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EXECUTIVE SUMMARY

Sequoyah Nuclear Plant, Units 1 and 2
NRC Inspection Report 50-327/96-12 and 50-328/96-12

This inspection included a review of the licensee's implementation of 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants" [the Maintenance Rule]. The report covers a 1-week period of inspection by inspectors from Region II and the Office of Nuclear Reactor Regulation.

Overall, the inspection team concluded that the licensee had a comprehensive Maintenance Rule program, and the program was being effectively implemented. The team found only minor deficiencies in program implementation, which were immediately corrected by the licensee. These deficiencies were considered to be isolated occurrences. It was obvious that the licensee was staying abreast of recent industry developments and recent NRC inspections at other nuclear facilities, and was taking action to strengthen their program concurrent with these activities. Many adjustments to the program were made during the last month prior to the inspection. One violation not directly related to implementation of the Rule was identified.

Operations

- Licensed operators, in general, understood their specific duties and responsibilities for implementing the Maintenance Rule. Their understanding of the risk matrix for removal of equipment from service was limited, and interviews indicated some confusion regarding the use and interpretation of the matrix and its associated administrative procedure (Section O4.1).

Maintenance

- Required structures, systems, and components (SSCs), with the exception of the Fuel Handling and Storage System (System 79), were included within the scope of the Rule. Once the licensee recognized this deficiency, immediate action was taken by the Expert Panel to place the system within the scope of the Rule in an (a)(1) status until performance data could be obtained. The team considered this deficiency to be an isolated occurrence and, as a result, no enforcement action was considered appropriate (Section M1.1).

- Plans for performing the periodic evaluation met the requirements of the Rule. In addition, the quarterly report of system performance was considered a positive indicator of the licensee implementation of the assessment process (Section M1.3).

- The approach to balancing reliability and unavailability was reasonable. The licensee had reviewed three systems to date and actions taken in this area were appropriate (Section M1.4).

- The licensee had considered safety in establishment of goals and monitoring for systems, and components in a(1) status. Industry wide operating experience was used and corrective actions were appropriate. Some weaknesses were identified: The team was concerned with the number of radiation monitor functional failures and with the fact that the corrective action plan for these failures had not yet been approved. However, Maintenance Rule Program requirements regarding these monitors were being followed. One violation, which was not directly associated with implementation of the Maintenance Rule was identified. Radiation recorder RR-90-12 and its associated area monitors were abandoned by a design change which was only partially completed, and the EOPs (E-0 and E-1) were not revised to reflect the fact that these monitors were no longer useable. This condition existed for a period of over two years (Section M1.6).

- Review of SSCs in a(2) status determined that performance criteria were established, industry-wide operating experience was considered, appropriate trending was being performed, and corrective action was taken when SSCs failed to meet performance criteria, or when a SSC experienced a maintenance preventable functional failure. Structures were being monitored and a systematic program for monitoring had been established. An item was identified for followup on licensee actions to provide performance criteria for structures after industry resolution of this issue (Section M1.7).

- In general, walkdown of systems determined that the systems were being adequately maintained, however, several concerns were identified: The number of vehicles in the switchyard appeared excessive, the balance of plant 480V electrical boards were not being maintained to the same standards as the safety related boards, the main feedwater turbines in both units had oil leaks, and excessive vibrations on the unit 2 main steam traps were noted (Section M2.1).

- Audits and self Assessments of the Maintenance Rule Program were thorough and corrective actions were appropriately implemented (Section M7.1).

Engineering

- The licensee's overall quantitative approach to perform risk ranking for SSCs in the scope of the Maintenance Rule using the probabilistic risk assessment (PRA) approach was adequate. PRA procedures in support of the Maintenance Rule were detailed and appropriate, and implementation went beyond the procedures. Performance criteria that were established were shown to be commensurate with safety. The Expert Panel meeting held during the inspection was comprehensive and probing, and was considered to be a benefit to the licensee's program (Section M1.2).

- The risk matrix and associated procedure for removal of equipment from service was considered a weakness, and interviews with users of the matrix indicated some confusion regarding its use and interpretation (Section M1.5).

- Systems engineers were knowledgeable of their systems (Section E4.1).

Report Details

Summary of Plant Status

Unit 1 operated at power during the inspection period. Unit 2 experienced a reactor trip on December 6, 1996 due to a 6.9 KV electrical fault.

Introduction

The primary focus of this inspection was to verify that the licensee had implemented a maintenance monitoring program which met the requirements of 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," (the Maintenance Rule). The inspection was performed by a team of inspectors that included a team leader and three Region II based inspectors, and an NRC contractor. A Senior Operations Analyst from NRR and a Senior Reactor Engineer from NRR observed the process to ensure inspection uniformity. The licensee provided an overview presentation of the program to the team on the first day of the inspection. The overview handout is included as an attachment to this report.

I. OPERATIONS

O4 Operator Knowledge and Performance

O4.1 Operator Knowledge of Maintenance Rule

a. Inspection Scope (62706)

During the inspection, the team interviewed three licensed reactor operators (ROs) and three licensed senior reactor operators (SROs) to determine if they understood the general requirements of the Maintenance Rule and their particular duties and responsibilities for its implementation.

b. Observations and Findings

The tasks associated with the Maintenance Rule that operators were responsible for included:

- Determining the impact on availability of SSCs when tagging equipment out of service and performing administrative requirements for tagging.
- Determining SSC out-of-service logging requirements and impact on availability.
- Evaluating priorities for system restoration.
- Evaluating job scheduling activities.
- Evaluating plant configuration to determine if work authorization created undue risk.

In general, the operators interviewed understood the philosophy of the Maintenance Rule and their responsibilities associated with the Rule. All indicated a strong emphasis on returning SSCs to service as soon as possible, in order to minimize SSC unavailabilities. Also, all indicated the need to document SSC outages in the control room log books for all SSCs under the scope of the Maintenance Rule. This documentation included noting when equipment is taken out of service and when the equipment is returned to service. In cases where there was a time delay between when equipment became available and when it was officially declared returned to service (e.g., the emergency diesels), both times were noted. The system engineer could then more accurately track actual equipment outages.

The "Equipment to Plant Risk (PSA) Matrix" in Site Standard Practice SSP-7.1 provides guidance for evaluating the plant configuration risk from equipment out of service while the plant is at power. The operators correctly understood that this matrix does not provide guidance for evaluating priorities for returning equipment to service. The SROs stated they use the matrix when emerging failures occur. Judgment was used in cases where the matrix did not provide any guidance (i.e., the combination of equipment out of service was not covered by the matrix). There was some confusion among the SROs interviewed concerning the level of plant risk given certain combinations of equipment outages covered by the matrix. Some thought the plant risk would be medium when the matrix indicated the risk would be high. However, this confusion did not adversely impact the use of the matrix, because the matrix did not provide separate guidance for different levels of plant risk.

c. Conclusions

In general, the ROs and SROs interviewed clearly understood the philosophy of the Maintenance Rule and their responsibilities for implementation of the Rule. There was some confusion concerning plant risk level interpretations when using the plant risk matrix, but this confusion did not adversely impact the SROs' use of the matrix.

II. MAINTENANCE

M1 Conduct of Maintenance

M1.1 Scope of Structures, Systems, and Components Included Within the Rule

a. Inspection Scope (62706)

Prior to the onsite inspection, the team reviewed the Sequoyah Final Safety Analysis Report, Licensee Event Reports, the Emergency Operating Procedures, previous NRC Inspection Reports, and other information provided by the licensee. The team selected an independent sample of SSCs that the team believed should be included within the scope of the Maintenance Rule, which was not classified as such by the licensee. During the onsite portion of the inspection, the team used this list to determine if the licensee had adequately identified the SSCs that should be included in the scope of the Rule in accordance with 10 CFR 50.65 (b).

b. Observations and Findings

The licensee established an Expert Panel to perform several Maintenance Rule implementation functions including establishing the scope of the Maintenance Rule. The panel's evaluation included 172 system/functions in the plant and determined that 113 system/functions were in the scope of the Rule. In addition, 15 structures and/or miscellaneous equipment such as tanks, tunnels, etc;, were placed within the scope of the Maintenance Rule.

The team's review was performed to assure the scoping process included:

- All safety-related SSCs that are relied upon to remain functional during and following design basis events and ensure the integrity of the reactor coolant pressure boundary, the capability to shut down the reactor and maintain it in a safe shutdown condition, and the capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposure comparable to the 10 CFR part 100 guidelines

- Non-safety SSCs that are relied upon to mitigate accidents or transients

- Non-safety SSCs which are used in the plant emergency operating procedures

- Non-safety SSCs whose failure could prevent safety-related SSCs from fulfilling their safety-related function

- Non-safety SSCs whose failure could cause a reactor trip or scram or actuation of a safety-related system.

The licensee provided additional information regarding scoping of SSCs during the onsite portion of the inspection which resulted in the team concluding that all required SSCs were included in the Rule with the exception of the following:

System 79 - Fuel Handling and Storage

The licensee held an Expert Panel meeting on December 4, 1996 and discussed this issue. Based on these discussions, the licensee issued a PER, Number SQ963091PER and identified that the Fuel Handling System (System 79) could cause an event which could lead to an Auxiliary Building Ventilation Isolation or a Containment Building Ventilation Isolation. Subsequently, the panel placed the Fuel Handling and Storage System in the scope of the Maintenance Rule. The team agreed with the panel that this system is non-safety related and non-risk significant. The team further determined this system was the only system that should be in the scope that the licensee had not previously included. The license took immediate corrective actions and the system is now included in the Maintenance Rule. The team considered this a minor oversight, therefore, no regulatory action was considered appropriate for this issue.

c. Conclusions

The team determined the required SSCs, with the exception of Fuel Handling and Storage System (System 79), were included within the scope of the Maintenance Rule. The licensee's Expert Panel took immediate corrective action to placed this system in the scope of the Rule once the issue was identified.

M1.2 Safety or Risk Determination

a. Inspection Scope (62706)

Paragraph (a)(1) of the Maintenance Rule requires that goals be commensurate with safety. Implementation of the Rule using the guidance contained in NUMARC 93-01 also requires that safety be taken into account when setting performance criteria and monitoring under (a)(2) of the Rule. This safety consideration would then be used to determine if the SSCs should be monitored at the train or plant level. The team reviewed the methods that the licensee had established for making these required safety determinations. The team also reviewed the safety determinations that were made for the systems that were reviewed in detail during this inspection (See sections M1.6 and M1.7).

b. Observations and Findings

b.1 Risk Ranking

The licensee's process for establishing the risk significance of SSCs within the scope of the Maintenance Rule was documented in the TVAN Maintenance Rule 10 CFR 50.65 Program Manual (Section 3.4.2, pp. 17 - 19) and SNP Technical Instruction 0-TI-SXX-000-004.0 (Section 7.1.2, p. 13 and Appendix B). These documents were found to be detailed and well written.

For SSCs modeled in the licensee's PRA, three importance measures were evaluated (risk achievement worth, risk reduction worth, and core damage frequency contribution), as recommended in NUMARC 93-01. However, the licensee went even further by evaluating importance measures using two different sets of inputs to the PRA: the base case and a sensitivity case with most human errors set to 0.0. The licensee also evaluated SSC importance based on both event tree top event importance and system importance (obtained from combinations of top events). For SSCs with importance values above NUMARC guidelines, the initial risk significance was determined to be high. However, the Expert Panel made the final determination, based on the PRA results and other information. Approximately ten SSCs indicated to be risk significant from the PRA were downgraded to non-risk significant by the Expert Panel. Documentation of these ten cases was provided in the minutes to Expert Panel meetings (November 4 and 26, 1996). The team found that sufficient information was presented in those meetings to justify the downgrading of those SSCs to non-risk significant.

For SSCs not modeled in the PRA, the Expert Panel and an operator Delphi process were used to establish risk significance. This process also appeared to be adequately documented.

Finally, the recent update to the PRA (Licensee's Nuclear Plant Individual Plant Examination Delta Report for Revision 1 Update, September 1995) was used to evaluate the SSC importance discussed previously. Therefore, the PRA input to the risk ranking process was up to date. The licensee indicated that the individual sequence frequency truncation levels ranged from 1E-9/y to 1E-12/y. The team believes that this level is low enough to result in accurate SSC importance, given the large event tree process used in the PRA.

