1. Modification of RCI-10

Extensive RCI-10, "Minimizing Occupational Radiation Exposures," revisions have taken place since the thimble tube event. Before the event, the procedure required an ALARA preplanning report to be completed by the responsible supervisor if the job had a potential exposure greater than 5 man-rem. The instruction has been revised to require an ALARA preplan report to be filled out by the responsible supervisor when in his estimation any specific job meets any of the following conditions:

- If an individual has received, from actual past exposures, greater than one rem (whole body) in one calendar day under one radiation work permit (RWP).
- If an individual has received, from actual past exposures, greater than 25 percent of the extremity quarterly limit in one calender day under one RWP.
- If the work area dose rate exceeds one rem/hour (whole body).
- Handling of radioactive material where extremity dose rates are in excess of 10 rem/hour at the working distance for the extremity.
- If an individual is expected to receive greater than 10 MPC hours in one day (after appropriat protection factors are applied).
- If an individual is expected to receive greater than 40 MPC hours in one week (after appropriate protection factors are applied).
- The collective dose is expected to exceed 5 man-rem under the RWP for each individual job.
- All jobs shall be preplanned when deemed necessary for exposure control by the ALARA engineer.

In addition, the preplanning and postplanning checklist was expanded to 41 items and approval requirements were expanded from the job planner and ALARA coordinator to the current level of preparer, cognizant engineer, Health Physics Shift Supervisor, section supervisor and ALARA engineer.

These changes are considered to be significant improvements to RCI-10 and the preplanning effort. Current modifications to the preplanning checklist simplification are being considered as are positive modifications to the RWP instruction RCI-14, "Radiation Work Permit (RWP) Program".

The ALARA engineer stated that 104 preplans were prepared in 1985 and 12 in 1986 as of February 21, 1986.

2. Conduct ALARA/RCI-10 Training

The ALARA engineer records show that he provided training instruction to 237 SQN personnel from the Operations, Mechanical Maintenance, and Instrumentation Mechanics Sections. These were conducted in combinations of one-hour lectures with handouts. Several MPC hour tracking training sessions were also conducted at weekly instrumentation safety meeetings.

3. Plant Instruction Reviews

The HP Group is represented on the PORC subcommittee's biennial review of current plant instructions and all new ones. If deemed applicable a precaution statement is inserted for ALARA and RWPs. Section 4.1 of SMI-0-68-28," Change Out of the RCS Narrow Range RTDs" is an example of the statement being inserted into applicable procedures. This section states:

> Contact HP for applicable radiation work permits (RWP) AI-33 shielding and ALARA preplanning.

This insertion is an improvement, since it instructs the personnel conducting the instruction to verify that ALARA preplanning has been performed, if necessary. At the time of this review, the HP technical supervisor stated that approximately one-third of the potentially affected instructions had been reviewed and that by 1988 all currently existing procedures will have been reviewed for RWP and ALARA preplan precaution determination.

Based upon the revision to RCI-10, the conduct of the training, and the plant instruction review, it has been and is being emphasized to the plant staff that compliance with ALARA preplanning requirements as specified in RCI-10 is required. This item is closed.

AA. I-84-12-SQN-14, Need for Formal Documentation for Upper Plant Management Approval to Work in Radiation Dose Rate Fields Greater Than 50 Rem/Hour

In the original investigation (reference A.25), NSRS recommended that SQN establish formal requirements and a method to document authorization to work in dose rate fields greater than 50 rem/hour. Nuclear Power responded in reference A.28 by stating that at the time of the thimble tube event, RCI-14, "Radiation Work Permit (RWP) Program, section IV.B.6, specified that the Plant Manager was required to review the RWP when dose rates exceed 50 rem/hour; the appropriate management personnel were notified and verbal authorization given to continue the job; RCI-14 was revised requiring formal documentation of this review and authorization, and the appropriate RWP signature sheets were being revised to include a signature slot for the Plant Manager, if required.

For this follow-up review, RCI-14, revision 4, dated July 10, 1985, was examined. The requirements for Plant Manager review and approval are stated in sections 1V.B.7 and V1.F. These state that the Plant Manager shall review and approve all RWPs when the work area dose rate equals or exceeds 50 rem/hour or prior to any entry inside the polar crane wall when the reactor is at power. Also, the Plant Manager will indicate any additional special instructions to be followed on the RWP. The RWP provides a signature slot for the Plant Manager. This item is closed.

BB. I-84-12-SQN-15, Availability of Communications Following the Accident

In the original investigation (reference A.25), NSRS recommended that anytime the telephone is out of service in the airlock, alternate communication methods should be considered and employed. Additionally, availability of communications should be considered during the performance of the job safety analysis and job planning.

NUC PR responded in reference A.28 that SQN acknowledges that the airlock telephone was inoperable and that additional emphasis would be placed on timely response for maintenance requests on these phones.

Section 6.6 of the NRC investigation report of the thimble tube event stated that while regulations do not address airlock communications, the potential for airlock operating mechanism failures and for events inside containment appears to justify maintaining reliable communications between airlocks and manned stations outside containment.

