, the licensee conducted U2 RFOs and U3 recovery activities simultaneously. During those time periods, the licensee's instrument and equipment inventory was adequate for the large amount of work activities performed and required RadCon job coverage. Upon U3 restart the licensee anticipated conducting less work activities as well as RadCon job coverage for U3 than for those work activities in previous years involving U3 recovery. In addition, an inventory of instruments was available from the licensee's Western Area Radiological Laboratory facility in the event additional instrumentation would be needed for additional work activities and RadCon job coverage.

- Restart Survey Procedure

  The licensee developed restart survey procedures as documented in RCI 1.1, titled "Field Operations Program Implementation," Rev. 38, dated June 28, 1995. Implementing Procedure No. 13

specifically addresses U3 RadCon start-up surveys to include survey points and methods. The licensee planned to implement the procedure and conduct those surveys when appropriate during U3 power ascension.

- Procedure Review (RadCon, Operations, Maintenance; - High Radiation Controls)

  RadCon personnel conducted a review of site procedures for different program areas and their applicability for U3 restart. The licensee completed that procedural review on May 30, 1995, and found the procedures contain appropriate and suitable precautions for HRA controls and work in the radiologically control area.

- EPRI BRAC Point Base Line Survey

  RadCon Personnel completed those surveys associated with U3 on June 30, 1995, and documented those survey results in a RadCon document titled "Primary System Characteristics Unit 3 Beginning of Cycle 7." In general, licensee representatives found the survey results to be consistent with the EPRI BRAC Point Base Line Survey references.

The two other RadCon items were still in the progress of being completed; however, the item for "Decon All Possible Areas" would be an ongoing item since it would be an effort by the licensee for conducting decontamination of U3 work areas during recovery, restart, and future activities.

For those items where RadCon did not have direct responsibility for closure, three of the five items had been completed by other organizations as noted below:

- RWCU and RHR Decontamination Taps

  The licensee installed decontamination connections on RWCU and RHR piping to reduce personnel dose associated with work activities in those areas. The licensee completed those installations on May 22, 1995, as documented in DCN No. T32776A and attached Forms SSP-83, titled "Modification Work Completion Statement."

- Replace 37 CRB Control Cells (Cobalt Reduction)

  The licensee replaced 37 CRBs which resulted in an effort to reduce source term. The licensee completed those replacements on May 22, 1995, as documented in Work Order No. 95-05142-00.

- REXS Turbine Building Communications

  The licensee's REXS required additional installation of equipment for U3 in the Turbine Building. The licensee completed those installations on April 24, 1995, as documented in DCN No. W20039A and attached Form SSP-83, titled "Modification Work Completion Statement."

Through discussions with licensee representatives and a review of applicable records, the inspector determined that the licensee was in the process of developing a procedure for U3 restart titled "Browns Ferry Nuclear Plant (BFN) - Unit 3 Power Ascension Test Program." In that draft procedure the licensee referenced the following GOIs:

- 3-GOI-100-1A, titled "Unit Startup from Cold Shutdown to Power Operation and Return to Full Power from Power Reductions," Rev. 1, dated June 30, 1995;

- 3-GOI-100-1B, titled "Unit Startup from Cold Shutdown to Hot Standby," Rev. 1, dated June 30, 1995; and

- 3-GOI-100-1C, titled "Unit Startup from Hot Standby to Power Operation," Rev. 1, dated June 30, 1995.

The inspector discussed with RadCon representatives their role in conducting restart surveys associated with those procedures. During those discussions and review of procedures, the inspector determined that the procedures referenced work activities not associated with RadCon. Through those discussions and reviews the inspector was informed by licensee representatives that the procedural references were administrative errors. As a result, the licensee initiated an Operations Procedure Change Request, dated July 19, 1995, to change the procedural references to reflect the correct assigned RadCon work activities.

The inspector reviewed the applicable documents associated with the closure of the above Punch List items and discussed those items with cognizant licensee representatives. Through those discussions, reviews and observations of related work activities, the inspector determined that the licensee adequately conducted reviews and work activities associated with the closure of the above Punch List items. The inspector noted no concerns with those reviews and work activities except for one item associated with procedure reviews as discussed above. In addition, the inspector noted that licensee activities were still ongoing for completion of the remaining items on the Punch List. The inspector informed licensee representatives that the completion of those items would be reviewed during future inspections of RadCon issues for U3 restart.