Based on the reviews discussed above, the team believes that the licensee's approach to establishing the risk ranking for SSCs within the scope of the Maintenance Rule is adequate. Also, the procedures were considered to be a strength of the licensee's implementation of the Maintenance Rule.

b.2 Performance Criteria

The team reviewed the licensee's performance criteria to determine if the licensee had adequately set performance criteria under (a)(2) of the Maintenance Rule consistent with the assumptions used to establish the safety significance. Section 9.3.2 of NUMARC 93-01 recommends that risk significant SSC performance criteria be set to assure that the availability and reliability assumptions used in the risk determining analysis (i.e. PRA) are maintained.

The licensee's approach to establishing performance criteria was outlined in the TVAN Maintenance Rule 10 CFR 50.65 Program Manual (Section 3.4.3, pp. 19 - 27) and the SNP Technical Instruction 0-TI-SXX-000-004.0 (Section 7.1.3, pp. 13 - 17 and Section 7.3, pp. 26 - 38). The approach was clearly described and appeared to meet the requirements of the Maintenance Rule implementation.

The performance criteria were presented in the system attachments to the SNP Technical Instruction 0-TI-SXX-000-004.0. In general, the SSC unavailability performance criteria were higher than values used in the PRA. This was done purposely, such that typical SSC unavailabilities (i.e., those identified in the plant-specific data collected from 1988 through 1995 for the updated PRA) would not result in performance criteria being violated. The licensee had evaluated the change in core damage frequency for each of the unavailability performance criteria. However, the team did not feel that this evaluation ensured that the unavailability performance criteria as a group were commensurate with safety. Also, that type of evaluation did not demonstrate that the risk rankings discussed previously would not change given the unavailability performance criteria. In response to these concerns, the licensee evaluated the core damage frequency increase when all of the Maintenance Rule unavailability performance criteria were simultaneously input into the PRA. The licensee also demonstrated that the risk significance determinations discussed in Section b.1 were not affected using these higher unavailabilities. This work was performed by the licensee during the inspection week.

For unreliability performance criteria, the licensee used functional failures (FFs) rather than maintenance preventible functional failures (MPFFs). The FF performance criteria vary from 0 to 5 per two-year period, depending upon the PRA unreliability values (if covered in the PRA), the estimated number of demands during the two-year period, and/ or other information. In general, the unreliability performance criteria correlated with but were higher than those in the PRA. The licensee had performed evaluations to determine the change in core damage frequency for each unreliability performance criterion. However, similar to the case with the unavailability performance criteria, the team did not feel that this evaluation ensured that the unreliability performance criteria as a group were commensurate with safety, nor did the evaluation demonstrate that the risk rankings would not change. In response to these concerns, the licensee evaluated the core damage frequency increase when all of the Maintenance Rule unreliability performance criteria were simultaneously input into the PRA. The licensee also demonstrated that the risk significance determinations discussed in Section b.1 were not affected using these higher unreliabilities. Again, this work was performed by the licensee during the inspection week.

The changes in core damage frequency when all of the unavailability performance criteria were input to the PRA and when all of the unreliability performance criteria were input were significant. The licensee argued that several things prevent the plant from approaching these higher core damage frequencies: (1) it was unlikely that all of the SSCs would approach the Maintenance Rule unavailability and unreliability performance criteria at the same time (or over a two-year period); (2) even if the performance criteria were approached in a two-year period, the PRA methodology of using a Bayesian update to process these plant-specific data would result in smaller core damage frequency increases (until at least several two-year periods in a row had high unavailability and unreliability data); (3) effective Maintenance Rule implementation should result in reduced unavailabilities and unreliabilities compared with past performance; and (4) the periodic (every two outages, or approximately three years) updating of the PRA (Standard Engineering Procedure SEP-9.5.8) would indicate an upward trend in core damage frequency, which would feed back into the reestablishment of more stringent performance criteria. The team agreed that these factors should help to limit potential core damage frequency increases.

b.4 <u>Expert Panel</u>

The team reviewed the licensee's process and procedures for establishment of an Expert Panel. It was determined that the licensee had established an Expert Panel in accordance with the guidance provided in NUMARC 93-01. The Expert Panel's responsibilities included the final authority for decisions regarding Maintenance Rule scope, risk significance, performance criteria selection, moving SSCs from (a)(2) status to (a)(1) status and vice versa, and balancing of unavailability and unreliability.

The team observed an Expert Panel meeting involving consideration of placing an additional SSC within the scope of the Maintenance Rule, several requests related to the balancing of unavailability and unreliability, and the movement of an (a)(1) system to (a)(2) status. The discussions were comprehensive with significant member participation, and the decisions were well-based.

The team also reviewed the minutes of recent Expert Panel meetings (November 4 and 26, 1996). The minutes were detailed and the decisions appropriately documented. The team also compared the Expert Panel member training and experience with the requirements in the charter of the Expert Panel. The training and experience were appropriate.

Overall, the team considered the Expert Panel to be a strength in the licensee's implementation of the Maintenance Rule.

c. Conclusions

Based on the team's reviews discussed previously, the licensee's approaches to risk ranking and performance criteria selection appeared to be appropriate. Also, the procedures and the Expert Panel were considered to be strengths in the licensee's implementation of the Maintenance Rule.

M1.3 Periodic Evaluation

a. Inspection Scope (62706)

Paragraph (a)(3) of the Rule requires that performance and condition monitoring activities and associated goals and preventive maintenance activities be evaluated taking into account, where practical, industry-wide operating experience. This evaluation is required to be performed at least one time during each refueling cycle, not to exceed 24 months between evaluations. The team reviewed the procedure the licensee had established to ensure this evaluation would be completed as required. In addition, the team discussed the requirements with the Maintenance Rule Coordinator who is responsible for this activity.

b. Observations, Findings and Conclusions

Plans for performing the periodic evaluation met the requirements of the Rule. In addition, the quarterly report of system performance was considered a positive indicator of the licensee implementation of the assessment process.

M1.4 Balancing Reliability and Unavailability

a. Inspection Scope (62706)

Paragraph (a)(3) of the Rule requires that adjustments be made where necessary to assure that the objective of preventing failures through the performance of preventive maintenance is appropriately balanced against the objective of minimizing unavailability due to monitoring or preventive maintenance. The team met with

Maintenance Rule Coordinator, system engineers, and representatives of the Expert Panel to discuss the licensee's methodology for balancing reliability and unavailability.

b. Observations and Findings

The team reviewed the licensee's approach to balancing system reliability and unavailability for risk significant systems to achieve an optimum condition. The licensee has scheduled balancing reviews during periodic evaluations at refueling outages, not to exceed 24 months. The requirements for balancing reliability and unavailability are discussed in the licensee's administrative procedure 0-TI-SXX-000-004.0, Maintenance Rule Performance Indicator Monitoring, Trending, And Reporting-10 CFR 50.65, Revision 5. System engineers are responsible for the balancing process for risk significant systems during periodic system evaluations. Additionally, the system engineer monitors and trends the system performance continuously. Should an adverse trend be identified the system engineer is responsible for initiating an evaluation at that time.

The licensee's procedures indicated that as long as both the reliability and unavailability performance criteria were not exceeded, a balance was achieved. Because the performance criteria were judged to be appropriate, this balancing philosophy was determined to be acceptable by the team. Observation of the Expert Panel's discussions concerning balancing for several systems indicated a proactive approach. For the cases observed, system engineers suggested changes in unavailability practices (extending preventive maintenance intervals or other changes) before the unavailability performance criteria were reached. In these cases, the equipment had not experienced any reliability failures, so the suggested changes to unavailability practices were judged to be appropriate by the Expert Panel.

Adequate definitions of reliability and unavailability and the calculational methods are specified in the procedure. For the systems selected for review, the team verified that the system engineers (owners) were collecting the time out of service and system demand data to compare reliability and unavailability with performance criteria and to facilitate balancing of reliability versus unavailability during periodic evaluations. These data were monitored, analyzed and trended for monthly performance on a 24 month rolling average. Industry experience and risk significance were considered in selecting performance criteria.

The team determined that the licensee had reviewed three systems for optimization of reliability and unavailability. Methods used to achieve balance included improved planning and scheduling, improved coordination between groups involved, elimination of unrequired testing and adjustment of PM frequency based on system performance.

c. Conclusions for Balancing Reliability and Unavailability

The team concluded that the licensee's method of balancing reliability and unavailability provided an acceptable approach. Also, the methods for collecting and evaluating reliability and unavailability data were appropriate.

M1.5 Plant Safety Assessments Before Taking Equipment Out of Service

a. Inspection Scope (62706)

Paragraph (a)(3) of the Maintenance Rule states that the total impact on plant safety should be taken into account before taking equipment out of service for monitoring or preventive maintenance. The team reviewed the licensee's procedures and discussed the process with the PRA representative, the plant operators, system schedulers, and work week supervisors.

b. Observations and Findings

The team reviewed the licensee's process and performance regarding their risk assessment of removing equipment from service. The process was documented in Site Standard Practice SSP-7.1 (Attachment 4) for removing equipment from service while the plant is at power, and in Standard Programs and Processes SSP-7.2 (Appendix C) when the plant is shut down.

When the plant is at power, the "Equipment to Plant Risk (PSA) Matrix" (Attachment 4 in SSP-7.1) was used by work planners and SROs to evaluate plant risk for single and double equipment outages. The licensee used a 12-week rolling schedule for planning surveillance and preventive maintenance. The work planners stated that they used the risk matrix to prevent planned concurrent equipment outages that would place the plant in a high risk situation. The SROs stated that they used the risk matrix for emergent work (resulting from unanticipated equipment failures). For combinations of equipment outages not covered by the risk matrix, the SROs stated they used experience and judgment to evaluate the plant risk.

The risk matrix in use at the start of the inspection (December 2, 1996) was considered to be weak in terms of effective use of PRA information to evaluate plant risk from concurrent equipment outages. Specific issues were the following:

- Not all risk-significant SSCs were covered by the risk matrix. Examples of such omissions include various HVAC systems that support safety systems (cooling to RHR, SI, and CS pump rooms), auxiliary control air, and others.

- The matrix provided no guidance for assessing plant risk when three or more pieces of equipment were out of service at the same time. Such combinations might place the plant in a high risk situation without the user realizing this.

- There was no clear distinction in actions for low risk situations compared with medium risk situations.

- There was no guidance for recovery from high risk configurations (no guidance on determining which piece of equipment to return to service first).

In addition, interviews with planners and operators indicated some confusion in their interpretations of plant risk for various combinations of component outages.

It should be noted that the licensee issued a revised risk matrix before the end of the inspection on December 6, 1996, which appears to address most of the issues listed above.

The procedures used by the licensee for plant shutdown conditions appears to be the standard industry approach, based on NUMARC 91-06, INPO guidelines for outage management, and EPRI guidance. In addition, the OUTAGE RISK ASSESSMENT MANAGEMENT (ORAM) computer code was used to evaluate plant risk from the planned outage activities and from the actual outage activities.

c. Conclusions

The team viewed the licensee's process for assessing plant risk resulting from multiple equipment outages to be appropriate. However, the tool used to assess plant risk while at power, the risk matrix, was viewed as a weakness in terms of making use of PRA risk information and in terms of understanding by the users. It should be noted, however, that the licensee revised the risk matrix during the inspection. The revised risk matrix appeared to address most of the team's concerns. However, additional training would be necessary for the users to better understand how to use and interpret the risk matrix.

M1.6 Goal Setting and Monitoring for (a)(1) SSCs

a. Inspection Scope (62706)

Paragraph (a)(1) of the Rule requires, in part, that licensees shall monitor the performance or condition of SSCs against licensee established goals, in a manner sufficient to provide reasonable assurance the SSCs are capable of fulfilling their intended functions. The Rule further requires goals to be established commensurate with safety and industry-wide operating experience be taken into account, where practical. Also, when the performance or condition of the SSC does not meet established goals, appropriate corrective action shall be taken.

The team reviewed the systems and components listed below which the licensee had established goals for monitoring of performance to provide reasonable assurance the system or components were capable of fulfilling their intended function. The team verified that industry-wide operating experience was considered, where practical, that appropriate monitoring was being performed, and that corrective action was taken when SSCs failed to meet goal(s), or when a SSC experienced a maintenance preventable functional failure.

