SALP REPORT - BROWNS FERRY UNIT 2

50-260/93-31

I. BACKGROUND

The SALP Board convened on October 7, 1993, to assess the nuclear safety performance of Browns Ferry Unit 2 for the period of May 24, 1992 through September 18, 1993. The Board was conducted pursuant to NRC Management Directive 8.6, "Systematic Assessment of Licensee Performance." Board members were Ellis W. Merschoff (Board Chairperson), Director, Division of Reactor Projects, NRC Region II (RII); J. Philip Stohr, Director, Division of Radiation Safety and Safeguards, NRC RII; Frederick J. Hebdon, Director, Project Directorate II-4, NRC Office of Nuclear Reactor Regulation; and, Johns P. Jaudon, Deputy Director, Division of Reactor Safety, NRC RII. This assessment was reviewed and approved by Stewart D. Ebneter, Regional Administrator, Region II.

II. OPERATIONS

This functional area consists of the control and execution of activities directly related to operating the plant. It includes activities such as plant startup, power-operation, plant shutdown, and response to transients. It also includes initial and requalification training programs for licensed operators.

In this area, TVA's attention and involvement have been focused on safety and have resulted in a superior level of performance.

Operators have consistently performed well in controlling routine (although often complex) evolutions. For example, the Cycle 6 shutdown and defueling and the Cycle 7 refueling and startup were very well controlled by the plant operators. In addition, TVA enhanced the operator training program by incorporating the Detailed Control Room Design Review upgrades in the simulator and utilizing the upgraded simulator to train operators on new plant modifications prior to plant startup from the refueling outage.

The plant operators have consistently performed well in placing the plant in a safe configuration during abnormal events. For example, the operators' response to the May 11, 1993 pressure transient was rapid and effective. In addition, the operators displayed a conservative response to the intermediate range monitor calibration problems during restart from the refueling outage.

Two minor operator weaknesses included inattentiveness and the lack of a questioning attitude. These weaknesses resulted in missed opportunities to avert problems; however, TVA conducted a good analysis of both events and implemented good recurrence prevention measures. Examples included fuel movement errors by a refueling bridge operator which resulted in placing a fuel bundle in an incorrect position in the reactor core while the refueling floor senior reactor operator and one of the bridge operators were preoccupied

with a different issue; and, failure to take immediate action to verify a valid alarm on a drywell radiation monitor.

Several examples of poor procedures were observed in the area of infrequently used procedures. Some key performance requirements had been left out of procedures, or were not consistently applied. For example, recirculation pump shaft seals failed and had to be replaced as a result of venting flow up through the seals instead of establishing purge seal flow down through the seals first. In addition, a poor procedure contributed to an improperly conducted excess flow check valve test.

TVA has had an excellent Emergency Operating Procedure (EOP) program, which has been well implemented. The EOP procedural network was clear, concise and reliable. Additionally, TVA continued implementation of a strong training program, including the initial licensed operator training program and the operator requalification program, as evidenced by the excellent performance of operators on NRC administered examinations.

TVA implemented an excellent broad scope incident investigation program, which resulted in a relatively large number of incident investigations. The incident investigations were typically well done.

The Nuclear Safety Review Board (NSRB) continues to provide quality oversight of plant activities. The NSRB is staffed with senior personnel capable of challenging the plant staff on safety issues. The Plant Operations Review Committee members provided effective reviews of plant issues (e.g., questioning manual operator action requirements and unnecessary cable replacement).

System configuration control during outages was excellent. The NUMARC guidance on shutdown management was incorporated into the planning of the outage. TVA performed a simplified system pre-operability checklist on some systems, and ensured that all open items affecting operability were completed or dispositioned prior to commencing fuel load and startup. Daily meetings held to review plant status and activities provided comprehensive review by managers.

The operations area is rated as a Category 1.

III. MAINTENANCE

The functional area of Maintenance addresses activities related to equipment condition, maintenance, surveillance performance and equipment testing.

During this assessment period, the Maintenance area has continued to improve, resulting in superior performance in a number of program areas. However, personnel errors and instances of failure to follow procedures have continued to occur. In addition, continuing deficiencies were noted in the ownership and management of measuring and test equipment (M&TE).