For this follow-up review, the NSRS reviewed AI-8 "Assess to Containment," revisions 10 through 16, and SQM 2, "Maintenance Management System," revision 16. At the time of the thimble tube event, AI-8 did not specifically require verification of the operability of the containment airlock telephone. Subsequent revisions to the procedure were made to add the requirement to check the airlock phone upon entering. Section 6.0 of the current AI-8, revision 16, requires the Public Safety Officer unlocking the airlock to ensure that the phone inside the airlock is checked for proper operation prior to the first person entering containment and to fill out a data sheet related to phone operability. If it is discovered that the phone is not operating properly, Public Safety shall initiate an immediate attention list MR to electrical maintenance for repair. Entry into containment during the period the phone is out of service shall be approved by the individual's supervisor or the shift engineer (SE) when the supervisor is not present.

The SQM 2 states that immediate attention WRs may be commenced at anytime, but normally would not bump a job already in progress. It should, however, be started within 24 hours. It is considered satisfactory that during the 24 plus hours that the phone could be out of service entrance is controlled by the supervisor or SE.

With respect to availability of communications being considered during performance of the job safety analysis and job planning, the following action was verified to have been performed: (a) RCI-10, "Minimizing Occupational Radiation Exposure," was revised to add a prejob ALARA planning report checklist which requires a determination of whether special communications equipment is needed to enable workers to communicate effectively while in radiation areas, (b) the job hazards analysis that was performed for entry into pressurizer enclosure with the unit at 100 percent power specified alternate egress routes and required, as a form of communication, posting an employee inside upper containment at the airlock wheel to open it in the event of an emergency, and (c) AI-8 was modified to require notification of personnel in containment of alternate egress routes in the event the airlock door is intentionally made inoperable. The combination of all of these actions demonstrate that communications are being considered as a part of the job planning and hazard assessment efforts. This item is closed.

CC. I-84-12-SQN-16, Effective Cleaning of the Thimble Tubes by NUS Corporation

In the original investigation (reference A.25), NSRS recommended that WBN be advised of the effectiveness of the NUS cleaning method over the Teleflex method. Nuclear Power responded in reference A.28 that the NUS thimble tube cleaning method appears to be effective and that they will advise WBN of the NUS technique. The response also stated that the ultimate effectiveness can only be judged after considerably more operating experience. NSRS concurred with the response in reference A.29.

For this follow-up review, it was determined the SQN Plant Manager sent a TVA 45D to the WBN Plant Manager informing him that the NUS thimble tube cleaning method appears to be an effective means to clean the tubes. The WBN mechnical maintenance personnel stated that the NUS thimble tube cleaning system has been purchased by WBN. The WBN cleaning procedure MI-94.3, "Incore Flux Thimble Cleaning and Lubrication," section 3.5 states: "This instruction is to be performed using the NUS supplied flux thimble cleaning equipment." This item is closed.

DD. I-84-12-SQN-17, Poor Quality Cleaning Procedures and Inadequate PORC Review

In the original investigation (reference A.25), NSRS recommended that SQN should evaluate the PORC review process and consider supplementing the review process with expert subcommittees to properly evaluate procedures and advise the Plant Manager on their adequacy before he approves or disapproves. Additionally, cancel SMI-0-94-1 and do not use SMI-0-94-2 again until it has been revised to include at least the quality elements listed above. Perform a generic review of all maintenance and special maintenance instructions to ensure adequacy.

The response in reference A.28 addressed recommendations 5, 7, 11, 17, and 22 as one item. The following is an extract.

> After thoroughly analyzing this event and the NSRS conclusions, SQNP acknowledges the following: (1) The work package (SMI-0-94-1 and MR) provided poor quality instructions in that they were not revised to reflect at-power cleaning and did not meet technical specification requirements for this maintenance activity. This procedure has been cancelled. (2) SMI-0-94-2 did not contain all the quality elements necessary for this maintenance activity and it is being revised to reference Maintenance Instruction MI-1.9 "Bottom Mounted Instrument Thimble Tube Retraction and Reinsertion" for the disassembly and assembly of the 10-path transfer devices. Appropriate cautions and warnings are being added to prevent damage to the mechanical seals. Postmaintenance inspections and testing requirements will be added to SMI-0-94-2; however, it should be noted that this procedure previously contained a double signoff that precluded its use at power.
>
> SQNP does not believe generic program weaknesses have been indicated by this event. However, SQNP management understands their detailed involvement in how the job was to be implemented during the evalulation to determine its feasibility may have unintentionally sent a message to key implementing employees creating the impression they had authority to proceed without adherence to normal plant practices.

NSRS replied in reference A.29 that the response, including corrective actions described, were acceptable. For this follow-up review, discussions with the Plant Manager showed that an evaluation of the PORC procedure process had been conducted. It had been concluded that the work load in PORC needed to be reduced. The review process was optimized by identifying who the procedure was to be routed to, and minimizing the number of reviewers. The current thinking is not for expert subcommittees but to get the procedure review out of the PORC process, by replacement with a qualified procedure reviewer. This would necessitate a Technical Specification change and would be unlikely to occur very soon. It appeared that Carolina Power and Light had obtained approval from NRC for such a change and the Plant Manager was following this up. The adequacy of procedure reviews is discussed in more detail in section IV.II (I-84-12-SQN-22) of this report.