The team reviewed program documents and records for the six systems or components the licensee had placed in the (a)(1) category in order to evaluate this area. The team also discussed the program with the Maintenance Rule Coordinator, system engineers, and other licensee personnel.

b. Observations and Findings

b.1 Reactor Coolant System

The licensee was monitoring the risk significant reactor coolant system on a plant level basis. The team's review found this system was not in the classification (a)(1), only the reactor coolant pump motors, and leakoff seals were considered in the (a)(1) classification based on problems experienced. Both Units were considered in the (a)(1) classification. The components were placed in the (a)(1) classification at the end of June 1996. Root cause was being developed and scheduled for completion by February 1997. The extended time for performing the root cause was due to sending the leakoff seals to Westinghouse for extensive evaluation. When the components went into (a)(1), the licensee established a goal of continuous operation of both units until October 1997. However, in October 1996, Unit 2 was forced to shutdown due to excessive seal leakage and other component failures. The licensee has now established that the system components will remain in (a)(1) classification until a criteria of only one anomaly per operating cycle per unit is met.

The team reviewed the System Health Report, Maintenance Rule monthly status reports, maintenance work orders, nonconformance reports, operating reports and additionally interviewed the Maintenance Rule coordinator, and system engineer to evaluate the implementation of the Rule. The team determined that the licensee had considered safety in establishment of monitoring and goals for this system. Although the root cause analysis and final corrective actions were slow due to the extensive evaluation process, corrective actions were appropriate. The System Engineer was knowledgeable of assigned systems and was proactive in development and implementation of corrective actions.

b.2 Control Room Emergency Ventilation (CREV)

This system was originally placed into (a)(1) status based on the Expert Panel's conclusion that not enough monitoring was being done to properly evaluate the system. Therefore it was placed in (a)(1) until 2 years of data was assembled. The assembled data confirmed that CREV should be reclassified as (a)(2).

The team reviewed the System Health Report, Maintenance Rule monthly status reports, maintenance work orders, nonconformance reports, operating reports and additionally interviewed the Maintenance Rule Coordinator, and system engineer to evaluate the implementation of the Rule. The team determined that the licensee had considered safety in establishment of goals and monitoring for this system. The System Engineer was knowledgeable of assigned systems and the Expert Panel was proactive in evaluation and placing the system in (a)(1) category in order to perform further evaluations.

b.3 Auxiliary Feedwater System

The Auxiliary Feedwater (AFW) System consists of two motor driven pumps (MDAFW system Train A and Train B) rated at 440 gpm each, a turbine driven pump (TDAFW system Train A-S) and associated level control valves, piping and instrumentation. The risk significant safety function of this system is to provide sufficient feedwater flow from the Condensate Storage Tank or the Essential Raw Cooling Water System, via the MDAFW and/or TDAFW, to the steam generators to remove primary system residual energy.

Thrust bearings were installed backwards in AFW pump 2B-B resulting in a maintenance preventable functional failure on April 2, 1996. As a consequence, the reliability performance criteria for a safety related, risk significant system was exceeded. The Expert Panel reviewed the circumstances and according to the Rule moved the Unit 2 AFW system to (a)(1) status. Corrective actions included verification that the thrust bearings were correctly installed in other AFW pumps, revision to the Maintenance Instruction 0-MI-MRR-003-001.0, Motor Driven Auxiliary Feedwater Pump Overhaul And Bearing Maintenance, to further clarify the procedure, training of the craft related to installation of these bearings, and use of vendor representatives to increase the skill of Sequoyah field personnel. Due to the nature of the failure and specific corrective actions taken, the goal for (a)(1) remained the same as the (a)(2) performance criteria with the provision that the pump must successfully pass three surveillance tests before being returned to (a)(2) status.

During corrective actions due to pump 2B-B failure, the licensee determined that the oil in the MDAFW pumps 1B-B, 2A-A and 2B-B exhibited dark oil. Iron was found in the oil analysis. Contact with the vendor and industry indicate that other utilities are experiencing the same phenomenon. The licensee initiated a level A Problem Evaluation Report, PER SQ962767, to identify the Root Cause for this problem and to identify, implement and track corrective actions. At the time of the inspection this process was in progress. The licensee declared the dark oil problem a Maintenance Preventable Repetitive Failure and placed both Unit 1 and Unit 2 MDAFW Pumps in (a)(1) status.

The Team concluded that the actions related to the bearing failure, and the dark oil problem were appropriate.

b.4 Radiation Monitors

The radiation monitoring system consists of a number of monitors having various applications and distributed throughout the plant to monitor levels of radioactivity. Initially only those monitors considered safety related were included in the scope of the Rule. About November 5, 1996, based on a survey of the industry and reevaluation of the system, the licensee added all monitors in the Technical Specification, ODCM and EOPs to the scope of the Rule and established a more appropriate performance criteria. As a result of the scope change, a review of maintenance history (work orders) for the previous 24 months was performed to develop a baseline. The review of maintenance work orders in conjunction with the performance criteria for those systems not previously in the scope of the Rule resulted in the identification of numerous functional failures, maintenance preventable functional failures, and repetitive preventable functional failures. As a result, 64 of 88 monitors and recorders were placed in the (a)(1) status. On November 27, 1996, a

Problem Evaluation Report (SQ962818PER) was issued identifying the problems, causes, recommended corrective actions and interim action where appropriate for the radiation monitors. These recommended actions varied from establishing PMs consistent with equipment problems, purchase of new equipment to replace obsolete equipment, to design changes. The team considered the failure analysis and recommended corrective actions to be detailed and thorough. However, these recommended actions have not yet been approved or implemented. To move the radiation monitors from (a)(1) status to (a)(2) status, the licensee established the goals that no repeat component failures occur and the total number of monitor failures must be less than the allowed performance criteria for that group.

During the preparation for this inspection the Sequoyah Emergency Operating Procedures (EOPs) were reviewed, and a sample of radiation monitors and recorders used in these procedures was selected for further detailed on site review. The onsite review included verification that the monitors and recorders had been included under the Radiation Monitoring System within the scope of the Maintenance Rule. This review determined that radiation recorder RR-90-12 (and its associated Continuous Air Monitors (CAMs)) were not included in the scope of the Radiation Monitoring System. Further investigation determined that the recorder and CAMs had been abandoned via the design control process at least two years earlier, and the emergency operating procedures had not been updated to reflect this change in plant configuration. The licensee had identified this deficiency just prior to this inspection, and had initiated a deficiency report to obtain the needed corrective action (reference SQ962847PER). However, the corrective action plan for this PER had not been approved, and corrective actions were not in progress at the time of the inspection. This deficiency is considered as Violation 50-327,328/96-12-01, for Failure to Update Emergency Operating Procedures as a Result of Design Changes to Abandon Plant Equipment.

b.5 <u>480 Volt Boards</u>

The 480V Low Voltage Power System was classified as two systems for the purpose of the Maintenance Rule. System 201 was identified as the "480V Safety Related & Non-Safety related Power Loads" system and 201A was identified as the "480V Essential Power Loads" system. The performance monitoring factors causing the functions to be classified as (a)(1) included the performance indicator of "unreliability". The performance criteria value exceeded was component level failures of the Arrow-Hart (A-H) motor starters. The root cause of this problem was 1) high resistance of front auxiliary contacts, 2) sticking front auxiliary contacts, and 3) binding clapper assemblies. The team verified that the licensee was in the process of implementing appropriate short term preventive maintenance by monthly inspection of the motor starter and trending of contact resistance. The licensee's long term corrective action to replace the A-H motor starters was in progress. The team concluded the performance criteria, goals, and monitoring met the requirements of the Maintenance Rule.

b.6 High Voltage Transformers

System 241 was classified as (a)(1) due to the functional failures that resulted in two scrams in each unit in 1995 and 1996. The system 241 events that caused the system to be placed in a(1) were as follows:

- July 17, 1995, Unit 1 tripped due to pressure relay failure on the main transformer.
- June 23, 1996, Unit 1 tripped due to coupling capacitor voltage transformer failure in the switchyard.
- January 5, 1995, Unit 2 tripped due to momentary short circuit in the transformer oil pump.
- January 13, 1995, Unit 2 taken off line due to overheating of a transformer bushing.
- April 28, 1995, Unit 2 tripped due to ground fault in the isophase bus housing seal ring.

In addition, there were five switchyard challenges in the third quarter ending in October 1996, and another event occurred during the inspection: Unit 2 scrammed due to the opening of a 6.9kV breaker.

The licensee had taken corrective action to repair the defective equipment for the failures listed above. In addition, the licensee was in the process of replacing some of the 500kV switchyard breakers as a preventive measure. The licensee had established appropriate goals for this system, and was monitoring against those goals. The team agreed with the (a)(1) classification of this system and the corrective actions underway.

c. Conclusions

The licensee had considered safety in establishment of goals and monitoring for systems, and components in (a)(1) status. Industry wide operating experience was used and corrective actions were appropriate. Some weaknesses were identified: The team was concerned with the number of radiation monitor functional failures and with the fact that the corrective action plan for these failures had not yet been approved. However, Maintenance Rule Program requirements regarding these monitors were being followed. One violation, which was not directly associated with implementation of the Maintenance Rule was identified.

M1.7 Preventative Maintenance and Trending for (a)(2) SSCs

a. Inspection Scope (62706)

Paragraph (a)(2) of the Rule states that monitoring as required in paragraph (a)(1) is not required where it has been demonstrated that the performance or condition of a SSC is being effectively controlled through the performance of appropriate preventative maintenance, such that the SSC remains capable of performing its intended function.

The team reviewed selected SCCs listed below for which the licensee had established performance criteria, and was trending performance to verify that appropriate preventative maintenance was being performed, such that the SSCs remain capable of performing their intended function. The team verified that industry-wide operating experience was considered, where practical, that appropriate trending was being performed, that safety was considered when performance criteria were established, and that corrective action was taken when SSCs failed to meet performance criteria, or when a SSC experienced a maintenance preventable functional failure.

The team reviewed program documents and records for selected SSCs the licensee had placed in the (a)(2) category in order to evaluate this area. The team also discussed the program with the Maintenance Rule Coordinator, system engineers, maintenance supervisors, and other licensee personnel. In addition, the team reviewed specific program areas based on review of operator logs.

b. Observations and Findings

b.1 Structures

The team reviewed the 5th diesel generator building and major portions of the main diesel generator building. The review included walkdowns evaluating the concrete and structural steel components in these buildings. No problems were noted other than minor surface cracking in the concrete that was not a concern. The team determined the licensee had recorded the imperfections and plan to consider these in the next five year inspection. All areas inspected were found acceptable. The team was accompanied by the Chief Civil Engineer who was very knowledgeable of the evaluation results.

The team determined that the licensee had established performance criteria for reclassifying structures from (a)(2) to (a)(1). The team reviewed this criteria and determined that it appeared to be adequate. However, the issue of performance criteria for (a)(2) structures is an industry wide issue and has been identified previously by the NRC. The reason for the issue is that there is presently no industry guidance in this area. As a result, Inspector Followup Item No. 50-327, 328/96-12-02, Followup on Licensee Actions to Provide Performance Criteria for Structures After Industry Resolution of this Issue, was identified.

b.2 Control Air

This system included station air and auxiliary control air. Station air is non-safety related and low risk. Auxiliary air is safety related and risk significant. Review of the evaluations associated with the system determined that performance criteria was being monitored on a train level for the auxiliary air system and monitored by plant level for the station air system. The team performed a detailed review of both trains of the auxiliary air system. The evaluation for performance criteria was based on unavailability and functional failures. The functional failures were determined by reviewing operating logs and the data was assembled by the system engineer. The team interviewed the system engineer, reviewed the System Health Report, maintenance work order logs, operation logs, nonconformance report logs, and system engineer's collection of unavailability data. No deficiencies were noted concerning this system.

b.3 Steam Generator Blowdown

The Steam Generator Blowdown (SGBD) system was initially included in the Maintenance Rule from July 10, 1996. As a non-safety related, non-risk significant system in continuous operation, the system was monitored at the plant level by the unplanned capacity loss factor. In November 1996 the licensee reevaluated this system and determined that the initial monitoring did not adequately monitor the EOP functions. The basic function of the system is to provide a drain path for steam generator high levels and to provide a sample path for monitoring steam generator activity. As such, a functional failure is the loss of a flow path. In reevaluation to address the EOP functions the licensee was monitoring at a system level and has set the performance criteria as equal to or less than five functional failures in a 24 month period.

