

**U.S. NUCLEAR REGULATORY COMMISSION**

**REGION II**

**Docket Nos:** 50-390, 50-391  
**License Nos:** NPF-90 and Construction Permit CPPR-92

**Report Nos:** 50-390/99-10, 50-391/99-10

**Licensee:** Tennessee Valley Authority

**Facility:** Watts Bar, Units 1 and 2

**Location:** 1260 Nuclear Plant Road  
Spring City TN 37381

**Dates:** November 7 through December 18, 1999

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Enclosure

## EXECUTIVE SUMMARY

### Watts Bar, Units 1 and 2 NRC Inspection Report 50-390/99-10, 50-391/99-10

This integrated inspection included aspects of licensee operations, maintenance, engineering, and plant support. The report covers a six-week period of resident inspection, a regional emergency preparedness inspection, a regional engineering inspection, and a regional security inspection.

#### Operations

- The conduct of operations was performed in a professional and safety conscious manner. Requirements were met for control room conduct and other areas reviewed such as turnovers, tagouts, documentation, staffing, and assistant unit operator activities (Section O1.1).
- An engineered safety feature system walkdown of portions of the auxiliary feedwater system and 120V vital DC power system identified system lineup, material condition, and housekeeping to be acceptable (Section O2.2).
- The Management Review Committee (MRC) exhibited a questioning attitude regarding corrective action plans and adequacy of immediate corrective actions for problems associated with problem evaluation report (PER) initiations. Corrective action plans were typically thorough, with occasional exceptions recognized and corrected by the MRC members. The licensee demonstrated a low threshold for initiation of PERs. The Human Performance Steering Committee and PER Coordinator Committees both appeared to be beneficial initiatives (Section O7.1).

#### Maintenance

- Maintenance and surveillance activities observed were adequately performed. Maintenance personnel were knowledgeable and carefully followed procedures to resolve plant equipment and component problems. Work performed was typically well documented (Section M1.1).
- The licensee properly implemented an adequate freeze protection program (Section M2.1).

#### Engineering

- Engineering activities reviewed were thorough and technically viable. Plant equipment problems were being addressed commensurate with plant safety (Section E1.1).
- Design change and temporary alteration activities were being conducted in a manner consistent with regulatory requirements (Section E1.2).
- 10 CFR 50.59 safety evaluation activities were being performed in accordance with regulatory requirements. The safety evaluations reached the correct conclusions concerning whether the proposed changes would compromise safety and whether an

unreviewed safety question was involved. Documentation of the safety evaluations was complete and readily retrievable (Section E1.3).

- Engineering support in the resolution of PERs was effective (Section E2.1).
- The operating experience program was working well and that the licensee's engineers were adequately evaluating and resolving the various problems discussed in the generic communications to maintain the design and licensing basis (Section E2.2).
- The engineering backlog was not excessive and was receiving appropriate management attention (Section E6.1).
- The licensee's self-assessment process was effective in identifying and resolving problems (Section E7.1).

#### Plant Support

- Radiological controls were adequate. Radiological areas were properly posted and high radiation areas were labeled. Personnel were attentive and followed requirements. The licensee provided thorough management oversight of chemistry results, and regulatory limits reviewed were met (Section R1.1).
- The licensee's overall performance in responding to the simulated emergency during the biennial exercise on November 17, 1999, was satisfactory, and the exercise was judged to be a successful demonstration of the licensee's emergency response capabilities (Section P4.2).
- Security personnel were attentive, followed requirements for access control, and barriers and zones were being adequately maintained (Section S1.1).
- The security alarm stations were appropriately equipped, manned, and operated in accordance with commitments and regulatory requirements and were capable of maintaining continuous onsite and offsite communications (Sections S1.2 and S1.3).
- The vehicle barrier system was functional, well maintained and met the commitments and regulatory requirements (Section 2.5).
- The licensee was in compliance concerning implementation of compensatory measures that were provided to effectively compensate for loss of security-related equipment (Section S2.6).
- The licensee's Security Training and Qualification Plan met the requirements of 10 CFR 50.54(p) (Section 3.1).

- **Licensee audits were thorough, complete, and effective. Audit findings and recommendations were appropriately reviewed, assigned, analyzed, and prioritized for corrective action. Corrective actions were technically adequate and timely. The audit/self-assessment program of the security program was comprehensive (Section S7.1).**

## Report Details

### Summary of Plant Status

Unit 1 began this inspection period operating in Mode 1 at 100 percent reactor power. Reactor power remained at 100 percent for the remainder of the inspection period.

Unit 2 remained in a suspended construction status.

### I. Operations

#### **O1 Conduct of Operations**

##### **O1.1 General Comments (71707)**

The inspectors conducted frequent inspections and reviews of ongoing plant operation. This included observation of routine control room (CR) crew activities and turnovers; review of logs, standing and night orders, CR staffing, and tagouts; and observation of assistant unit operator (AUO) activities.

The conduct of operations was professional and safety conscious. Requirements were met for CR conduct and other areas reviewed such as turnovers, tagouts, documentation, staffing, and AUO activities.

#### **O2 Operational Status of Facilities and Equipment**

##### **O2.2 Engineering Safety Feature System Walkdown (71707)**

The inspectors performed an engineered safety feature systems walkdown of the auxiliary feedwater and the 125 volt DC vital control power system. System lineup, material condition, and housekeeping were acceptable in all cases. No substantive concerns were identified as a result of this walkdown.

#### **O7 Quality Assurance In Operations**

##### **O7.1 Licensee Self-Assessment Activities (40500)**

The inspectors reviewed various self-assessment activities which included the following:

- Observation of Management Review Committee (MRC) meetings;
- Review of selected problem evaluation reports (PERs) for adequacy of corrective actions and implementation of procedural requirements;
- Review of PER initiations; and
- Observation of Human Performance Steering Committee and PER Coordinator Committee meetings.