The majority of the programs within the maintenance area exhibited effective management control and planning. Excellent plant material condition and overall equipment performance contributed to a good operating record. Preventive and corrective maintenance backlogs were kept very low. Plant leakage rates were low. Management control was enhanced by effective daily meetings to assure coordination between plant organizations. During the successful Unit 2 refueling outage, effective scheduling and maintenance practices were demonstrated by completion of an extensive outage with several major maintenance tasks with minimal problems. In addition, TVA's incident investigation program was aggressive and corrective actions were generally effective.

Review of routine maintenance indicated use of clear work packages and detailed procedures which were performed by well-qualified, skilled personnel. Pre-job briefings were generally thorough and detailed. Examples of good maintenance efforts included the comprehensive actions for small line leaks inside the drywell and efforts to reduce main steam isolation valve leakage.

In general, TVA maintained excellent control of routine surveillance testing. Procedures for routine tests were followed properly; personnel performing tests were knowledgeable of both the system and procedure; and, independent verification was normally accomplished correctly.

Two significant problems involving personnel errors and inadequate procedures occurred during surveillance testing. Both events involved infrequently performed evolutions, indicating a need for increased management attention in this area. During the first event, an operator pressurized the reactor coolant system during the combined performance of an instrument line excess flow check valve test and inservice vessel leak check. The primary pressure control gauge used was taken out of service because of an inadequate surveillance procedure. Operator error in the reliance only on the inoperable instrument contributed to the event. In the second event, a manual scram was initiated shortly after reaching criticality when several intermediate range monitors failed downscale as a result of an improper amplifier gain adjustment because the general operating instruction did not indicate the need to perform an existing surveillance.

Other personnel errors and failure to follow procedures were identified in the maintenance area. These included the failure to verify prerequisites prior to commencing work on a power supply for a valve motor, and an inadequate procedure and post maintenance test for a control room emergency ventilation temperature switch calibration. In the last example, attention was not focused on the need to replan work which went beyond the scope of the original maintenance.

Deficiencies noted in the surveillance area included the following. Gear damage occurred when the 3A emergency diesel generator was started with a manual turning tool engaged. During surveillance testing, a one hour Technical Specification action statement for tripping an inoperable RPS trip channel input signal was not met because of poor procedural guidance. A surveillance instruction to verify secondary containment isolation was not followed resulting in a loss of secondary containment integrity. This example

involved poor procedural guidance coupled with lack of training on the proper method of verification. One surveillance on the reactor building crane was missed as a result of poor communications.

Inadequate management oversight in the control of measuring and test equipment was identified. The program exhibited a lack of structure and ownership which led to program deficiencies. These deficiencies continued over the SALP period. Early in the SALP period, problems included untimely and incomplete investigations of equipment found out of tolerance; administrative errors; and, failure to generate status reports. Later in the SALP period, additional instances of failure to properly control measuring and test equipment were identified. Increased management attention to this area is appropriate.

The maintenance area is rated as a Category 2.

IV. ENGINEERING

The functional area of engineering addresses the adequacy of technical and engineering support for all plant activities. Design control and modifications are encompassed as is engineering and technical support for operations, maintenance, outages and testing.

The engineering and technical support of day-to-day plant operations and the refueling outage was strong. While TVA demonstrated strong engineering support in a number of areas, the numerous and significant problems with licensing submittals detracted from TVA's overall performance. There were also minor lapses noted in the quality and completeness of engineering work.

The involvement of design engineering in plant operations and in the complex refueling outage was noteworthy. During the refueling outage, over 200 design changes were accomplished, and the outage was completed essentially on schedule. Engineering also was effective in updating primary drawings and in reducing the backlog of secondary drawings. TVA has actively pursued the use of probabilistic risk assessment methodology in the design change process. Also, engineering has been aggressive in controlling the dedication of commercial grade spare parts for safety related uses.

The technical support and the design engineering organizations have provided effective control of temporary modifications and have coordinated their efforts to support operations and maintenance effectively.