Currently, the licensee had identified 3 functional failures on Unit 1 and 3 functional failures on Unit 2 in the previous 24 months. The system had met its performance criteria and remains in (a)(2) status.

b.4 Sampling

The sampling system is composed of several subsystems including the Hydrogen Analyzer (43A), Post Accident Sampling Facility (PASF,43B), Reactor Coolant System (RCS) sampling (43C), and Steam Generator Blowdown (SGBD, 43D) sampling. With the exception of the Hydrogen Analyzer, these are non-safety related, non-risk significant subsystems which function to provide information for decisional purposes. The performance criteria in terms of the number of functional failures per train per 24 months differs according to the system function.

Review of system records show that all subsystems meet the performance criteria and remain in (a)(2) status. However, Unit 2, Train B, Hydrogen Analyzer experienced a functional failure in July 1996, which brought the number of functional failures on that Train to 3 in the last 24 months. This was the maximum allowed for this subsystem.

The cause of failures was attributed to aging of the equipment. Corrective action to develop PMs to replace components at the vendor recommended frequency had been initiated but will require some time to become effective.

b.5 Main Feedwater System

The feedwater system was classified as six systems for the purpose of the Maintenance Rule: System 003 was Main Feedwater (MFW), System 003A was Feedwater Isolation, System 003C was SG Pressure Boundary Isolation, System 003D was Auxiliary Feedwater Emergency Supply, System 003E was AMSAC, and System 003F was Auxiliary Feedwater Startup/Cooldown. This review addressed systems 003 and 003A. Main Feedwater, System 003, has a system function to supply feedwater to, and control the level of, the steam generators during normal operations. Feedwater Isolation, System 003A, has a system function to generate and isolate main feedwater flow to the steam generators.

Review of the system data indicated the licensee was implementing a PM program. However, the number of open corrective maintenance work orders was more than was expected. Only one functional failure was identified for System 003: Valve 1-FCV-3-103 (Unit 1) failed to open December 8, 1995. The performance criteria and a(2) classification of this system by the licensee were considered appropriate.

The team considered the description of the monitoring for System 003A in 0-TI-SXX-000-004.0, Rev. 5 to be misleading. It specified that only failure data from the performance of Section XI Program tests be trended in lieu of all system failures. This issue was discussed with the licensee, and the licensee agreed to revise the procedure to clarify the requirements to monitor the system for all failures.

b.6 Main Feedwater Control System

The Main Feedwater Control, System 046, only includes the controls for the main feedwater turbines. Review of the system data determined that one reduced power event occurred during June 12, 1996, for Unit 1. The main feedwater turbine (oil) pump electro-hydraulic (MFPT 1A EH) controller was repaired. The EH converter torque motor failed and was replaced. The 4TH QTR System Health Report indicated the short term corrective actions require control refurbishment during the next refueling outage. The performance criteria and (a)(2) classification of this system by the licensee were considered appropriate.

c. Conclusions

Performance criteria were established, industry-wide operating experience was considered, where practical, appropriate trending was being performed, and corrective action was taken when SSCs failed to meet performance criteria, or when a SSC experienced a maintenance preventable functional failure for most of the SSCs reviewed. Structures were being monitored and a systematic program for monitoring had been established. An Inspector Followup Item was identified for followup on licensee actions to provide performance criteria for structures after industry resolution of this issue.

M2 Maintenance and Material Condition of Facilities and Equipment

M2.1 Material Condition Walkdowns

a. Inspection Scope (62706)

During the course of the reviews, the team performed walkdowns of the following systems and plant areas, and observed the material condition of these SSCs.

- Emergency Diesel Generator Building
- Control Room HVAC
- Control Air System
- Steam Generator Blowdown
- Radiation Monitoring
- Auxiliary Feedwater System
- Sampling System
- 480 Volt Boards
- High Voltage Transformers
- Main Feedwater System

b. Observations and Findings

The team performed material condition walkdowns on selected portions of each system that related to the areas inspected. Housekeeping in the general areas around system and components was acceptable. Piping and components were painted, and very few indications of corrosion, oil leaks, or water leaks were evident. The team did observe the following problem areas:

- Main Feedwater, System 003

  The team observed the material condition of the MFW turbines, turbine controls, regulating valves, and by-pass valves. All the valves were found to be in good condition and no deficiencies were identified. However, all four MFW turbines and the turbine control units had oil leaks. The leak on turbine 1B required towels to be placed under it to prevent the oil from spreading over the floor. In addition, in Unit 2, the team observed excessive vibration of the piping and steam traps for the main steam system. The licensee had previously identified this condition in July 1996 and was addressing this concern.

- High Voltage Transformers and Switchyards, System 241 and 241A

  During the walkdown of the switchyards, the team observed numerous work projects in progress. One item of concern was the number of vehicles allowed inside the 500kV switchyard.

- 480 Volt Boards, System 201 and 201A

  The 480V load centers and motor control centers (MCCs) were examined through out the plant. The safety related centers and MCCs were clean, dust free and in good condition. However, the MCCs in the turbine building had dust in them that could affect the electrical contacts and moving parts. The licensee agreed to address this concern.

c. Conclusions

In general walkdown of systems determined that the systems were being adequately maintained, however, several concerns were identified: The number of vehicles in the switchyard appeared excessive, the balance of plant 480V electrical boards were not being maintained to the same standards as the safety related boards, the main feedwater turbines in both units had oil leaks, and excessive vibrations on the Unit 2 main steam traps were noted.

M7 Quality Assurance in Maintenance Activities

M7.1 Licensee Self Assessment

a. Inspection Scope (62706)

The team reviewed licensee's audits to determine if Maintenance Rule self assessments were conducted and the findings of the audits were addressed.

b. Observations and Findings

The team reviewed five licensee audits:

- Corporate QA Maintenance Audit Report No. SSA9512 dated October 28, 1995

- Corporate Maintenance Report on Maintenance Rule Independent Assessment for all TVA Nuclear Sites, Report WO5 960403800 dated April 16, 1996

- Site Nuclear Assurance Vertical Slice of Performance Data for the Final Compliance Assessment of the SQN Maintenance Rule Implementation Report dated June 20, 1996

- Nuclear Assurance and Licensing Assessment Report, (all TVA sites) Knowledgeable of the Maintenance Rule, L17 960703 800 dated July 3, 1996

- Corporate Nuclear Assurance & Licensing Assessment Report (all TVA sites) Maintenance Rule Program, Report SSA9611 dated October 24, 1996

The overall quality of the audits was good. The audits were detailed, addressed the Maintenance Rule, and a large number of recommendations were listed. The team reviewed sufficient updated documentation that included the licensee's Maintenance Rule Program Manual, the Maintenance Rule Procedure TI-04, and numerous PERs to verify that the recommendations and concerns in the audits were addressed.

c. Conclusions

The team concluded the audits and assessments were detailed and thorough. The concerns and recommendations were addressed in a timely manner.

III. ENGINEERING

E2 Engineering Support of Facilities and Equipment

E2.1 Review of Updated Final Safety Analysis Report (UFSAR) Commitments (62706)

A recent discovery of a licensee operating their facility in a manner contrary to the UFSAR description highlighted the need for a special focused review that compares plant practices, procedures and/or parameters to the UFSAR descriptions. While performing the inspections discussed in this report, the team reviewed the applicable portions of the UFSAR that related to the areas inspected. The team verified that the UFSAR wording was consistent with the observed plant practices, procedures and/or parameters.

E4 Engineering Staff Knowledge and Performance

E4.1 Engineer Knowledge of the Maintenance Rule

a. Inspection Scope (62706)

The team interviewed licensee system owners (system engineers) for the SSCs reviewed in paragraphs M1.6 and M1.7 to assess their understanding of the Maintenance Rule and associated responsibilities.

b. Observations/Findings and Conclusions

The system engineers were knowledgeable of their systems, proactive in corrective actions, and actively participated in Maintenance Rule development.

V. MANAGEMENT MEETINGS

X1 Exit Meeting Summary

The team leader discussed the progress of the inspection with licensee representatives on a daily basis and presented the results to members of licensee management at the conclusion of the inspection on December 6, 1996. The licensee acknowledged the findings presented.

PARTIAL LIST OF PERSONS CONTACTED

LICENSEE:

R. Adney, Site VP
J. Bajraszewski, Site Licensing
R. Baron, General Manager Nuclear Assurance and Licensing
L. Bryant, Assistant Plant Manager
M. Burzynski, Engineering and Materials Manager
M. Fecht, Manager Nuclear Assurance and Licensing
J. Rupert, Engineering and Support Services Manager
T. Rutledge, Maintenance Rule Coordinator
M. Skarzinski, Technical Support Manager
J. Thomas, Site PSA Engineer
I. Zeringue, Senior VP Nuclear Operations

NRC:

H. Christensen, Chief, Maintenance Branch, DRS, RII
R. Correia, Chief, Maintenance Branch, NRR
S. Ebneter, Regional Administrator, RII
S. Eide, NRC Contractor
R. Gibbs, Reactor Inspector, DRS, RII
M. Miller, Reactor Inspector, Maintenance Branch, RII
M. Shannon, Sequoyah Senior Resident Inspector, RII
G. Walton, Reactor Inspector, Special Inspection Branch, RII
H. Whitener, Reactor Inspector, Maintenance Branch, RII
J. Wilcox, Senior Operations Engineer, NRR
P. Wilson, Senior Reactor Analyst, NRR

LIST OF INSPECTION PROCEDURES USED

IP 62706	Maintenance Rule

LIST OF ITEMS OPENED

50-327, 328/9612-01	VIO	Failure to Revise Emergency Operating Procedures as a Result of Design Changes to Abandon Plant Equipment (Section M1.6.b.4).
50-327, 328/96-12-02	IFI	Followup on Licensee Actions to Provide Performance Criteria for Structures After Industry Resolution of this Issue (Section M1.7.b.1).

LIST OF ACRONYMS USED

AFW	Auxiliary Feedwater System
CREV	Control Room Emergency Ventilation
EOP	Emergency Operating Procedure
EPRI	Electric Power Research Institute
FF	Functional Failure
GPM	Gallons Per Minute
HVAC	Heating Ventilation and Air Conditioning
INPO	Institute for Nuclear Power Operations
MCC	Motor Control Center
MDAFW	Motor Driven Auxiliary Feedwater
MFW	Main Feedwater
MOV	Motor Operated Valve
MPFF	Maintenance Preventable Functional Failure
NRC	Nuclear Regulatory Commission
NRR	Nuclear Reactor Regulation
PASF	Post Accident Shutdown Facility
PER	Problem Evaluation Report
PM	Preventative Maintenance
PRA	Probabilistic Risk Assessment
PSA	Probabilistic Safety Analysis
QA	Quality Assurance
RCS	Reactor Coolant System
RHR	Residual Heat Removal
RO	Reactor Operator
SG	Steam Generator
SGBD	Steam Generator Blowdown
SI	Safety Injection
SNP	Sequoyah Nuclear Plant
SQN	Sequoyah Nuclear Plant
SRO	Senior Reactor Operator
SSC	Structures Systems and Components
SSP	Site Standard Practice
TDAFW	Turbine Driven Auxiliary Feedwater
TI	Technical Instruction
UFSAR	Updated Final Safety Analysis Report

LIST OF PROCEDURES REVIEWED

0-TI-SXX-000-004.0, Rev.5, Maintenance Rule Performance Indicator Monitoring, Trending, and Reporting - 10 CFR 50.65

Maintenance Rule 10 CFR 50.65 Program Manual, Rev. 2

Maintenance Rule 10 CFR 50.65 System/Scoping and Risk Significant Determination, dated January 1996