Procedure SMI-0-94-1 was cancelled on October 9, 1984, and SMI-0-94-2 cancelled December 11, 1984. MI-1.10, "Incore Flux Thimble Cleaning and Lubrication," was approved as a thimble tube cleaning procedure on October 31, 1984 with a current revision date of September 9, 1985. This procedure and SWAGELOK fittings is discussed in Section IV. MM (R-85-02-SQN/WBN-02) of this report. Generic weaknesses in maintenance instructions and ongoing corrective action are discussed in Section IV. II (I-84-12-SQN-22) of this report. This item is closed.

EE. I-84-12-SQN-18, Noncompliance with Serious Accident Reporting and Accident Scene Preservation Requirements

In the original investigation (reference A.25), NSRS recommended that SQN determine the cause of the noncompliance and take corrective actions as necessary to ensure future compliance with established requirements.

The Nuclear Power responded in reference A.28 stating:

> This event was initially considered in terms of its radiological impact with recovery to reduce exposure as its optimum concern. Industrial and radiological safety were both considered during this recovery. Approximately 12 days after the event a team from NUC PR was designated to review the industrial safety aspects of the accident to determine if it fell under the TVA Serious Accident Investigation Procedure and, if not, to proceed with a report highlighting lessons learned. The Designated Agency Health & Safety Official (DASHO) and the Manager, Office of Power, were notified at this time. The team concluded that this event did not meet the requirements of the agency's procedure and made that recommendation to NUC PR management.
>
> The Office of Nuclear Power acknowledges the need to review existing TVA reporting and investigation requirements for industrial safety incidents and, where needed, will provide clarification on when these requirements are applicable. This review will also focus on defining requirements related to the nuclear safety and radiological aspects of an incident and should be complete by January 1, 1985.
>
> With regard to the NSRS concern on preservation of the accident scene, the accident scene immediately after the event was extensively recorded by photographs. In any event, it would not have been possible for either a division-level or agency-level team to actively investigate the scene of the accident due to the high postevent radiation fields present in the incore instrument room.

The NSRS response in reference A.29 concluded that:

> This event fell within the guidelines of the TVA Serious Accident Investigation Procedure based on the amount of damage involved (including cleanup costs as clarified by NUC PR personnel). It appears that the existing criteria is not specific enough to identify when events should be investigated by an independent organization. We concur that existing procedures for

reporting and investigation of accidents/incidents need to be reviewed and revised to address events of a nuclear safety/radiological nature. As a part of our follow-up effort we will examine changes you make to the existing corporate and plant procedures to address these concerns.

The Nuclear Power response in reference A.36 stated that:

> The Office of Nuclear Power is developing a procedure to address investigations of both industrial nuclear safety and radiological incidents. The composition of the investigative teams will be addressed in this procedure and will, of course, be dependent upon the nature of the incident. In the interim, we feel we demonstrated during the recent Browns Ferry unit 3 startup the ability to designate an investigative team with the appropriate expertise.

For this follow-up review, it was determined that the Nuclear Power procedure for Serious Incident Investigations was issued May 14, 1985 (reference A.47). The revisions to the site procedure for Accident Reporting and Investigation SQS 29 were incorporated and approved July 18, 1985. Section IV. FF (I-84-12-SQN-19) discusses the content of SQS 29 and it is concluded that the procedure adequately addresses team member independence, preservation of the scene of the accident, timeliness and content of the investigation and report. This item is closed.

FF. I-84-12-SQN-19, Limited NUC PR Accident Investigation

In the original investigation (reference A.25), NSRS recommended that during future accident investigations appropriate personnel should be appointed to eliminate any potential conflict of interest; the investigation should be initiated as soon as possible after the accident as prescribed by established procedures; sufficient time should be allowed for conduct of the investigation; and it should encompass all aspects of the accident including programmatic weaknesses or breakdowns, and nuclear and radiological safety. The Nuclear Power report should be revised to delete the recommendation that consideration should be given to leaving the inner door open during such activities.

The Nuclear Power response in reference A.28 stated:

> The investigation team was named to perform a specific function as stated in finding I-84-12-SQN-19. If it had determined that a serious potential did exist, the agency level team (AIT) would have been named by the DASHO and office manager. The division level teams would at that time have been disolved. In all probability the SQNP FSG supervisor would not have been designated to serve on the AIT. However, SQNP sees no conflict in his serving on the division level team. In fact, it is TVA's philosophy that safety is

line management responsibility. Consistent with that philosophy, since the FSG was involved in this incident, the FSG supervisor should be involved in the investigation. The division level accident report did provide basic conclusions and recommendations in the area of industrial safety. The team concluded that this event did not meet the requirments of the agency's procedure and made that recommendation to NUC PR management.

The NSRS response in reference A.29 stated:

> We still disagree with the position of having the responsible supervisor participate as a member of the investigation team. This situation can create a perception of potential conflict of interest in terms of having an individual investigating an incident in which he and his crew were involved. We concur fully that safety is line management responsibility; however, appropriate feedback can be received from the investigative process without participating as a member of an investigation team.