The MRC exhibited a questioning attitude regarding corrective action plans and adequacy of immediate corrective actions for problems associated with PER initiations. Corrective action plans were typically thorough, with occasional exceptions recognized and corrected by the MRC members. The licensee demonstrated a low threshold for initiation of PERs. The Human Performance Steering Committee and PER Coordinator Committees both appeared to be beneficial initiatives. The Human Performance Steering Committee provided ongoing oversight of the status of improvement initiatives and served to develop new initiatives. Ongoing initiatives included training initiatives, a cultural survey, department performance indicators, and self-assessment reviews. The PER coordinators functioned to provide a critical review of selected PERs for lessons learned, discuss methods to improve PER processing and thoroughness of documentation, and provide feedback to their department personnel for lessons learned. Each department was represented on these committees.

## **II. Maintenance**

### **M1 Conduct of Maintenance**

#### **M1.1 General Comments**

##### **a. Inspection Scope (62707)**

The inspectors observed preplanned and emergent maintenance activities including all or portions of the following work orders (WOs) and surveillance instructions (SIs) and reviewed associated documentation:

- WO 99-09818-000, Battery Charger III Relay and Instrument Test PMUG 3137F
- WO 99-013607-000, Calibrate 1-RM-90-106 in accordance with IMI 90.003, 90 Day General Atomic Pig Monitor Flow Instrument Calibration, Revision 6

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

The inspectors observed the activities identified above and determined that personnel involved in the work were qualified and knowledgeable in the tasks being performed. The work instructions were observed being followed, and problems, if encountered during the performance of the work, were properly dispositioned. Work performed was also typically well-documented. Where appropriate, radiation control measures were in place.

##### **c. Conclusions**

Maintenance and surveillance activities observed were adequately performed. Maintenance personnel were knowledgeable and carefully followed procedures to resolve plant equipment and component problems. Work performed was typically well-documented.

**M2 Maintenance and Material Condition of Facilities and Equipment****M2.1 Freeze Protection Equipment****a. Inspection Scope (62707, 71707)**

The inspector reviewed the licensee procedure for confirmation of operability of freeze protection equipment (1-PI-OPS-1-FP, Freeze Protection, Revision 6), reviewed documentation of implementation of the procedure, reviewed results of a recent self-assessment of freeze protection, and observed freeze protection equipment in the field for higher risk significant systems. These systems included equipment in the intake pumping station such as essential raw cooling water pumps and fire pumps, the condensate storage tanks, the refueling water storage tank, and the diesel generators.

**b. Observations and Findings**

No significant problems were identified with the freeze protection procedure, and implementation was properly documented. The self-assessment was thorough, and corrective actions were performed regarding problems found. Freeze protection equipment was in good material condition and operating properly.

**c. Conclusions**

The licensee properly implemented an adequate freeze protection program.

**III. Engineering****E1 Conduct of Engineering****E1.1 General Observations (37551)**

The inspectors observed Engineering support activities for PER evaluations, review of plant equipment problems and associated corrective action plans, and MRC meetings. Engineering activities reviewed were thorough and technically viable. Plant equipment problems were being addressed commensurate with plant safety.

**E1.2 Design Changes and Plant Modifications (37550)****a. Inspection Scope**

The inspectors reviewed 23 completed design changes notices (DCNs) implemented in 1997, 1998 and 1999, and four temporary alteration control forms, some of which were currently installed (refer to report Attachment A for a listing of the specific items reviewed). The inspectors assessed the overall quality of each design change package and verified that they were consistent with the plant design and licensing basis.

b. Observations and Findings

The inspectors found that the scope and impact of the change were adequately described in the DCN package. The 10 CFR 50.59 screenings, safety assessments, and safety evaluations were judged to be technically adequate. With the exception of one minor deficiency noted in the checklist of M-DCN 39979, for which the licensee initiated PER 99-017148-000, the level of detail in the design change packages was appropriate to ensure proper installation and testing of the modification. The inspectors observed that the packages included marked up versions of the Updated Final Safety Analysis Report (UFSAR) and specified appropriate training requirements. The inspectors confirmed on a sampling basis that drawings and procedures were updated. The inspectors reviewed several completed post modification test results and agreed that the test demonstrated that the system performed as design. In addition, the inspectors observed that each of the design change packages had been reviewed and approved by the appropriate review organizations in accordance with program procedures.

The inspectors found that temporary alterations were being controlled in accordance with program procedures, and technically adequate 10 CFR 50.59 safety evaluations were performed. At the close of the inspection there were 4 temporary alterations installed in the plant, consisting of one welded and three injected on-line leak repairs. These items had not been installed for an excessive period of time.

c. Conclusions

The inspectors concluded that both design changes and temporary alterations were being conducted in a manner consistent with regulatory requirements.

E1.3 Review of Safety Evaluations

a. Inspection Scope (37550) (37001)

The inspectors reviewed a sample of recently completed safety evaluations which had been prepared pursuant to 10 CFR 50.59, "Changes, Tests and Experiments." For those specific safety evaluations reviewed, see Attachment A to this report.

b. Observations and Findings

By letter dated October 18, 1999, the licensee submitted a summary report of the implemented safety evaluations performed in accordance with 10 CFR 50.59 (b)(2) covering the period from October 21, 1997, to September 30, 1999. These safety evaluations were performed for changes to engineering specifications and procedures, maintenance and operating procedures, the UFSAR, and design changes. Safety evaluations were also performed in relation to work orders and PERs. The inspectors reviewed the summary report, except for the design change section, and selected a sample of about six safety evaluations related to UFSAR changes. Most of these covered multiple changes to an entire section of the UFSAR which had been generated by the UFSAR review and update program. In addition, the safety evaluations associated with the design changes referenced in Section E1.2 were also reviewed.