SSP-3.4, Rev. 17, Corrective Action

SSP-4.4, Rev. 5, Managing the Nuclear Experience Review Program

SSP-4.5, Rev. 6, Regulatory Reporting Requirements

SSP-6.3, Rev. 16, Preventive Maintenance

SSP-6.30, Rev. 2, Generic Design Change Notice Work Order Package

SSP-6.51, Rev. 2, Guidelines for Conduct of Reliability Centered Maintenance

SSP-7.1, Rev. 12, Work Control

SSP-7.2, Rev. 0, Outage Management

SSP-8.6, Rev. 5, ASME Section XI Inservice Testing of Pumps and Valves

SSP-8.50, Rev. 9, Conduct of Technical Support

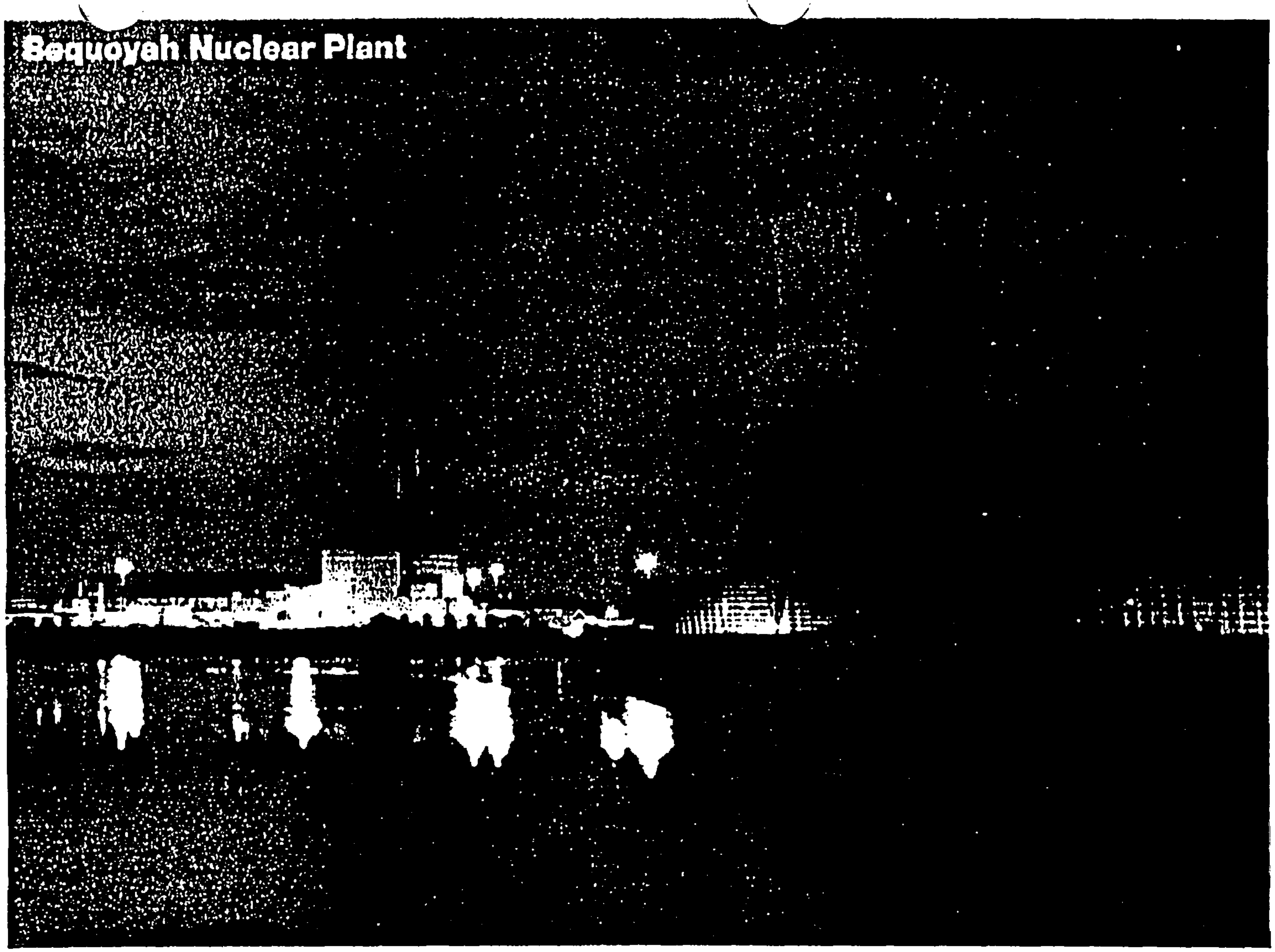
SSP-9.3, Rev. 15, Plant Modifications and Design Change Control

SSP-9.5.8, Rev. 0, Probabilistic Safety Assessment (PSA) Program

SSP-9.52, Rev. 2, Equipment Management System

SSP-12.16, Rev. 7, Emergency Operating Instruction Control

SSP-12.63, Rev. 2, Sensitive Equipment Control



TVA

Maintenance Rule Presentation
December 1996

ATTACHMENT

WELCOME

Robert Adney

Site Vice President

TVA

MISSION STATEMENT

TVA

To Develop a Maintenance Effectiveness Program That Satisfies the Requirements of 10CFR50.65. It Should Be Accomplished Through the Integration of Appropriate Site Equipment Reliability Processes With a Focus on Improving Plant Reliability. It Shall Be Commensurate With Safety While Reducing Overall Plant Costs.

INTRODUCTION

Mark Skarzinski

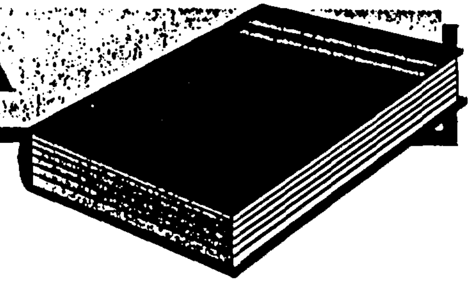
Systems Engineering Manager

TVA

AGENDA

- *Background*
- *The TVA Program*
- *Discussion of Program Bases*
- *Sequoyah Implementation*
- *Organization*
- *Development*
- *Implementation*
- *Status*
- *Summary*

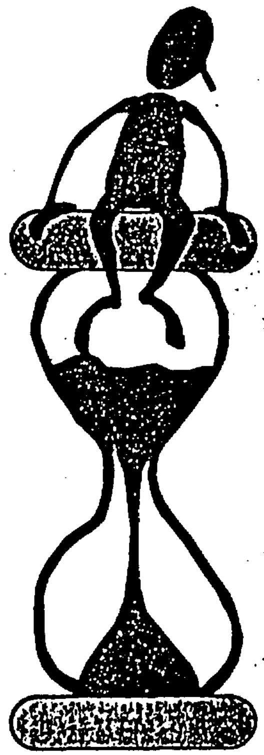
THE PROGRAM AT TVA



Marci Cooper

Corporate Maintenance Rule Representative

BACKGROUND

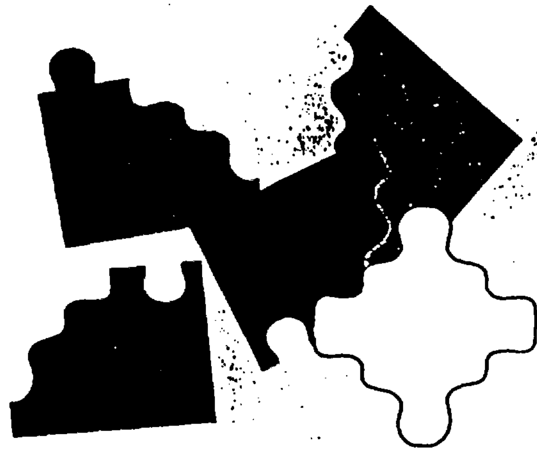


- 1991
  - *Corporate Maintenance Rule Coordinator Established*
  - *SQN Maintenance Rule Coordinator Established*
  - *TVAN Peer Group Established*
  - *Two TVAN Individuals on NUMARC Advisory Committee Drafting 93-01*
- 1992
  - *NUMARC Assistance Visit*

BACKGROUND (CONTINUED)

- 1993

  NUMARC 93-01 Revision 0 Issued
  Industry Working Meetings Begin
  Industry Peer Visits



- 1994
  - *TVAN Program Manual Issued*
  - *First Meeting of SQN Expert Panel*
  - *First Meeting of SQN Steering Committee*
  - *NEI Assist Visit*
  - *Independent Contractor Review*
  - *Performance Criteria Prepared*
  - *Data Collection Begins*

BACKGROUND (CONTINUED)

- **1995**
  - *NRC Issues NUREG 1526 - Results of Pilot Inspections*
  - *SQN Monitoring & Trending Begins*
- **1996**
  - *SQN Maintenance Rule TI Issued*
  - *Independent Assessments & Reviews*
  - *Site Communication & Training Reinforcement*
  - *RULE Effective July 10, 1996*
  - *Baseline NRC Inspections Results Review*
  - *NEI Workshop - Industry Evaluation*
  - *Ongoing Industry & NRC Communication*

TVA

KEY ELEMENTS

Program Manual

- *Incorporates 93-01 for Program Elements & Guidance*
- *Unified TVAN Wide Program*
- *Managed by Corporate Maintenance Rule Coordinator*

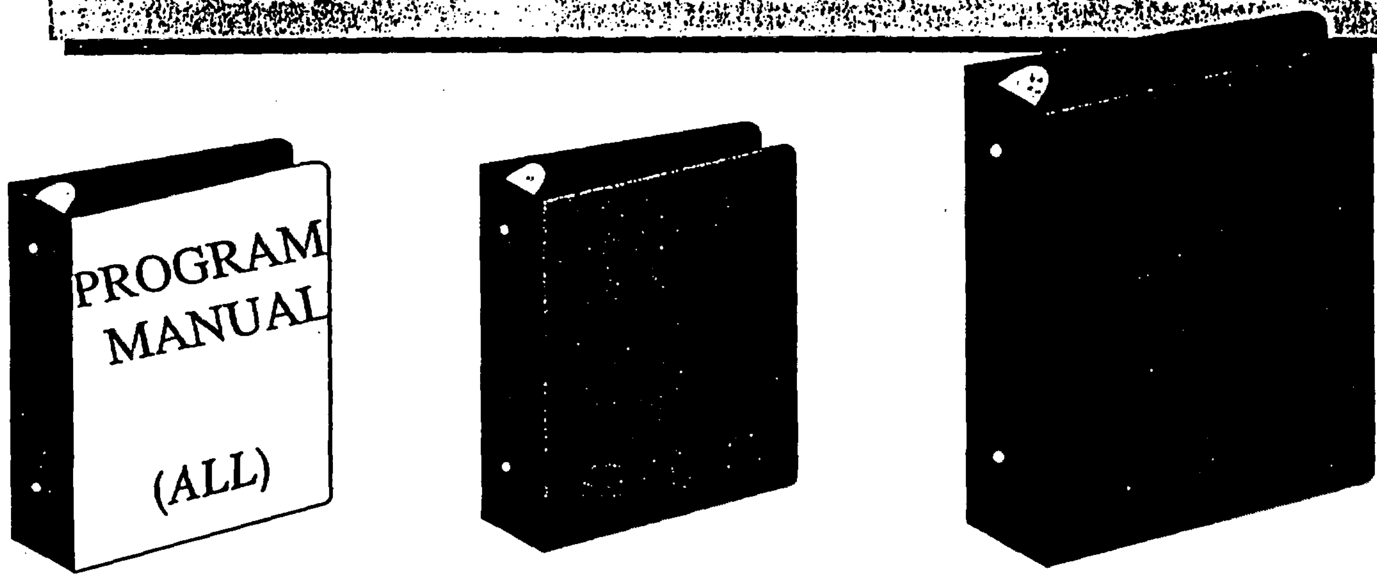
Expert Panel (during development phase)

- *Chaired by SQN Maintenance Rule Coordinator*
- *Key Representation - Engineering, OPS, Maintenance*
- *Approved Scoping, Risk Significance, & PC*

Steering Committee (during development phase)

- *Chaired by Plant Manager*
- *Corporate Maintenance Coordinator Advisor*
- *Key Representation - Engineering, OPS, Maintenance*
- *Management Strategy, Oversight, TVAN Consistency*