No violations or deviations were identified in this area.

5. Facilities and Equipment (83727)

a. Facility Design Changes

Section 3.1.C.1 of SSP 9.3, titled "Plant Modifications and Design Change Control," Rev. 18, dated March 23, 1995, states, in part, that DCN packages are developed in accordance with BFEP PI 89-06.

BFEP PI 89-06, titled "Design Change Control," Rev. 14, dated December 16, 1994, states, in part, that an ALARA Screening Review be completed for applicable DCN types.

Through discussions with licensee representatives and review of applicable records, the inspector determined that for applicable U3 DCNs the ALARA staff was included on the review board. This allowed the ALARA staff to ensure that ALARA concerns would be addressed for U3 activities associated with the applicable DCNs. The inspector reviewed various U3 DCNs associated with HRAs and hot spots. Through those discussions and reviews the inspector determined that the licensee began tracking hot spots for U3 on or about February 1991. At that time the licensee identified 52 hot spots. As a result of DCNs initiated for work activities associated with U3 recovery the licensee eliminated 33 hot spots. The inspector concluded that for 25 of the 33 hot spots removed, ALARA concerns played a role in their removal. Also, the inspector reviewed additional DCNs and did not identify any potential for the creation of new HRAs or hot spots.

b. Equipment

Section 7.15, titled "Health Physics Laboratory Radiation Monitoring Equipment" of the Browns Ferry Nuclear Plant FSAR, Amendment No. 12, requires, in part, that the licensee maintain sufficient quantities of operational, portable health physics radiation survey instruments capable of detection radiation types and intensities expected at BFN.

Through discussions with licensee representatives and a review of applicable records, the inspector determined that the licensee maintained a listing of available personnel radiation protection equipment at BFN to include portable radiation detection and measurement survey instruments, respiratory protective equipment, personnel contamination and tool monitors, portable CAMs and dosimetry. In addition, the licensee maintained a listing of available portable radiation detection and measurement survey instrumentation and air samplers available to BFN from the licensee's Western Area Radiological Laboratory facility. As discussed above in paragraph 4, the licensee maintained adequate instrumentation while conducting Unit 2 RFOs and U3 recovery activities simultaneously. Based on discussions, reviews and

previous NRC evaluations of adequate RadCon job coverage for U2 RFO and U3 recovery activities, the inspector determined that the licensee maintained an adequate RadCon instrument and equipment inventory to support U3 restart.

c. Training

Through discussions with licensee representatives and a review of applicable records, the inspector determined that the licensee conducted training on the use of newly acquired RadCon instrumentation through continuing training or on an as needed basis. Also, the inspector determined that most training on licensee instrumentation maintained at the facility had been conducted several years ago. The inspector concluded that through continuing use of instrumentation, the RadCon technicians were prepared for U3 restart.

No violations or deviations were identified in this area.

6. Exit Meeting

At the conclusion of the onsite inspection on July 21, 1995, an exit meeting was held with those licensee representatives indicated in Paragraph 1 of this report. The inspector summarized the scope and findings of the inspection and indicated that no apparent violations or deviations had been identified. Licensee representatives did not indicate any of the information provided to the inspector during the inspection as proprietary in nature and no dissenting comments were received from the licensee.

7. Index of Abbreviations and Acronyms Used in this Report

ALARA	As Low As Reasonably Achievable
ARM	Area Radiation Monitor
ARMS	Area Radiation Monitoring System
BFEP	Browns Ferry Engineering Project
BFN	Browns Ferry Nuclear Plant
BRAC	BWR Radiation Assessment and Control
CAM	Continuous Air Particulate Monitor
CHRM	Containment High Range Monitor
CRB	Control Rod Blade
DCN	Design Change Notice
EPRI	Electric Power Research Institute
FSAR	Final Safety Analysis Report
GOI	General Operating Instruction
HRA	High Radiation Area
IR	Inspection Report
No.	Number
NRC	Nuclear Regulatory Commission
PI	Procedure Instruction
RadCon	Radiological Control
RCI	Radiological Control Instruction

Rev.	Revision
REXS	Radiation Exposure System
RFO	Refueling Outage
RHR	Residual Heat Removal
RWCU	Reactor Water Clean Up
SSP	Site Standard Practice
TMI	Three Mile Island
TS	Technical Specification
U2	Unit 2
U3	Unit 3