The inspectors found that the safety evaluations reviewed addressed whether the changes would alter the performance or integrity of any structure, system or component important to safety through answering detailed questions on the formal evaluation form. The potential effect of the proposed change on the ability of the operators to control and monitor the plant was considered. The inspectors found that the safety evaluations reviewed addressed potential failure modes. The inspectors noted that Technical Specification requirements and procedure impacts were discussed in relation to each proposed change. The impact on special programs was also considered. The inspectors found that the safety evaluations reviewed reached correct conclusions with regard to the considerations mentioned above.

The documentation of the safety evaluations included written statements for all the pertinent considerations. In some cases the detailed considerations were stored separate from the design change package. The inspectors considered this acceptable because the location was referenced within the main package, and the inspectors verified in a few examples that the documentation was readily retrievable from records storage. Documentation included a listing of all the identified applicable UFSAR sections. The evaluation packages were signed by the originator, the supervisor and reviewers from supporting organizations. Appropriate review and approval from the plant oversight committee was also confirmed.

c. Conclusions

The inspectors concluded that 10 CFR 50.59 safety evaluations were being performed in accordance with regulatory requirements. The safety evaluations reached the correct conclusions concerning whether the proposed changes would compromise safety and whether an unreviewed safety question was involved. Documentation of the safety evaluations was complete and readily retrievable.

**E2 Engineering Support of Facilities and Equipment**

**E2.1 Review of Problem Evaluation Reports (37550)**

a. Inspection Scope

The inspectors reviewed 40 PERs that included corrective actions assigned to Engineering (see report Attachment A for a list of the PERs reviewed). The inspectors evaluated the corrective actions using the guidance of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Action."

b. Observations and Findings

The inspectors verified through interviews of engineers and reviews of pertinent documentation that the corrective actions specified in the PERs were adequate to resolve the problems, and that the corrective actions were being performed in a timely manner based on safety significance.

c. Conclusions

The inspectors concluded that Engineering support in the resolution of PERs was effective.

E2.2 Review of Component Engineering and Operating Experience Information

a. Inspection Scope (37550)

The inspectors reviewed the licensee's evaluations for sample of nine NRC Information Notices and five Part 21 reports (refer to report Appendix for listing of the specific items). Seven of the information notices were issued in 1998 and two information notices and all the Part 21s were issued in 1999. The items selected for review dealt with equipment problems or system design problems. The acceptance criterion applied by the inspectors was that the licensee maintained the design basis in light of the potential problems described in the operating experience information.

b. Observations and Findings

The inspectors found that the information notices and Part 21 reports were managed at a central office in Chattanooga, TN, for all three TVA sites. The central office determined applicability to each site, and forwarded the applicable items to a site for review or information as marked on the transmittal sheet. Detailed evaluations were to be performed at the sites. The Watts Bar site had prepared evaluation files for all but one of the items in the inspectors' sample. The one item without a file was a Part 21 report from the Ginna nuclear plant. This report was readily accessible to the licensee on the NRC web site and was apparent to the inspectors that the issue involved did not require action at Watts Bar.

Through reviews of documents in the licensee's files and discussions with the licensee's engineering personnel, the inspectors found that the information notices and Part 21 reports had been adequately evaluated by the licensee. The inspectors found evidence of detailed evaluation in examples where the licensee expanded the scope of an issue beyond that originally described and where a manufacturer was contacted for additional details. For each information notice and Part 21, PERs had been initiated where appropriate and the corrective actions documented were thorough and timely.

c. Conclusions

After a review of the resolution of a sample of operating experience items, the inspectors concluded that the operating experience program was working well and that the licensee's engineers were adequately evaluating and resolving the various problems discussed in the generic communications to maintain the design and licensing basis.

## **E6 Engineering Organization and Administration**

### **E6.1 Engineering Backlog (37550)**

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

The inspectors reviewed the licensee's engineering backlog of open design changes, temporary design alterations, and engineering corrective action documents.

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

The backlog was being reported weekly in "Engineering & Support Status Reports." The current backlog (November 28, 1999) included:

- 110 open hardware design changes
- 82 open document design changes (e.g., corrections of drawings)
- 158 open corrective action resolution documents (PERs)
- 4 temporary design alterations

Status reports dating back to 1996 revealed no adverse trend in the backlog of open hardware changes. A review of the open corrective action documents found that 3 were initiated in 1997, 29 in 1998, and 126 in 1999. The inspectors reviewed the database descriptions of the 5 oldest assigned to engineering and found that the time for completion was appropriate for the problems being addressed.

#### **c. Conclusions**

The inspectors concluded that the engineering backlog was not excessive and was receiving appropriate management attention.

## **E7 Quality Assurance in Engineering Activities**

### **E7.1 Engineering Self Assessments**

#### **a. Inspection Scope (37550)**

The inspectors reviewed eight self-assessment reports selected from the list of annual assessments performed in 1998 and 1999 (for the specific reports reviewed see the Appendix to the report).

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

The self-assessment reports reviewed involved the Motor Operated Valve Program, 50.59 Safety Assessment/Safety Evaluation Program, Temporary Alteration Program, ASME Section XI Program, Procurement Engineering, Modification Process, EQ Program, and Conduct of Engineering. Two of the reports reviewed were still in draft because the assessments had just recently been completed. From the reports reviewed, no significant findings or reportability items had been identified by the licensee.

However, some findings did result in PERs being initiated. The scope and depth of the assessments appeared appropriate for the areas examined. The findings identified in the final reports were found to be properly identified and dispositioned through the corrective action program as PERs. The recommendations were also found to be properly tracked and dispositioned by the licensee. The self-assessment results were being reported to appropriate station management. The reports were found to be consistent with the self-assessment program procedures.

c. Conclusions

The inspectors concluded that the licensee's self-assessment process was effective in identifying and resolving problems.