THE PROGRAM CONCEPT

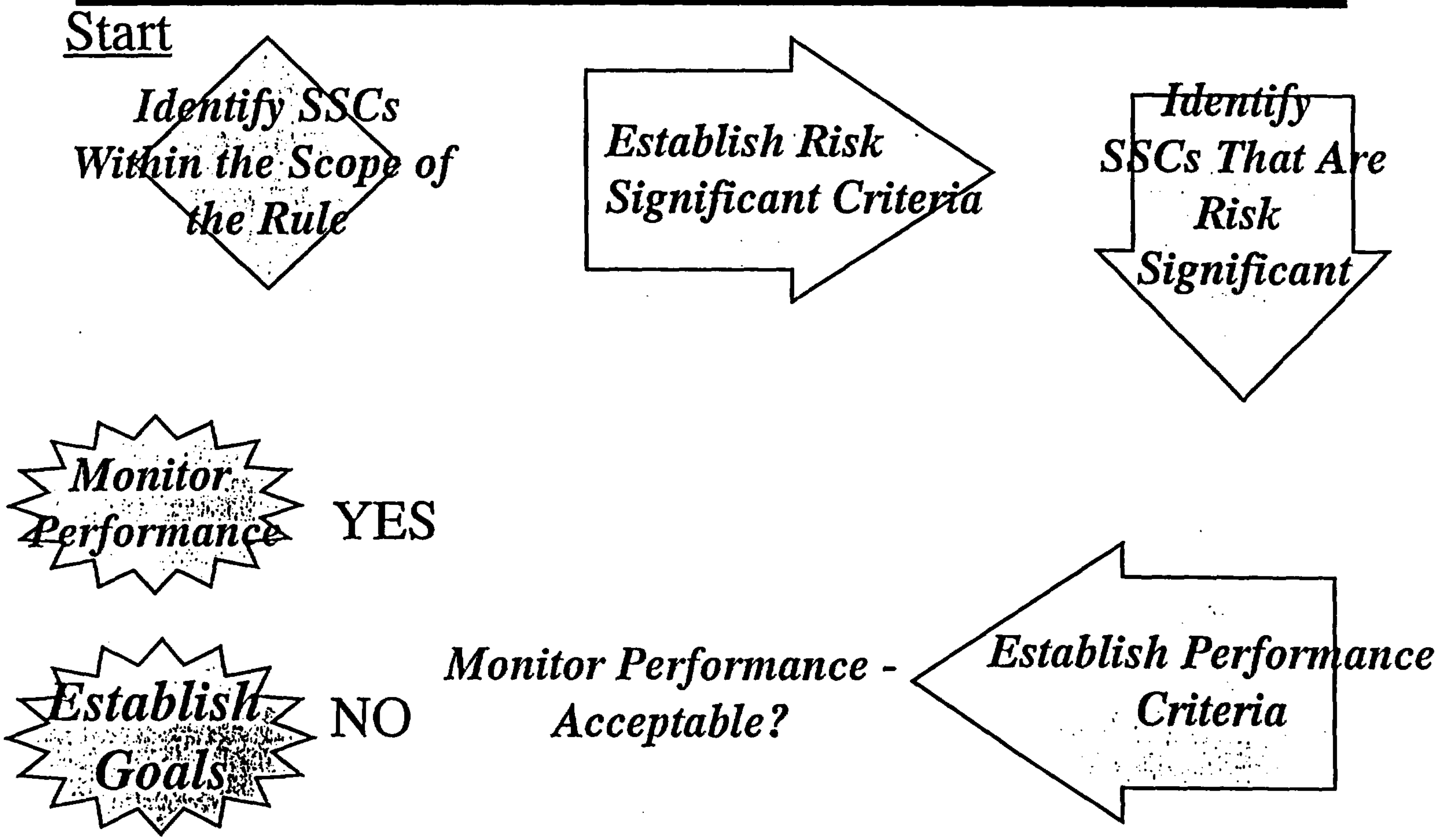


ONE MANUAL FOR ALL SITES

EACH SITE HAS SAME BASIC TI

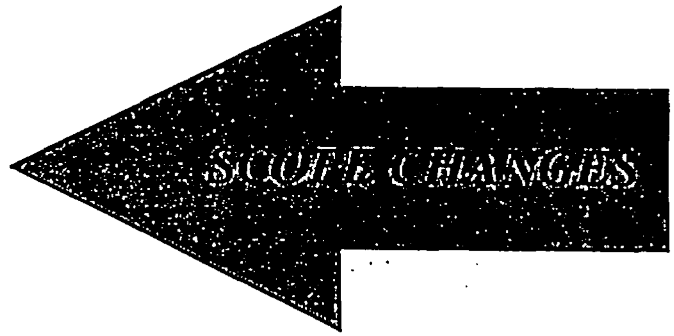
UNIQUE APPENDIX & ATTACHMENT FOR EACH SITE

THE BASIC 10CFR50.65 PROCESS



50.65 (B) SCOPING

- UTILIZED 93-01 GUIDANCE
- SECTION 3.4.1 TVA PROGRAM MANUAL
- SPECIFIC LISTING FOR SQN - TI, APPENDIX B
- INITIAL LIST COMPILED BY SITE EXPERT PANEL
- PROGRAM IS DYNAMIC :
  - *DESIGN CHANGES*
  - *OPERATING EXPERIENCE*
  - *PSA UPDATE*
  - *PROCEDURE REVISIONS*



DETERMINE RISK SIGNIFICANCE

- Performed At the System Level
- BASES from IPE GL-88-20
  - *Results Documented in Site IPE*
  - *DELPHI From Expert Panel*
- Established by Expert Panel
- TVA Program Manual Identifies Methodology (Para 3.4.2)
- SQN TI, Appendix B Listing
- Will Change as the PSA Model Changes Over Time

IMPLEMENTATION ELEMENTS

- 10 CFR 50.65 (a)(2) PC & Monitoring
  - *System Level Specific & Plant Level*
  - *CDEFs/FF/PFF/RPFF*
- 10 CFR 50.65 (a)(1) Goal Setting & Monitoring
  - *Criteria for (a)(1)*
  - *Root Cause, C/As, Goals*
  - *Performance to Return to (a)(2)*
- 10 CFR 50.65 (a)(3)
  - *Balancing Availability & Reliability*
  - *Assessment of Risk for Removal of SSCs from Service*
  - *Periodic Assessment of Maintenance Effectiveness*

The Sequoyah Program

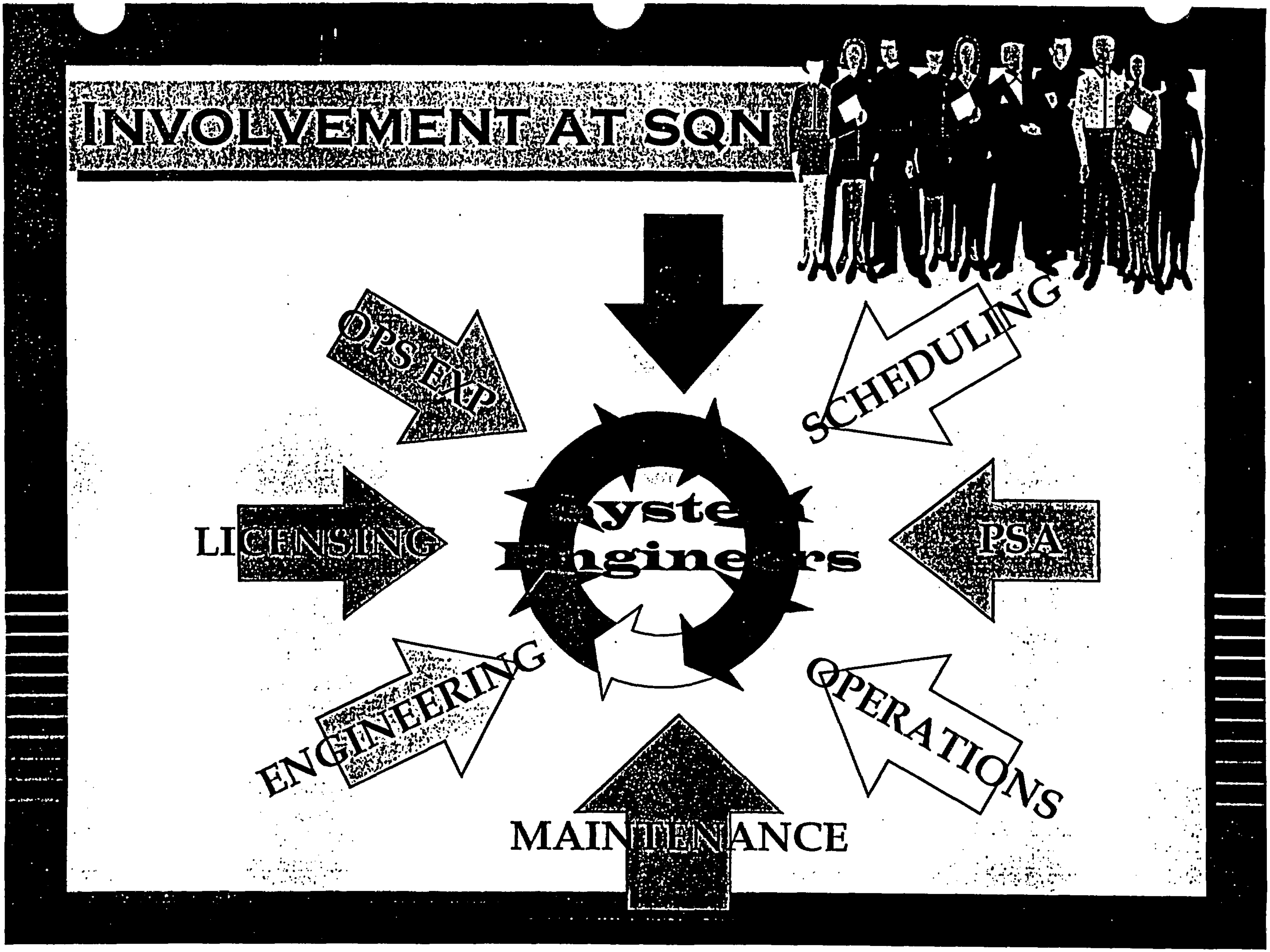
Terry Rutledge

Maintenance Rule Coordinator

TVA

TVA SQN Program Bases

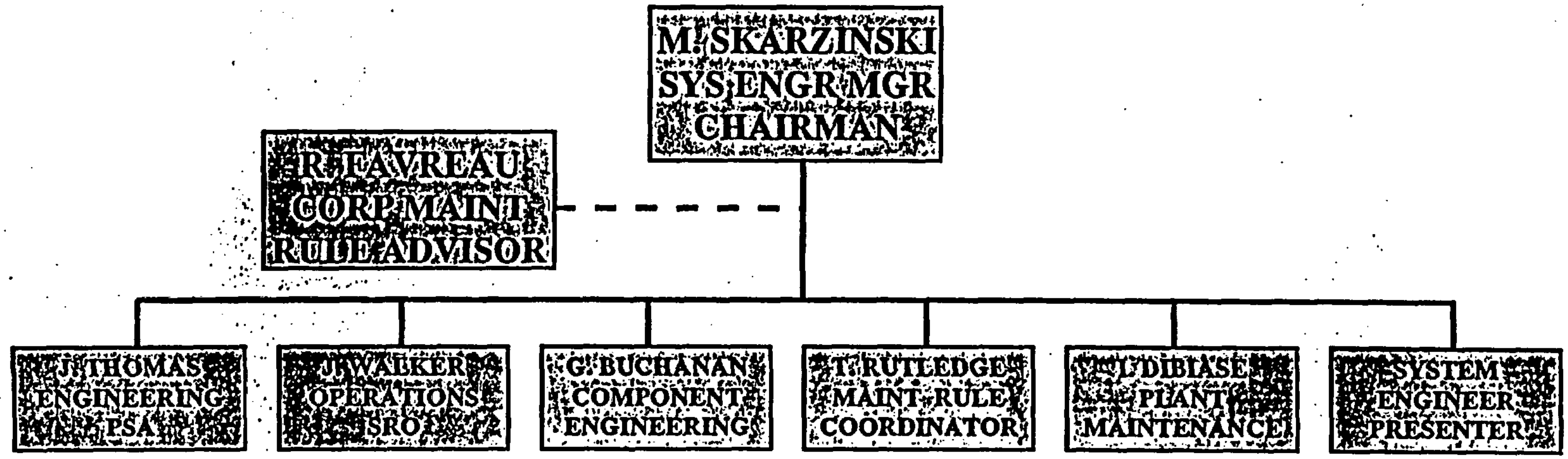
- Meets 10CFR50.65
- Follows the Guidance of Regulatory Guide 1.160 "Maintenance Program Implementation"
- Follows the Guidance of NUMARC 93-01
- Consistent with NRC Maintenance Rule Inspection Program (NRC IP 62706 & 62707)


INVOLVEMENT AT SQN
OPS EXP
SCHEDULING
LICENSING
PSA
ENGINEERING
OPERATIONS
MAINTENANCE

SATELLITE PROCEDURES

- Corrective Action SSP-3.4
- Operating Experience SSP-4.4
- EOPs SSP-12.16
- Work Control SSP-7.1
- Outage Management SPP-7.2
- Design Change Control SSP-9.3
  - *ADDED 50.65 TO ISSUE PRIORITY MATRIX*
- SQN-CI-96.02 Structural Walkdown
- PSA Program SEP-9.5.8