The Director of Occupational Health and Safety in reference A.38 wrote to the Manager of Nuclear Power and stated:

> In regard to the composition of investigative teams for serious accidents, our view remains unchanged from that outlined in the SAIP, and we do not plan to recommend any modifications. The need for a degree of independence on the investigative team, apart from the immediate organization in which the event occurred, is recognized in the SAIP and is a commonly followed practice in the safety profession.

For this follow-up review, it was determined that the Nuclear Power procedure for Serious Incident Investigations was issued May 14, 1985, and incorporated into SQN site procedures SQS 29 which was approved July 1985. The independence of the investigation team is adequately given in section 4.2 of SQS 29 which defines an Independent Investigation Team as:

> A team designated by the Manager of NUC PR that has defined responsibilities for investigation and report preparation. Team members are normally selected from organizations which do not report administratively or functionally to management located at the affected site.

Section 5.1.7 of SQS 29 adequately addresses scene preservation as:

> The director of the affected site shall ensure that the scene of the incident remains undisturbed until arrival of the investigation team, except as necessary to protect people and property.

The performance and reporting of investigations in section 6.7 of SQS 29 define timeliness, root cause evaluations and reporting content as:

> Once the investigation team is formed, an investigation shall proceed immediately and a preliminary report containing only factual data shall be prepared and transmitted to the Manager of NUC PR normally within 5 working days of activation of the team. This report shall form the basis for a decision to continue the investigation.
>
> An evaluation report shall be prepared by the team, normally within 15 working days after the team is activated. This report shall provide an indepth analysis of the root causes and define needed corrective actions. This report shall be presented to the affected site management at a briefing. After the briefing, site management will have an opportunity to comment on the evaluation report and provide proposed actions. A final evaluation report containing the factual account of the event, the team evaluations and defined corrective actions, site management comments, and the proposed management actions shall be prepared by the team and transmitted to the Manager of NUC PR and affected management. This will normally take place within 25 working days after the team is activated.
>
> A briefing of the Manager of NUC PR by representative of the investigation team and affected site management will normally be held to discuss the final evaluation report. At the conclusion of the investigation, the Manager of NUC PR shall define responsibilities and schedules for corrective actions.

It was determined that the recommendation of the Nuclear Power report that consideration be given to leaving the inner door open was not implemented. Instead, AI-8, "Access to Containment," section 2.6, was revised to require informing personnel working in containment of airlock doors being made intentionally inoperable. The instruction states:

> The upper and/or lower containment airlock doors shall not be intentionally made inoperable (prevent personnel egress) while personnel are inside containment. If the doors must be made inoperable with personnel inside, they will be instructed to use an alternate exit.

Sections 4.2, 5.1.7, and 6.7 of SQs 29 satisfactorily address the elimination of conflict of interest, timely establishment of the investigation, allow sufficient time to conduct the investigation, to be thorough and to provide a factual account of the event. This item is closed.

GG. I-84-12-SQN-20, Needed Reemphasis on the TVA and SQN Employee Expression of Concerns for Safety and Safety-First Policies

In the original investigation (reference A.25), NSRS determined that the employees did not relate their increasing concerns for the safety of the job to upper management and an expression of concern for the adequacy of the design of the new tool support base was not followed up. NSRS recommended that it should be emphasized to all SQN employees that they are responsible for voicing their views concerning safety. Also to emphasize to all supervisors, engineers, and foremen that responsible concerns expressed to them must be evaluated. The TVA and SQN safety-first policy should be emphasized to all SQN employees that nuclear safety is the number one SQN objective and that safety first means before schedule and before production.

The Nuclear Power response in reference A.28 stated SQN had numerous mechanisms available to the employee to express their concerns. The response concluded that SQN would, through normal safety communications, reemphasize the rights and responsibilities of employees as described in SQN Standard Practice SQS 7 and General Employee Training GET 1.2.

For this follow-up review, NSRS conducted a review of safety documentation. Documentation related to safety responsibility has been in existence for some time as expressed in the Occupational Health and Safety Manual; Administrative Instruction AI-30, "Nuclear Plant Method of Operation"; SQA 46, "Employee Complaints Concerning Safety and Health;" and others. The SQN Standard Practice SQA 7, "Hazard Control Plan," specifically designates each employee to accept responsibility for performing duties using safe and reasonable procedures. It was determined that GET 1.2 no longer exists; however, GET 2.1, 2.3, and 2.4 primarily emphasize radiological safety and includes a presentation of the recently implemented Employee Concern Program (ECP) contained in Standard Practice SQA 178, "TVA Office of Nuclear Power Employee Concern Program Line Organization Procedure."

The ECP, SQA 178, specifically identifies the Office of Nuclear Power policy that safety and quality are paramount. In addition, the employee responsibility to identify safety concerns and the supervisor's responsibility to evaluate these is specifically identified in SQA 178, section 4.0, which states:

> All personnel involved in TVA nuclear activities have an obligation to protect the health and safety of the public and their fellow employees. To this end, TVA has established the following policy regarding the

handling of information related to any condition, practice, or event which may adversely impact quality, deviate from technical or procedural requirements, or have the potential for degrading equipment, operating capabilities or personnel's ability to accomplish assigned responsibilities. Any such practice, condition, or event of which any TVA employee becomes aware should be brought to the attention of the employee's supervisor.