**IV. Plant Support**

**R1 Radiological Protection and Chemistry (RP&C) Controls**

**R1.1 General Comments (71750)**

The inspectors routinely observed radiologically controlled areas to verify adequacy of access controls, locked areas, personnel monitoring, surveys, and postings. The inspectors also routinely reviewed primary and secondary chemistry results.

Radiological controls were adequate. Radiological areas were properly posted and high radiation areas were labeled. Personnel were attentive and followed requirements. The licensee provided thorough management oversight of chemistry results, and regulatory limits reviewed were met.

**P4 Staff Knowledge and Performance in Emergency Preparedness (EP)**

**P4.1 Review of Exercise Objectives and Scenarios for Power Reactors (82302)**

a. Inspection Scope

The inspectors reviewed the exercise scenario to determine if it was of sufficient detail and challenge to demonstrate exercise objectives and meet regulatory requirements.

b. Observations and Findings

The complete scenario package for the 1999 Watts Bar exercise, including the scope and objectives, was submitted to the NRC in advance of the exercise. The exercise scenario was judged to provide a sequence of simulated emergency conditions sufficiently detailed and challenging to demonstrate the designated objectives and test the licensee's onsite and offsite emergency organizations.

c. Conclusions

The licensee's submittals of the scope and objectives as well as the scenario package were timely and appropriate for this biennial emergency preparedness exercise.

P4.2 Evaluation of Exercises for Power Reactors (82301)

a. Inspection Scope

During the period November 15-19, 1999, the inspectors observed and evaluated the biennial, full-participation emergency preparedness exercise as well as selected activities related to the licensee's conduct and self-assessment of the exercise. Licensee activities inspected during the exercise included those occurring in the control room simulator (CRS), technical support center (TSC), operations support center (OSC), and central emergency control center (CECC). The inspectors evaluated licensee recognition of abnormal plant conditions, classification of emergency conditions, notification of offsite agencies, development of protective action recommendations, command and control, communications, adherence to Emergency Plan implementing procedures (EPIPs), and the overall implementation of the licensee's Emergency Plan. The exercise was conducted on November 17, 1999, from 9:00 a.m. to about 2:40 p.m.

b. Observations and Findings

Observations and findings for the various emergency response facilities and the exercise critique are discussed in the following paragraphs:

Control Room Simulator

The initiating event in this scenario commenced at about 9:10 a.m. and included a fire in a large truck delivering painting supplies. (For further details, see the narrative summary of the exercise scenario in Attachment B to this report.) The control room simulator shift manager (CRSSM) correctly classified the event and declared an Alert at 9:30 a.m. The CRSSM provided timely briefings on plant conditions and emergency declarations to the CRS crew and to plant personnel via public address system announcements. An effective formal briefing was provided by the CRSSM to the site emergency director (SED) stationed in the TSC, prior to the turnover of responsibility to the TSC.

Technical Support Center

The TSC was staffed expeditiously upon the declaration of an Alert. The TSC staff received the first of a series of frequent briefings on plant conditions at 9:56 a.m., at the time the TSC was activated. The briefings of the staff occurred at intervals of about 30 minutes and were effective in maintaining cognizance of events in progress. A site assembly, started at 10:21 a.m. and was reported to the TSC as being completed, at 10:34 a.m.

### Operations Support Center

The OSC was staffed expeditiously upon the declaration of an Alert. The briefings of the staff occurred at intervals of about 30 minutes and were effective in maintaining cognizance of events in progress. Repair teams were organized, briefed and dispatched.

### Central Emergency Control Center

In response to the Alert declaration at 9:30 a.m., the interim site emergency coordinator directed activation of the CECC via a telephone call to the operations duty specialist, who actuated the pagers for the CECC staff at 9:39 a.m. Required minimum staffing was expeditiously achieved, and the CECC was declared to be operational at 10:05 a.m. The primary responsibilities of the CECC were communications with offsite authorities, development of protective action recommendations (PARs) for the public, plant assessment, and radiological assessment.

Command and control of facility operations by the CECC director was commendable. Periodic briefings of the staff included input from the managers of each technical discipline. The CECC staff functioned efficiently and professionally. The plant assessment and radiological assessment teams provided strong technical support to the emergency response effort. Effective working relationships were observed between the licensee staff and the State representatives.

Notifications to offsite governmental agencies following the site area emergency and general emergency declarations were timely and accurate. Both the initial PAR (issued at 12:20 p.m.) and the upgraded PAR (issued at 12:40 p.m.) were timely and correct.

### Licensee Exercise Critique

Following the exercise, the licensee conducted facility critiques in which the players assessed their own performance and identified areas for improvement. The player critiques for the CRS, TSC, OSC, and CECC were observed to be thorough, open, and self-critical. On the day after the exercise, the licensee's controller/evaluator organization held detailed discussions, reviewed documentation, and conducted interviews as required to develop its critique results. On November 19, 1999, the emergency planning supervisor made a detailed presentation of the critique findings to licensee management.

### c. Conclusions

The licensee's overall performance in responding to the simulated emergency was satisfactory, and the exercise was judged to be a successful demonstration of the licensee's emergency response capabilities. The alert, site area emergency, and general emergency declarations were timely and correct, and all offsite notifications were initiated within 15 minutes. Command and control in each of the ERFs was effective. Staffing of emergency response facilities was timely.

**S1 Conduct of Security and Safeguards Activities****S1.1 General Observations (71750)**

The inspectors routinely observed security activities for conformance to requirements which included protected area barriers, isolation zones, personnel access, and package inspections. Security personnel were attentive, followed requirements for access control, and problems were not identified with barriers and zones.