The technical support organization provided daily interface with operations, acting as a bridge to the design engineering group when necessary. The result was a close coupling of engineering expertise in the resolution of plant issues and problems while providing a quick turnaround.

The technical adequacy and regulatory completeness of numerous documents submitted to the NRC was weak. Extensive correspondence and many meetings were required to resolve issues in some cases. Significant examples included: the failure to address the criteria required by 10CFR50.12 in a response to Generic Letter 92-08 (regarding Thermo-Lag); the failure to address the owners

group maintenance program or the vendor exceptions thereto, in an application to extend the diesel generator surveillance frequency from 12 to 24 months; the failure to justify deletion of one of the current Technical Specification requirements associated with off-gas system explosive monitor setpoints when requesting technical specification changes in accordance with Generic Letter 89-01; and, the failure to address the lack of procedural guidance to accomplish a reactor protection system channel trip in a response to a violation.

Despite the generally effective level of engineering and technical support provided, minor deficiencies were identified by the NRC and TVA involving omissions and failure to substantiate or verify design information. Deficiencies included the failure to evaluate radiological consequences during the operation of the hardened wetwell vent; discrepancies and unsubstantiated assumptions in calculations for the wetwell vent and other calculations; inadequate evaluation of the control air system excess flow setpoint; and, inadequate verification and justification of field changes.

The engineering area is rated as a Category 2.

V. PLANT SUPPORT

The Plant Support functional area covers all activities related to plant support functions, including radiological controls, emergency preparedness, security, chemistry, fire protection, and housekeeping controls.

The radiological controls program continued to control internal and external radiation exposures effectively. A well managed ALARA program that implemented a number of dose saving initiatives contributed to this high level of performance. Notable ALARA initiatives included increased use of temporary shielding, videocameras, interactive video tour system, improved outage planning, robotics, and the use of soft chemical shutdown to enhance corrosion product removal and lower dose rates during outages. These initiatives resulted in significantly reduced collective radiation exposure during outages.

Radioactive effluents were effectively monitored and controlled. There were no unplanned gaseous or liquid releases that required reporting to the NRC. The environmental monitoring of the licensee's site has continued to indicate a minimal impact on the environment due to operation of the facility. Browns Ferry has continued to reduce the volume of radwaste produced by the site and the current levels of waste production are consistent with industry guidelines. Effluents were confirmed to be low by the environmental monitoring program. Thorough self assessments, audits, and prompt followup also contributed to this high level of radiation safety performance. There were some examples of failure to adhere to procedures in this area, but overall performance remained superior.

Comprehensive and well administered training programs in the physical security, fire protection, and emergency preparedness areas were instrumental

in effective program implementation. This was demonstrated in various drills and exercises throughout this period.

TVA remained committed to maintaining a comprehensive emergency preparedness program. Drill performance revealed a thorough understanding of emergency duties and responsibilities among key members of the emergency response organization. Annual exercise performance was commendable and there were no NRC weaknesses noted. Staffing and activation of emergency response facilities was prompt and command and control of facility operations was effective. Protective actions were properly formulated and notifications to offsite agencies were timely. TVA maintained an enhanced level of readiness by conducting drills at a frequency above those required by regulation. The licensee maintains a cooperative working relationship with offsite authorities.

Within the fire protection area, fire brigade performance was good. However, problems were identified on several occasions with respect to inattentive fire watches and failure to establish necessary fire watches. Weaknesses have also been noted relative to control of combustibles, compliance with procedures, and effectiveness of corrective measures.

The physical security program was effectively implemented. Improvement was noted, particularly towards the end of the period. The training program was considered a strength. An indepth-audit program successfully identified issues and assured that comprehensive, timely corrective action was taken. Problems identified during this period with regard to access control and access authorization were effectively corrected during the period. Strong management support for this program continued, as evidenced by the ongoing overall upgrade of the physical security system.

Plant housekeeping was generally good as TVA continued efforts to upgrade housekeeping. A slight decline in housekeeping performance was noted due to the Unit 2 and 3 outage activities.

The plant support area is rated as a **Category 1.**