EXPERT PANEL*



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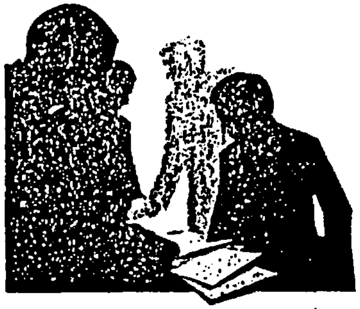
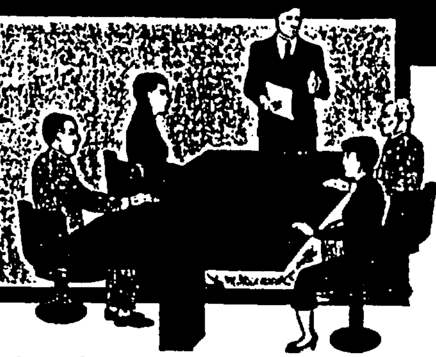


Risk Significance & the Expert Panel

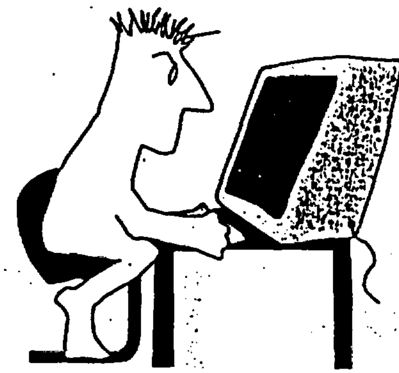
- Identified Systems That Support Critical Safety Functions (Such As Described in FSAR, DBDs)
- Made Risk Significance Decisions Based on Expertise
- Integrated PSA Results With Deterministic Input

Expert Panel Responsibilities



- Experience from Ops, Engineering, PSA & Maintenance
- Advise Plant Manager Concerning SSCs Performance Relative to 50.65
- Review Changes to Scoping & Risk Significance
- Review Adequacy of Performance Criteria (As Required)
- Approve SSCs for Movement From (a)(2) to (a)(1)
- Approve SSCs for Movement From (a)(1) to (a)(2)
- Review Periodic Assessments

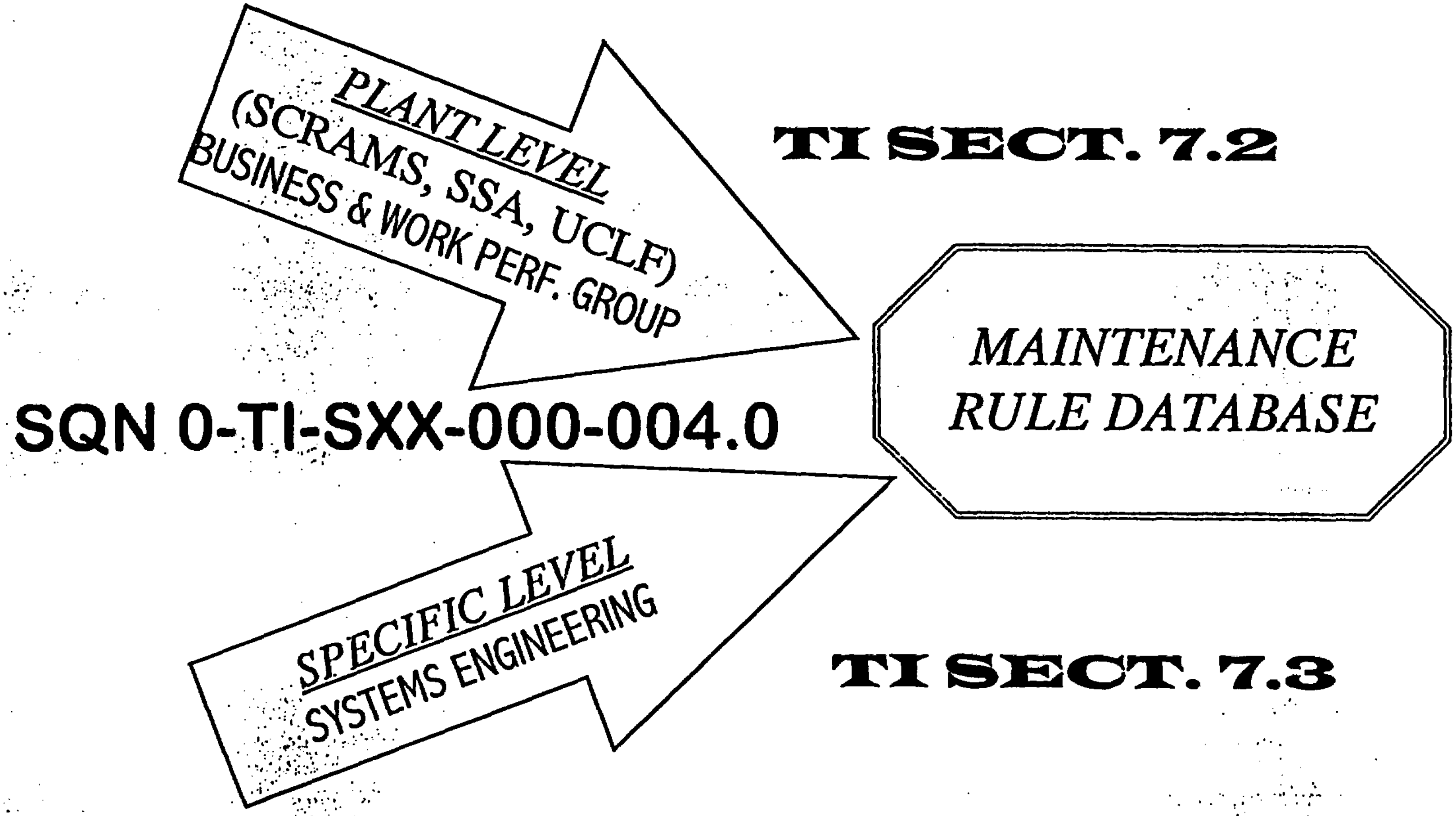
TOOLS TO IMPLEMENT 10CFR50.65



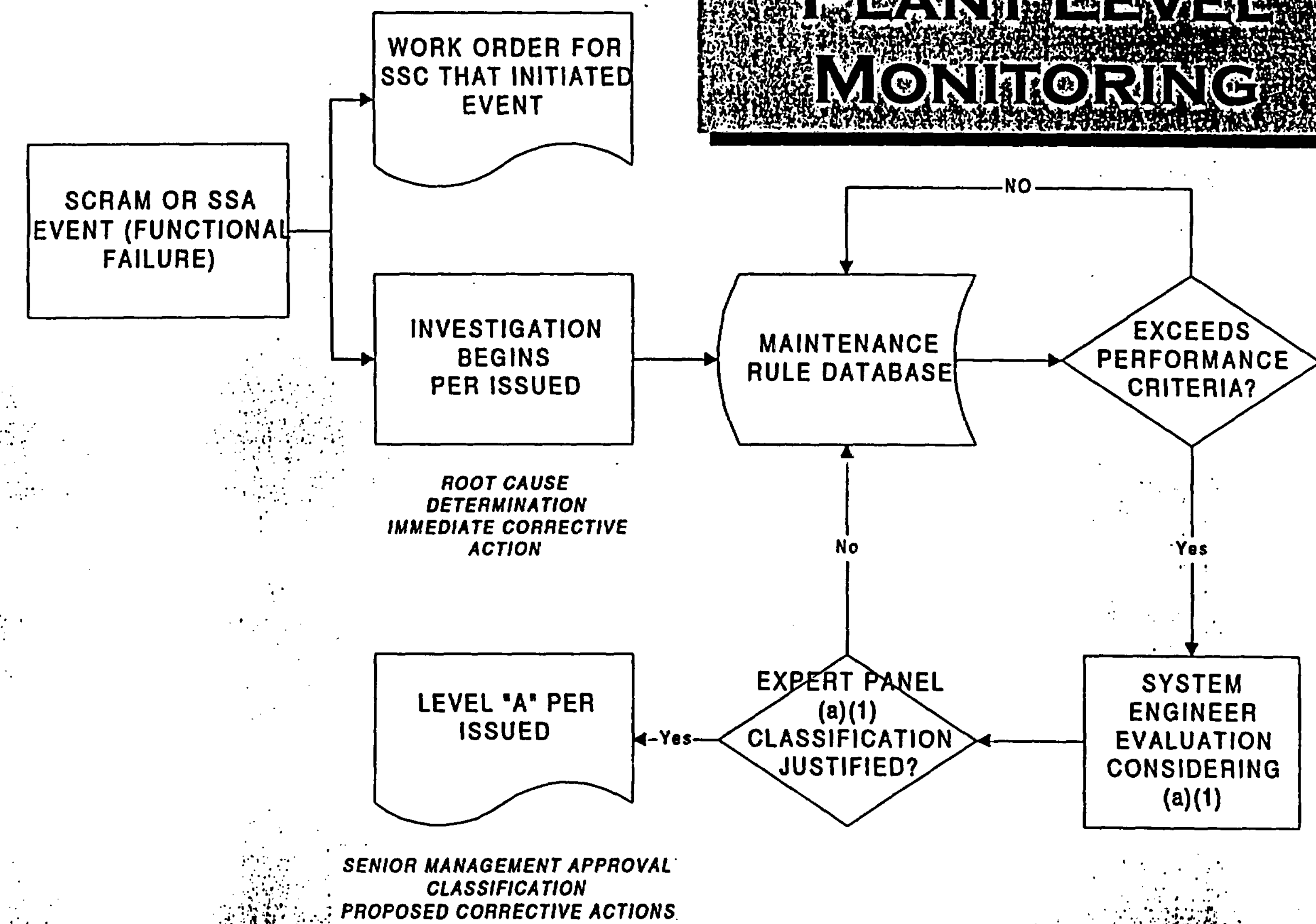
- PLANT PROCESS COMPUTER
- NOMS (LCOs, Ops Logs, Hold Orders)
  - *Nuclear Operations Management System*
- EMPAC (Work Orders)
  - *Enterprise Maintenance Planning and Control*
- TROI (PERs Data)
  - *Tracking and Reporting of Open Items*
- OASIS (Site Wide 50.65 Information)
  - *Operation Automated Status Information System*
- SOIBEAN (Site Wide System Information)
  - *System Open Item BEANcount*
- Maintenance Rule Database
- System Status (Health) Report
- SQN Hotline - Dial RULE (7853)