**S1.2 Alarm Stations****a. Inspection Scope (81700)**

The inspector evaluated operation of the alarm stations against licensee commitments of the Physical Security and Contingency Plan (PSP), applicable security procedures, and NRC regulatory requirements.

**b. Observations and Findings**

The inspector observed operations of the central and secondary alarm stations and verified that the alarm stations were equipped with appropriate alarms, surveillance, and communications capabilities. Interviews with the alarm station operators found them knowledgeable of their duties and responsibilities. The inspector also verified, through observations and interviews, that the alarm stations were continuously manned, independent, and diverse so that no single act could remove the plant's capability for detecting a threat or calling for assistance. In addition, the inspector verified that alarm station personnel did not have any other activities that could interfere with their detection, assessment, and response functions. The alarm stations and other security systems had an uninterrupted power supply for emergencies.

**c. Conclusions**

The alarm stations were appropriately equipped, manned, and operated in accordance with the commitments and regulatory requirements.

**S1.3 Communication****a. Inspection Scope (81700)**

The inspector evaluated the alarm stations' communications capabilities against the licensee's commitments in the PSP, applicable security procedures, and NRC regulatory requirements.

**b. Observations and Findings**

The inspector verified by document reviews, observations, and discussions with alarm station operators, that the alarm station personnel were capable of maintaining continuous intercommunications, communications with each security force member on

duty, and were exercising communication methods with the local law enforcement agencies as committed to in the PSP. The three modes of communications onsite and offsite were radios, direct commercial telephone lines, and station telephones. On December 14, 1999, at 3:05 p.m., the inspector requested the Central Alarm Station operator to test the emergency call-out of officers. At 3:50 p.m., the call-out was completed. Eleven out of 51 off duty officers were available for response which is a sufficient number of officers to support a contingency event. Therefore, the licensee demonstrated that adequate officer response was available for emergencies.

c. Conclusions

The licensee's alarm stations were capable of maintaining continuous onsite and offsite communications according to the PSP commitments and regulatory requirements.

**S2 Status of Security Facilities and Equipment**

**S2.5 Vehicle Barrier System (VBS)**

a. Inspection Scope (81700)

The inspector evaluated the VBS to verify that it was in place and functioned according to the PSP.

b. Observations and Findings

The inspector verified the placement of the anchored jersey barriers, cables, rocks, and the active and passive vehicle gates of the VBS. The inspector evaluated the licensee's program for inspecting, testing, and maintenance of the VBS. The VBS quarterly inspection documentation verified that the licensee provided means for monitoring and maintaining the VBS.

c. Conclusions

The VSB was functional, well maintained, and met the PSP commitments and regulatory requirements.

**S2.6 Compensatory Measures**

a. Inspection Scope (81700)

The inspector evaluated the licensee's employment of compensatory measures when security equipment fails or its performance has been impaired and also verified that the compensatory measures employed do not reduce the effectiveness of the security that existed prior to the failure.



b. Observations and Findings

The inspector reviewed safeguards events and discussed with security management their understanding of the need to provide compensatory measures and how they determine if proper compensatory measures have been implemented in the event of security equipment failures.

c. Conclusions

The licensee was in compliance concerning implementation of compensatory measures that were provided to effectively compensate for loss of security-related equipment.

**S3 Security and Safeguards Procedures and Documentation**

**S3.1 Security Program Plans and Procedures**

a. Inspection Scope (81700)

The inspector reviewed the licensee's Training and Qualification Plan, Revision 3, dated September 20, 1999, against the provisions of 10 CFR 50.54(p).

b. Observations and Findings

The inspector reviewed a representative sample of revision 3 to the Training and Qualification Plan to verify the licensee's submittal met the requirements of 10 CFR 50.54(p).

c. Conclusions

The licensee's Training and Qualification Plan met requirements of 10 CFR 50.54(p).

**S7 Quality Assurance in Security and Safeguards Activities**

**S7.1 Audits/Self-Assessment Program**

a. Inspection Scope (81700)

The inspector evaluated the licensee's audit program against the commitments of the Physical Security/Contingency Plan. During the inspection, a representative sample of problems identified by audits was evaluated to determine whether reviews and analyses were appropriately assigned, analyzed, and prioritized for corrective action and whether corrective actions were technically adequate and performed in a timely manner.

b. Observations and Findings

The licensee's program commitments included auditing the security program at least every 12 months. The audits reviewed routine and contingency security procedures and practices. The reviews evaluated the effectiveness of the physical protection system

testing and maintenance program, access authorization, safeguards contingency plan implementation, training and qualification, central alarm station operation, storage of safeguards information, and access control. The inspector reviewed the annual audit SSA 9906, Security, dated December 13, 1999. Additionally, the security section had conducted eight self-assessments between October 1998 and September 1999. The audit reports concluded that the security program was effective and recommended actions to improve the performance of the security program. The licensee responded appropriately to the audit report recommendations. The audits and self-assessments were thorough, complete, and effective in identifying problems and there was good problem resolution of identified problems.

**c. Conclusions**

Licensee-conducted audits were thorough, complete, and effective. Audit findings and recommendations were appropriately reviewed, assigned, analyzed, and prioritized for corrective action. Corrective actions were technically adequate and timely. The audit/self-assessment program of the security program was comprehensive.

**V. Management Meetings**

**X1 Exit Meeting Summary**

The resident inspectors presented inspection findings and results to licensee management on December 17, 1999. The licensee acknowledged the findings presented.