All supervisors have the additional responsibility for considering resolving, or referring such practices, conditions, or events brought to their attention.

All Office of Nuclear Power personnel have received training on the Employee Concern Program. Other discussions on job safety are provided in sections IV. H, J, S, GG, and II (I-82-21-SQN-02, -05; I-84-21-SQN-06, -20, -22) of this report. This item is closed.

HH. I-84-12-SQN-21, Ineffective SQN ISEG Activities

In the original investigation (reference A.25), NSRS concluded that the SQN Independent Safety Engineering Group (ISEG) had been ineffective in performing the function that was originally intended for the organization. This was due in part to the dual responsibilities for compliance/ISEG activities and the lack of true independence from line responsibilities and pressures. The NSRS recommended that SQN reorganize or reassign functions as necessary to provide ISEG personnel adequate independence from line responsibilities and pressures. Additionally, functions should be limited to ISEG-type duties as required by the Technical Specifications.

In reference A.28, Nuclear Power responded by stating SQN does not agree that a broadly stated conclusion can be justified based on the evaluation of a single event. The response also stated:

> The SQNP ISEG organization has been described to NRC in correspondence and the site NRC residents are very aware of the ISEG organization. The present organization is an effective means of meeting the intent of NUREG and technical specifications requirements. The line duties of the compliance staff (coordinating the plant's response to all inspection/audit findings, investigation of potential reportable occurrences (PROs), preparation of Licensee Event Reports (LERs), tracking of corrective actions, and trending of PROs, LERs, and NRC violations - in short the maintenance of a broad overview of all activities potentially impacting plant safety) serve to enhance not detract from the ISEG function. SQNP acknowledges that the ISEG was not directly involved in the discussions and preplanning associated with this specific maintenance activity. The size of the ISEG staff necessarily precludes its detailed involvement in the conduct of every maintenance and operational activity occurring at the plant. The focus of the ISEG review activities in fulfilling its nuclear safety engineering function is directed toward determining the overall effectiveness of plant programs and systems which affect nuclear safety. To accomplish this objective, the ISEG monitors trends and looks for possible generic deficiencies in plant programs and systems.
>
> The Office of Nuclear Power has not identified any programmatic problems associated with the SQNP ISEG function. This finding is supported by previous NRC, TVA Nuclear Safety Review Board, and TVA Quality Assurance evaluations in this area.

The NSRS response in reference A.25 stated:

> The NSRS concurs with your observation that a broad conclusion regarding ISEG effectiveness should not have been drawn based on one event.
>
> Your response does not directly address the question of whether the ISEG, as structured, meets Technical Specification requirements of having at least five dedicated full-time engineers onsite to perform this function. This issue will be examined in greater detail by NSRS in a future review.

The NRC Region II Inspection Report of the thimble tube event addressed the ISEG function in Section 11.0 of the report. With respect of the ISEG activities, the NRC concluded that:

> The ISEG efforts appeared adequate, and their technical decisions did not appear to suffer from being incorporated in the Regulatory Compliance Group. While the five individuals comprising the ISEG have a dual reporting requirement (onsite and independent offsite), the inspectors found no obvious lack of independence in the performance of their duties.

The NRC report also addressed the ISEG staffing issue. It concluded that:

> The inspectors and reviewers concluded that since the licensee appeared to be responsive to the need for STA training and since the ISEG appeared to be performing its desired function, that the overall intent of Technical Specification 6.2.3.2 was met. However, to avoid future questions, the inspectors indicated to licensee management that an alternate member should be assigned during excessive (one month) periods of absence. Licensee management agreed to implement this or similar guidance. No violations or deviations were identified.

For this follow-up review, additional documention was reviewed and discussions held with the SQN and Nuclear Power staff. A proposed Technical Specification Change No. 111 was prepared and issued for review. Section 6.2.3.4 of the Technical Specification was proposed to be modified as a result of TVA organization changes to have the ISEG function report to the Site Director rather than the Assistant Director for Maintenance and Engineering of the Division of Nuclear Power (a position that was abolished by the reorganization). As a result of their review, the Nuclear Safety Review Board had the following concerns related to the proposed changes:

The board believes that these ISEG changes are substantive and should be specifically mentioned in the description of the proposed change which will be submitted the the NRC. Furthermore, the board believes that the proposed ISEG change does not meet NUREG-0737 in regard to (a) reporting offsite to a corporate official who holds a high-level technically oriented position that is not in the management chain for power production, and (b) composition of five dedicated full-time engineers. In this regard, the board believes that an adequate justification for the exceptions to NUREG-0737 should be provided for submittal to NRC.