10CFR50.65(A)(2) MONITORING

Methodology Defined in TVA Program Manual Sec. 3.4.3



PLANT LEVEL MONITORING



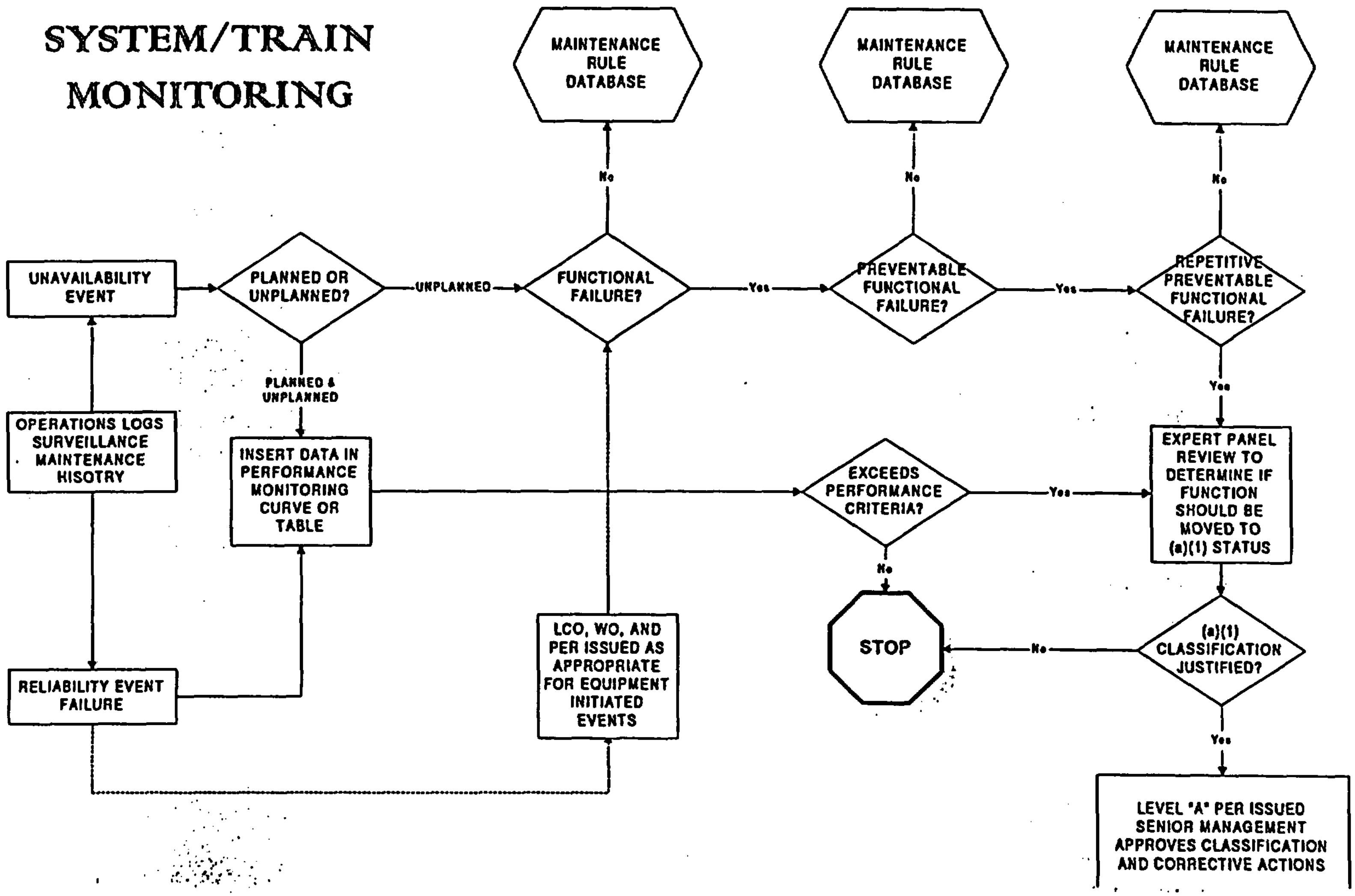
(A)(2) PLANT LEVEL PERFORMANCE CRITERIA

Plant Level Performance Criteria - TI Section 7.2

- SCRAMs - no more than 2 per system per unit or no more than 4 per unit total (last 24 months)
- UCLF - no more than 6% per unit or no more than 3% or 3 UCL events per system (last 24 months)
- SS Actuations - no more than 2 per system per unit or no more than 4 per unit total (last 24 months)

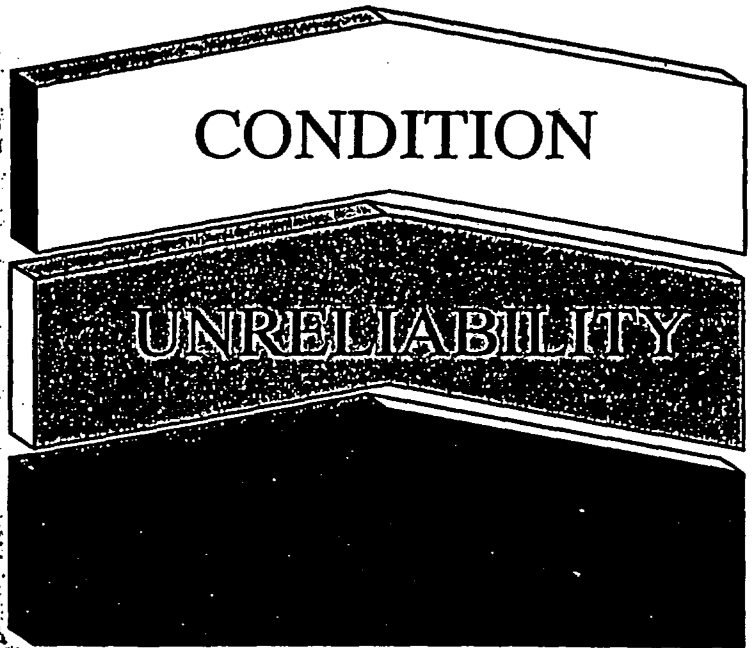
SYSTEM - TRAIN MONITORING

SYSTEM/TRAIN MONITORING



(A)(2) Specific Performance Criteria

- ✓ TI Section 7.3 & Attachments



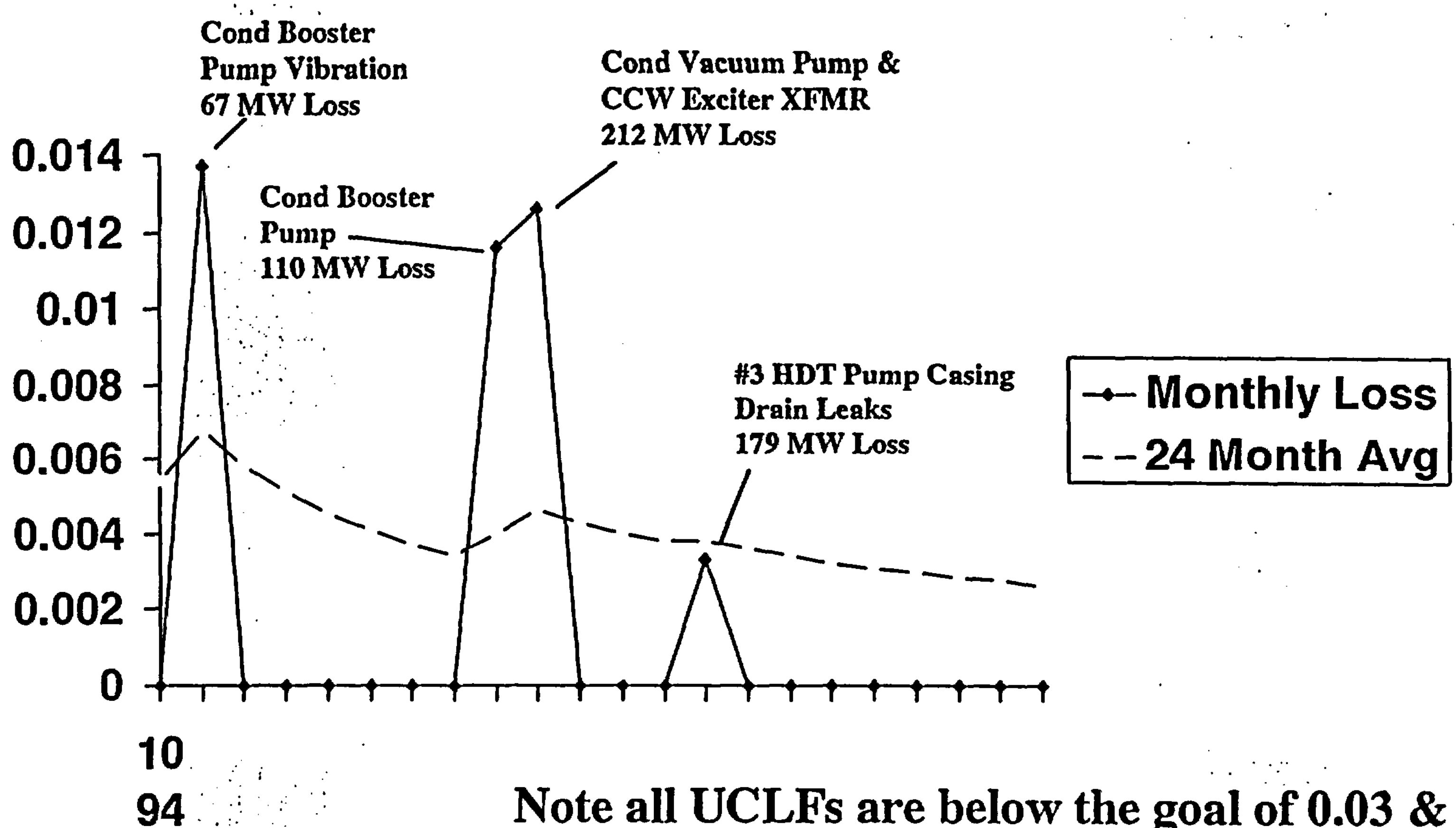
Monitoring Examples

- *SCRAMs* - U1, 12/25/95, Sys 57, Main Gen Exciter - Voltage & Amps were swinging. Problem determined to be a ground on the #7 field pole due to design deficiency & poor workmanship from Westinghouse.

- *Functional Failure* - U1, 5/1/95, Sys 30, CREVs - While performing SI, Control Room pressure did not reach acceptance criteria. Cause was 2 breaches. Breaches were sealed; SQ950353PER initiated.

- *ESF Actuation* - U1, 5/26/96, Sys 99, Response Time Testing - All 4 D/Gs started inadvertently. Cause was malfunction in relay test panel. Test panel was modified to eliminate dual pickup capability; ref SQ961578PER.

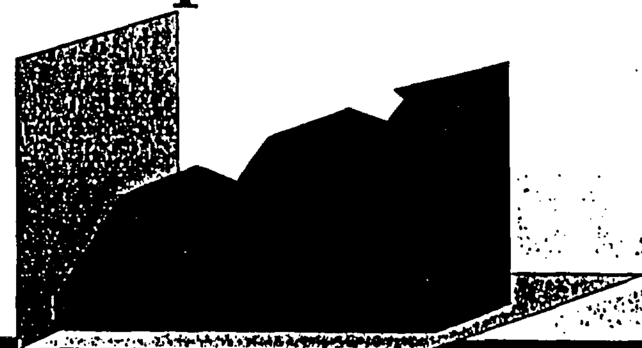
UCLF - U1, SYS 2



Note all UCLFs are below the goal of 0.03 & all MW losses are < 20% (236 MW).

50.65(A)(1)

- Process Defined By TVA Program Manual Section 3.4.3.D
- Implementation - SQN TI Section 8.0 & 9.0
- Purpose - To Return to Acceptable Performance



(A)(1) 9 Point Criteria

- Function Number
- Performance Monitoring Factors
- Direct Cause
- Analyze Unavailability & Reliability
- Corrective Actions
- Industry Experience Sources
- Interim Performance Monitoring Indicator
- Level of Performance to Return to (a)(2)
- Monitoring Schedule

Systems in (a)(1) Category: "Goal Setting" as of November 1996

TVA

- System 3 Aux Feedwater Pumps
- System 68 Reactor Coolant Pumps
- System 30 HVAC
- System 201 480V Power (Arrow Hart Bkrs)
- System 241 Switchyard & Transformers
- System 57 Main Generator Exciter - U1
- System 90 Radiation Monitors

STRUCTURAL PROGRAM

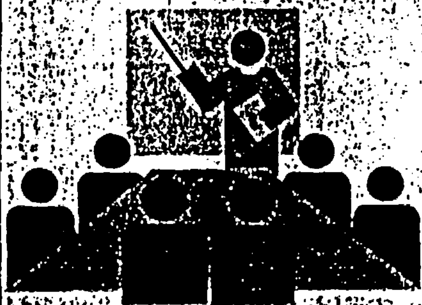
- 7/96 Original Program Implemented
- 9/96 Began Enhancements to Program
- SQN-CI-96.02 Structural Walkdown Procedure
  - *Better Criteria*
  - *Better Defined Responsibilities*
  - *Establishes Personnel Qualifications*
- New Baseline In-Process
- Schedule: 90% Complete in Aug '97, 100% @ U2C8

TVA

(A)(3) Assess Impact of Maintenance on Plant Safety

- Work Control SSP-7.1
- Work Week Managers
- Manage 12 Week Schedule
  - *Per Risk Matrix (SSP-7.1)*
- Integrated With Surveillance Program
- SENTINEL - Installation in Progress
  - *Modes 1 thru 4*
  - *1st Qtr 1997*
- Outage Management SPP-7.2 - Modes 5 & 6

SITE VP DEFINED TRAINING



- MAINTENANCE & MODS
- OPERATIONS
- TECH SUPPORT
- SCHEDULING
- ENGINEERING (INCLUDES SYSTEMS,STRUCTURAL & PSA)
- RADCON & CHEM
- OUTAGE MANAGEMENT
- LICENSING
- BUSINESS & WORK PERFORMANCE
- SITE SUPPORT

SUMMARY

TVA

- Program Addresses 10CFR50.65
  - *Includes Industry Guidance Documents*
  - *Actively Participated in Industry Initiatives*
- Developed Procedures
  - *Integrated With Existing Programs*
- Provided Training
- Implemented Program 7/10/96
- Enhance the Program as Experience Dictates