The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

**PARTIAL LIST OF PERSONS CONTACTED**

**Licensee**

R. Beecken, Maintenance and Modifications Manager  
 D. Boone, Radiological Control Manager  
 L. Bryant, Assistant Plant Manager  
 S. Casteel, Radiological and Chemistry Control Manager  
 J. Cox, Training Manager  
 L. Hartley, Maintenance Rule Coordinator  
 M. King, Acting Chemistry Manager  
 D. Kulisek, Operations Manager  
 W. Lagergren, Plant Manager  
 B. Mays, Licensing  
 D. Nelson, Business and Work Performance Manager  
 P. Pace, Licensing and Industry Affairs Manager  
 R. Purcell, Site Vice President  
 J. Roden, Operations Superintendent  
 B. Schnetzler, Site Security Manager

S. Spencer, Site Nuclear Assurance Manager  
J. West, Assistant Plant Manager

**NRC**

P. Van Doorn, Senior Resident Inspector  
D. Rich, Resident Inspector

**INSPECTION PROCEDURES USED**

IP 37001	Modifications Needing NRC Approval
IP 37550	Engineering
IP 37551	Onsite Engineering
IP 40500	Effectiveness of Licensee Controls in Identifying, Resolving, and Preventing Problems
IP 61726	Surveillance Observations
IP 62700	Maintenance Program Implementation
IP 62707	Maintenance Observation
IP 71001	Re-qualification Inspection
IP 71707	Plant Operations
IP 71750	Plant Support Activities
IP 81700	Physical Security Program for Power Reactors
IP 82301	Evaluate EP Exercises For Power Reactors
IP 82302	Review Of Exercises And Scenarios For Power Reactors
IP 92901	Operations Follow up

**LIST OF DOCUMENTS REVIEWED****PROBLEM EVALUATION REPORTS GENERATED DUE TO ISSUES IDENTIFIED BY NRC**

99-017148-000 Improperly Completed Checklist

**DESIGN CHANGE NOTICES (DCNs)**

W-DCN 28623	Repair Support Anchor Bolts
W-DCN 32098	Revise Drain Trap Configuration
F-DCN 37123	Access Door Details Required
W-DCN 39024	Replace FAC Susceptible Pipe/Fittings
W-DCN 39026	Replace FAC Susceptible Pipe/Fittings
W-DCN 39409-A	Replace SOVs/EQ Improvement
M-DCN 39548-A	Adds Electronics and Readouts to Use New TSI Equipment
S-DCN 39692-A	Revise Environmental Dwgs 47E Series
M-DCN 39767-A	DG Motor Driven Governor Replacement
M-DCN 39608-A	Replace Containment Sump Level Transmitter
S-DCN 39829-B	WGA Drain Lines
S-DCN 39835-A	Revise Model No. of Voltage Regulator on Schematic Diagrams
W-DCN 39860	Provide Repair Details for Thimble Tubes
M-DCN 39979	Pipe Repair
E-DCN 50243	Provide Method for Evaluating Thimble Tube Wall Loss and Detail for Plugging Thimble Tube When it Is Required
D-DCN 50300	Replace with More Reliable Valve
D-DCN 50302-A	Replace K1 Relay on DG 1B-B with the K1 Relay from the 5 <sup>th</sup> DG
M-DCN 39265	Delete Negative Flux Rate Reactor Trip
S-DCN 50037	Hydrogen Recombiner - Design Document/UFSAR Discrepancies
E-DCN 50052	Drawing Change - Resistor in Diesel Generator Control Circuit
W-DCN 39812	Butterfly Valve Situation
W-DCN 40004	Eliminate Torque Switch in Valve Closing Circuit
D-DCN 50028	Replace Existing Valve with Unit 2 Valve

**TEMPORARY ALTERATION CHANGE FORMS**

1-99-8-41	Steam Generator Layup
1-99-11-27	Change Normal Backwash Setpoint for East Waterbox Outlet Strainer
1-99-12-61	Remove Plunger from 1-FSV-61-118 Internals to Provide Flow Path When Valve Is De-energized
1-99-2-26 R1	Install Temporary Plate in Steam Generator Layup Line

**PROBLEM EVALUATION REPORTS (PERs)**

99-003009-000	Blue Powder on Discharge of CRDM Fan
99-003085-000	Fitup of Weld Lug Removal Areas Not Inspected
99-003466-000	WBN Cycle 2 Incore Flux Thimble Eddy Current Data

99-004705-000	1-CKV-68-849 Failed LLRT
99-004747-000	Unapproved Chemicals Used on Tubes on Main Condenser
99-004792-000	Ten Cylinders of Weld Gas Tied off to Electrical Conduit
99-012255-000	Repair and Replacement Program Work Order Omission
99-012556-000	Repair and Replacement Program Work Order Omission
99-003393-000	Valve Overthrust Problem
99-011894-000	Valve Stroke Time Problem
99-004618-000	Throttling Valve Mispositioned Due to Incorrect Turns
99-002925-000	Relief Valves Not Set per ASME Requirements
99-006415-000	Loud Noise on Start of RHR Pump 1B
99-010592-000	Removal of Output Data for GL 89-10 from Drawing
99-012577-000	Work Order and DCN Could Not Be Performed as Written
99-002882-000	Valve Failed Stroke Time Acceptance Criterion
99-002900-000	Problem with MSIV Air Regulator
99-002902-000	Two CIVs Failed to Close Upon Phase B Isolation
99-002903-000	Water Found in Junction Box
99-003628-000	Three CIVs Failed to Close During Surveillance
99-003365-000	Problem With Thermal Barrier Booster Pump During Surveillance
99-003391-000	Wrong Crimp Tool Used on Electrical Terminal Lug (Level B)
99-003392-000	Raceway Radiant Energy Shield Breached (Level B)
99-003642-000	Alarm from Containment Pressure HI-HI Spray Actuate
99-003702-000	#14/16 Lugs Installed on #18 Stranded Wire
99-003794-000	Minimum Flow Valve for RHR Pump Cycling
99-004284-000	6900 V Breaker Failure
99-004718-000	Problem with Level Indicating Controller During Surveillance
99-004811-000	CRDM Fans Did Not Stay off Following Reset of Phase B Isolation Signal
99-004873-000	Conflicting Requirements Exist for the CRDM Coolers and the LCCs
99-004936-000	DG 2A-A Failed to Reach Rated Speed
99-004966-000	Untimely Revision to PER 99-003391-000
99-005425-000	Drawing Discrepancy - Molded-Case Circuit Breaker Size
99-006457-000	Untimely Corrective Action for Chiller Problem
99-006727-000	Wrong Size Molded-Case Breaker Installed
99-006733-000	Contacting Cover Found Not Latched
99-006776-000	PER 99-006733-000 Was Untimely
99-007157-000	Hydrogen Ignitor Failures (Level A)
99-008984-000	1A-A Diesel Generator 7 Day Tank Level Reading 5.3 ft, No Alarm
99-010848-000	DC Motor Driven Fuel Oil Pumps Failed to Start