Reference F.1 submitted the proposed Technical Specification change to NRC with: (a) the ISEG/Compliance staff reporting to the Plant Manager with a dotted line ISEG function reporting to the Site Director, and (b) a change to Section 6.2.3.2 that deleted the word "dedicated", i.e. to read "The ISEG shall be composed of at least five full time (dedicated*) engineers located onsite." The SQN justified the management reporting change by providing the various responsibilities of the Site Director in that he is a high-level corporate manager, located onsite in a technically oriented position, and is responsible for all activities affecting the plant. However, the Plant Manager remains directly responsible for day-to-day operations. The dual roles of compliance/ISEG were justified by stating that the tasks are complimentary and that a departure from the total dedication to ISEG functions, specified in NUREG-0737, is justified. An additional change to the Technical Specification has been submitted in reference F.4. This proposed change shows the plant Compliance Staff (noting that the plant Compliance Staff fulfills the responsibiltiy of the ISEG) reporting to the Site Director.

*Word deleted from proposed change

The plant Compliance/ISEG Staff currently has seven full-time engineers (six engineers plus one supervisor). Six of the seven are STA qualified with the seventh scheduled to start STA training at the beginning of 1987. The engineers rotate on STA shift work thus bringing the knowledge gained on plant operations to their ISEG function. This is considered to be an excellent practice and should be continued. It also satisfies the NUREG-0737 recommendation of integrating the STAs into the ISEG function to enhance the group's knowledge of and contact with day-to-day plant operations. This staffing level is consistent with the five engineers specified in the Technical Specifications.

Four ISEG reports were generated from June 11, 1985, through January 30, 1986, and a memorandum that plant operations management sent to the operating personnel incorporating several recommendations of an ISEG report were reviewed. Based upon the review and discussions with several of the ISEG/Compliance engineers, it was concluded that the ISEG reports demonstrated that: (a) comprehensive and thorough reviews are being performed and documented, (b) root cause determinations and recommendations to prevent future occurrences are made, (c) the Plant Manager decides whether the recommendations will be implemented then they are put on the Corrective Action Tracking System (CATS), and (d) the evidence suggests that the reviews were conducted in an independent manner.

Based upon the discussion with several of the ISEG/Compliance Staff engineers and the review of the ISEG reports and the resulting recommendations, it was concluded that: (a) the independent performance of the ISEG function did not appear to be adversely influenced by reporting to the Site Director, (b) the dual ISEG/Compliance Staff has at least five full-time engineers onsite during working hours; however, they do not devote 100 percent of their time to the ISEG function, and (c) the NRC has been kept informed of the current ISEG/Compliance reporting and staffing arrangement by the proposed Technical Specification changes submitted in October 1984 and November 1985 and by discussions with NRC. Also, changes in the ISEG reporting chain are being strongly considered by the new Office of Nuclear Power top-level management. The final resolution of this recommendation will be made when NRC and TVA resolve the proposed Technical Specification combined with top-level Office of Nuclear Power organization changes that may impact the Office of Nuclear Power Manager to whom ISEG reports. Since positive action has been taken by TVA which will be pursued to a resolution with NRC, this item is closed.

II. I-84-12-SQN-22, Significant Breakdown in the SQN Procedure Process for Maintenance Activities

In the original investigation (reference A.25), NSRS recommended that:

> The procedural process for maintenance activities at SQN should be thoroughly evaluated. Corrective actions including procedure verification should be initiated as necessary to improve the (1) knowledge of those personnel preparing and using procedures of what constitutes an appropriate procedure, the quality elements that should be incorporated into a procedure, and the change process for existing procedures; (2) quality of the PORC and biennial reviews; and (3) compliance with procedures.

The Nuclear Power response in reference A.28 addressed recommendations I-84-12-SQN-05, -7, -11, -17, and -22 as one item. The following is an extract that provides a description of their decisionmaking logic and procedural guidance:

> Management made the decision to clean the blocked thimbles tubes while at the 30 percent power level and specified adequate guidelines and precautions to conduct this work activity. However, the work package (MR and Special Maintenance Instruction SMI-0-94-1) were not revised to reflect these directions. Discussions were held between the cognizant engineer and foreman concerning the high pressure connections and their proximity to the 10-path breakdown connections. No work was to be done nor was it done without the lead engineers at the seal table. The 10-path transfer devices were disconnected and rolled back prior to beginning the cleaning process without an MR or procedural guidance, but the engineers involved were aware of the unit conditions at the time of the work, the system design, mechanical makeup of the components, and potential hazards. Employee awareness of the unit conditions and absolute requirements was demonstrated by informal planning and cursory attempts at satisfying requirements. The at-power cleaning process began using the MR and SMI-0-94-1 as procedural guidance.

For this follow-up review, additional information was obtained by having discussions with SQN personnel, reviewing draft procedural guides, and the NRC Systematic Assessment of Licensee Performance (SALP) report for the period March 1, 1984, through May 31, 1985. The SALP report provided the NRC assessment of the overall maintenance process. The following is an extract from the report:

> The overall quality of maintenance operations has been erratic, ranging from poor to good. . . . Some technicians performing maintenance tasks were observed using good work practices and implementing the management expressed philosophy of adhering to procedural requirements; however, maintenance instructions were weak or nonexistent for some safety-related activities. Several procedural violations were identified during the assessment period . . . involving the failure to establish or implement procedures. In general maintenance procedures were adequately written and followed. However, many procedures were cascaded and interwoven with other procedures, requiring technicians to transfer between documents in order to complete a single maintenance activity. There was also some duplication of procedures written for similar tasks by different organizations (Office of Nuclear Power, OE). The cumbersome procedural interdependencies resulted in confusion.