### **SELF-ASSESSMENT REPORTS**

SA-98-02	Conduct of Engineering Self Assessment
SA 98-14	Temporary Alterations
JSA-99-01	50.59 Process
JSA-99-02	Modification Process (Draft Copy)
JSA-99-03	Environmental Qualification Program (Draft Copy)
JSA-99-04	ASME Section XI Program

JSA-99-05 Procurement Engineering (PEG)  
SA-99-12 Motor Operated Valve Program

### NRC INFORMATION NOTICES

99-17 Problems Associated With Post-Fire Safe-Shutdown Circuit Analysis  
98-03 Inadequate Verification of Overcurrent Trip Setpoints in Metal-Clad, Low-Voltage Circuit Breakers  
98-07 Offsite Power Reliability Challenges from Industry Deregulation  
98-19 Shaft Binding in General Electric Type SBM Control Switches  
98-22 Deficiencies Identified During NRC Design Inspections  
98-38 Metal-Clad Circuit Breaker Maintenance Issues Identified by NRC Inspections  
98-41 Spurious Shutdown of Emergency Diesel Generators from Design Oversight  
96-48 Supplement 1: Motor-Operated Valve Performance Issues  
88-23 Supplement 5, Potential for Gas Binding of High Pressure SI Pumps During a LOCA

### PART 21 REPORTS

C&D "L" Series Batteries, submitted by Cooper Plant  
Woodward EGM Controllers, submitted by Engine Systems, Inc., dated September 23, 1999  
Communications Instruments, Inc. Relay Style N0152CK, submitted by Foxboro Co., dated September 13, 1999  
ABB Circuit Breaker Trip Paddle Interference, submitted by V.C. Summer plant  
Eaton Co. Relay Style Nbfd65nr, submitted by Ginna plant

### CALCULATIONS

8573-6-005, "HVAC Typical Support," Revision 0  
8573-6-147, "HVAC Typical Support," Revision 0  
N3-78-01A, "Pipe Analysis Calculation," Revision 18  
WBNAPS3-088, "Dose on the Refueling Floor Without the Bioshield Blocks Installed at the Equipment Hatch," Revision 0

### PROCEDURES

SPP-1.6, "TVAN Self-Evaluation Program," Revision 0  
SPP-3.1, "Corrective Action Program," Revision 1  
SPP-9.3, "Plant Modification and Design Change Control," Revision 1W2

### OTHER DOCUMENTS REVIEWED

Design Change Notice excerpts from weekly status report computer files for January 5, 1997; June 29, 1997; September 28, 1997; December 14, 1997; March 29, 1998; June 28, 1998;

October 30, 1998; January 3, 1999; March 7, 1999; May 2, 1999; July 11, 1999; October 31, 1999; and November 21, 1999.

Engineering & Support Status Report, dated November 28, 1999.

Printout of open Design Change Notices from the licensee's database on November 30, 1999.

Plant Operations Review Committee (PORC) Safety Evaluation Sampling Plan,  
January 13, 1998.

**NARRATIVE SUMMARY****WATTS BAR 1999 GRADED EXERCISE****Initial Conditions:****Unit 1:**

100% power for 284 days

Motor Driven Auxiliary Feed Water (MDAFW) 1BB Out Of Service for outboard motor bearing replacement (OSC Task WB99B01 - Elec)

Containment Spray (CS) 1BB Out Of Service for repair of 1-FCV-72-21 Limitorque Operator geared limit switch (OSC Task WB99B02 - Elec)

Large truck delivering painting supplies for turbine building floor painting

**Common:****Weather:**

The weather will feel somewhat wintry today with cold temperatures and cloudy skies. High temperatures will only reach the low 40s today. Some breaks in the clouds may occur by afternoon. The winds will be from the northwest at about 5-10 mi/hr. No precipitation is expected.

**LCO:**

MDAFW 1BB - LCO 3.7.5.B - 72 hours

CS 1BB - LCO 3.6.6.A - 72 hours

**Scenario:**

The exercise begins about T=0:10 when a large delivery truck delivering painting supplies to the breeze way near the old loading dock catches fire from a gasoline leak in the engine compartment (OSC Task WB99B03 - Fire). The fire spreads to the cab and then into the cargo area. At T=0:11 minute the truck is fully engulfed in flames and personnel are told by the driver to evacuate the area due to the chemicals on the truck (paint, paint thinner, and paint remover). The smoke entering the intake causes the Aux Building Ventilation System to isolate. At T=0:13 minutes (just before the arrival of the Fire brigade) the truck explodes causing minor damage to the Refueling Water Storage Tank (RWST) (OSC Task WB99B04 - Mech) and major damage to the nearby Feedwater and Main Steam lines (OSC Task WB99B05 - Mech). The explosion throws several barrels of chemicals toward the feedwater lines and they in turn explode as they are heated by the existing fire. The fire fully engulfs the feedwater and main steam lines for several minutes until brought under control by Fire Operations. *(Note: This ruptures all four feedwater lines as well as steam lines for SG 1 & 4).*