Discussions with supervisors and engineers indicated that this was a fair assessment for that time period. The review of the NRC report on the inspection conducted from December 2-6, 1985, indicate that significant improvements have been made at SQN, since a team of 11 inspectors identified only 3 examples of failure to follow procedures in the areas of motor operated valve modification.

As a result of the SALP report, meetings with foreman and craft were held during November 1985 to inform them on how to use plant instruction change (ICF) forms in order to have existing procedures changed when errors were found or the instructions were inadequate to perform the activity. Several recently revised mechanical maintenance instructions were examined. Most had been instituted by ICFs originated by mechanical maintenance engineers, but one dated December 12, 1985, was originated by a mechanical maintenance planner. This indicates that instruction details are being reviewed and the ICF system is being used.

Knowledge of personnel preparing procedures was verified by reviewing maintenance instruction in the draft stage. Two mechanical engineers, both degreed engineers, had written MI 10.05.1 and MI 1.11. Both procedures appeared to be satisfactory for the activity to be performed and were being sent for review. One had used the draft SQN writers guide and had found it to be a useful tool. It was noted that the craft are now required to review the draft instructions in addition to those previously required to do so. The results of instruction reviews by the craft were examined. It was concluded that the craft suggestions for improving the instruction were positive and practical.

The biennial review of Maintenance Instructions (MIs) and Instrument Maintenance Instructions (IMIs) was examined. The newly appointed Mechanical Maintenance Supervisor had found that the commencement of the review of MIs was overdue and had issued a deviation report DR# 85-10-127 R. A three-page checklist was developed for the MI review which was completed on December 30, 1985. Changes to the existing MIs have been postponed and proposals from external contractors to rewrite MIs are currently being studied with no decisions having been made. In addition, a commitment has been made to NRC for SQN to review all MIs with a fully developed checklist by July 1987.

A draft procedure writers guide has been developed by mechanical maintenance using INPO 85-026 and NUREG/CR-139 as guidelines. It is proposed to become Appendix A of SQM 1. The Instrument Maintenance Section has developed a checklist for review of plant precedures and issued it as IMS-I32 on November 27, 1985. The Quality Assurance Section Instruction Letter SIL 5.1 in effect at the time of the thimble tube event was compared with that currently used. A procedures review checklist has been added since that time. That checklist has also been incorporated into IMS-I32. These checklists and writers guides will improve the preparation and review quality of procedures.

Discussions were held with the QA PORC representative and the QA representative on the PORC subcommittee for maintenance procedure reviews. It was their opinion that both the quality of proposed procedures and procedure reviews has improved. The quality of PORC reviews was assessed by examining current PORC reviews of maintenance instructions. The PORC subcommittee for the review of IMIs in accordance with AI-4 had met January 31, 1986. The subcommittee recommended in their memorandum dated February 3, 1986, that their report be accepted. The report was reviewed and rejected by PORC. At the time of this review, the report had been revised (but not submitted) to incorporate the PORC comments. This indicates that PORC is doing the job it was intended to do.

Compliance with procedures has been and is being stressed on a continual basis to SQN personnel. SQA 129 was issued by the plant manager in January 1986, and it stresses compliance with instructions and to take time to correct those that are inadequate. In addition, at the Plant Managers' daily morning meeting, failures to follow procedures are discussed. Additional details are provided in sections IV.R and IV.GG (I-84-12-SQN-05 -20) of this report.

The implementation of checklists for procedure reviews, involvement of all levels of personnel in the reviews including the crafts, commitments have been made to NRC to review all MIs by July 1987, foreman and crafts were trained on use of plant instruction change forms, tangible evidence exists that PORC reviews have improved, and compliance with instructions is emphasized on a continuing basis satisfactorily resolve this recommendation. This item is closed.

JJ. I-84-12-SQN-23, Inadequate Reporting of the Event to NRC

In the original investigation (reference A.25), NSRS recommended that SQN revise the LER to reflect the true nature of the leak, the adequacy and violation of SMI-0-94-2, and the effective long term corrective action.

The Nuclear Power response in reference A.28 was the following:

> The true nature of the leak (rate, amount, duration, its effect on instrumentation, as well as the ferrule failure and thimble ejection) was adequately described.
>
> The LER did not mention inadequate procedures or failure to adhere to procedures in conduct of the maintenance activity because the plant did not and does not consider these to be causal factors of the event.
>
> The LER will be revised by submittal of supplemental information to the NRC to indicate the cleaning technique in use at the time of the event will not be performed with the reactor coolant system at temperature and/or pressure but that other available

techniques will be carefully and thoroughly evaluated prior to any future decision to clean thimble tubes with the reactor coolant system at temperature and/or pressure. In addition, the Office of Nuclear Power response to this NSRS report will be included in the supplemental LER submittal to NRC so that the full scope of short-term and long-term corrective actions associated with all aspects of this event are brought to the attention of NRC.