The loss of feedwater results in the rapid drop of Steam Generator water level causing a reactor trip within a few seconds. When the Turbine Driven Aux Feedwater pump attempts to start after the Reactor Trip, the Turbine Driven Auxiliary Feed Water (TDAFW) Trip & Throttle Valve experiences problems and fails closed (OSC Task WB99B06 - Mech). With Motor Driven Auxiliary Feed Water pump 1BB out of service as an initial condition, this leaves only Motor Driven Auxiliary Feed Water Pump 1AA to supply water to Steam Generators 1 and 2. The operators begin a reactor cool down using Steam Generators #1 & #2 and their PORVs. The operators should also implement the Spill Prevention and Control Plan (SPCC) due to the hazardous chemicals entering the storm drain system (OSC Task WB99B11 - Chem).

Fire/explosion that affects a safety system (i.e. RWST) is an ALERT per Emergency Action Level (EAL) 4.1 *Fire in any of the areas listed in table 4.1 that is affecting Safety Related Equipment* and/or EAL 4.2 *Explosion in any of the areas listed in table 4.1 that is affecting Safety Related Equipment*. The Auxiliary Building ventilation fire alarm system (the "Blue Goose") alarms indicating smoke in the Auxiliary Building being pulled in through the normal ventilation system.

After about 30 minutes, (T=0:43) the Motor Driven Auxiliary Feed Water pump 1AA fails when 6.9kV Shutdown Board 1AA shorts to ground and is severely damaged (OSC Task WB99B07 - Elec). This results in NO Feedwater or Auxiliary Feedwater (Loss of Heat Sink). This also results in the loss of all the A Train Emergency Core Cooling Systems (ECCS) (1AA Centrifugal Charging Pump, 1AA Residual Heat Removal, and 1AA Safety Injection pumps), A Train Containment Spray, and the A Train of the Containment Air Return Fans. The operators have reactor injection capability but have no way to remove the decay heat from the reactor vessel. Consequently the reactor begins heating up and re-pressurizing. With no other heat removal option available, the operators will eventually open Pressurizer Power Operated Relief Valves (PORVs) and dump steam (and therefore heat energy) to quench underwater in the Pressurizer Relief Tank. This is process also referred to as Reactor Coolant System Feed & Bleed. The quench water begins heating up and pressurizing the Pressurizer Relief Tank.

The Control Room will request installation of the Fire Protection Spool Pieces (OSC Task WB99B08 - Mech). When these are installed and the system is attempted to be put in service, valve O-FCV-26-1352 suffers a bonnet failure due to the increased operating pressure. With this failure, the Fire Protection System cannot build sufficient pressure to inject into the Steam Generator. Fire Protection System B can be returned to service after isolating the two systems but other valve failures prevent aligning the B Train Fire Protection System to the Steam Generators.

After the Pressurizer Relief tank heats up enough to rupture the Pressurizer Relief Tank Rupture diaphragm, containment pressure begins increasing and at around T=1:00 reaches 2.81 psi (phase B containment isolation), the SED will declare a Site Area Emergency based on loss of one barrier under EAL 1.2.2 *RCS Leak results in loss of subcooling (<65 °F indicated) [<85 °F Adverse Containment]* and Potential Losses of two other barriers under EAL 1.3.2 *Pressure >2.81 psig and less than one full train of Containment Spray*, EAL 1.1.1 *Heat Sink Red (RHR not in service)* and EAL 1.2.1 *Heat Sink Red (RHR not in service)*.

Ten minutes after reaching Phase B, the 1BB Air Return Fan, attempts to start but fails due to a problem with the breaker (OSC Task EB99B09 - Elec). With no containment spray or air return fans available, the ice condenser will absorb what heat it can but is relatively ineffective. The containment will continue to pressurize to high pressure. Radiation levels in containment also begin increasing due to clad damage caused by localized film boiling in the core.

Around T=2:25, the OSC will be successful in providing a temporary patch on one Main Feedwater Line. The repairs should be able to support 300 psi but would not be expected to sustain full system pressure.

As pressure continues to build, a penetration to the annulus fails releasing the gaseous containment contents into the annulus at T=2:30. The high flow rate into the annulus damages the EGTS and eliminated the filtering effectiveness within a few minutes. This radioactivity will be released into the environment through Emergency Gas Treatment System (EGTS). Upon identifying the increased release through the Shield Building Stack, the Site Emergency Director will declare a **GENERAL EMERGENCY** based on **EAL 1.1.1 Core Cooling Orange or Heat Sink Red (RHR NOT in service)**, **EAL 1.2.1 Pressurized Thermal Shock or Heat Sink Red (RHR NOT in service)**, **EAL 1.2.2 RCS Leak results in loss of subcooling (<65 °F indicated) [<85 °F Adverse Containment]**, **EAL 1.3.2 Rapid Unexplained decrease following initial increase or containment pressure or sump level not increasing (with LOCA in progress)**, and **EAL 1.3.4 Unexplained VALID increase in area or ventilation RAD monitors in areas adjacent to containment (with LOCA in progress)**.

By T=2:50, the offsite environs teams identify dose rates at the site boundary indicative of potential exposures greater than 1 rem TEDE over the next few hours. The radiation release continues until a method of heat removal is established other than steaming through the Pressurizer Power Operated Relief Valves and/or Containment Spray is repaired to reduce Containment Pressure.

Around T=3:30, damaged equipment may begin returning to service. We would expect the Reactor Coolant System to be cooled and shutdown cooling to be established between T=4:00 and T=5:00. At around T=4:00, the 1bb Containment Spray may be returned to service to help reduce offsite releases.

The exercise is expected to terminate around T=5:00.