The NSRS response in reference A.29 concluded that the LER was not complete because of the following:

> The manner in which the leak initiated and the rapidity with which it escalated was not accurately described. This description is necessary for a complete understanding of the event [see 50.73 (b) (2) (i)].
>
> Regarding lack of adherence to the special maintenance instruction SMI-094-1, NUREG-1022, on pages 18 and 26, and Question and Answer 2.7 on page 5 of NUREG-1022, Supplement 1,
> specify that violations of procedures are to be reported in the LER regardless of whether such violations are causal factors.

The NSRS response further stated that:

> The NSRS recommendation on this item was to revise the LER. Inasmuch as you have committed to revise the LER and to submit the Office of Nuclear Power response and the NSRS report to the NRC, we believe these submittals will meet the intent of the recommendation.

For this follow-up review, it was determined that the LER was revised and submitted to the NRC in reference F.2. The revised LER: (a) modified the original information on the specifics of the instrumentation failures and calibration shifts; the class 1E qualified instruments experienced calibration shifts, one of which was outside the technical specification limit, (b) stated that the modification of the orginal Teleflex tool (base added) was the basis of error for the event, (c) two long-term corrective actions were identified, and (d) the NSRS report I-84-12-SQN and Nuclear Power response (references A.25 and A.28, respectively) were attached to the LER, thus both documents became part of the LER and public record. The specifics of the LER were not modified to revise the description of the nature of the lead nor the adequacy and violation of SMI-0-94-1; however, since the revised LER attached the NSRS report and the ONP response it resolved the intent of these items.

The NRC report of the investigation of the thimble tube event concluded that the inadequacy and failure to follow procedures did not appear to be the true cause of the event and thus reporting requirements were not violated. The NRC report of the investigation of the thimble tube event, reference E.1, stated:

> The inspectors reviewed 10CFR50.73, the 10CFR50.73 statements of consideration, NUREG 1022, and handouts from NRC-sponsored seminars on the new rule. The inspectors determined, particularly from the statements of consideration, that licensees should report personnel errors and inadequate procedures associated with reportable events when those errors or procedures caused the event or impeded the recovery from the event. Based on the preceeding paragraph of this inspection report, the true cause of the event appears to be use of an improperly modified tool. While the inadequate SMI and failure to follow or change the SMI show inadequate understanding and implementation of NRC procedure establishment and procedure compliance requirements, it appeared that, had these deficiencies been corrected prior to commencing work on the thimble tubes, the tool would likely still have caused the leak event. Consultations between the inspectors and AEOD supervision also supported the conclusion that reporting requirements were not violated by the licensee's decision that these deficiencies were not pertinent to the event.

It is concluded that corrective action has been taken to resolve the recommendation since the NRC has determined that the SQN LER did not violate the NRC LER reporting requirements (it is the judgment of NSRS that the procedure violation and inadequacy factored into the event initiation to some degree), SQN has deleted the instruction in question, procedure compliance has been stressed to all personnel, and a revised LER was submitted to NRC with the NSRS report and Nuclear Power response as an attachment. This item is closed.

KK. R-84-17-NPS-02, <u>Lack of Approval of Onsite Vendor Services at SQN</u>

In the original review (reference A.41), NSRS recommended that SQN should develop and implement a program that satisfies the requirement and intent of OQAM [NQAM], part III, section 2.1, paragraph 10. For the follow-up review, SQN provided additional information which was reviewed. The NSRS report cited three examples of vendor service for which no QA documentation was provided by the site (though repeatedly requested by NSRS) that demonstrated the work was accomplished in accordance with the QA requirements.

Because the documentation was not provided at the time of the review, NSRS had to assume none existed; therefore, the NQAM requirement was not being met.

In the May 21, 1985 (L12 850520 800) Nuclear Power response to the report, some documentation was provided to demonstrate that proper QA was provided on each of the three examples. That response, however, was insufficient. In the September 5, 1985 response (L12 850826 800), additional information was provided. Based upon that information, a review of valve drawings D-3-1500-11 R8, 47W809-1 R26, 47A366-62-11 R9, and telephone conversations with the vendor, Crosby Valve and Gage Company, on one of the examples, it was determined that proper quality control was applied to the vendors and adequately monitored by SQN. This item is closed.

LL. R-85-02-SQN/WBN-01 (NUC PR) Office-Wide Awareness Bulletin for Tube Fitting Maintenance Activities

In the original review (reference A.42), NSRS recommended that a NUC PR office-wide awareness bulletin or similar mechanism should be prepared and distributed to the nuclear plants. The bulletin should discuss tube fitting design; assembly, reassembly, and inspection criteria; policy on interchanging components; failure modes (including those identified by the SQN and WBN maintenance craft personnel); hazards involved in working on pressurized fittings; and should specify special precautionary measures when maintenance on pressurized fittings is necessary. The desired bulletin should be incorporated into a permanent instruction at each plant for future awareness of new employees.

The Nuclear Power response in reference A.44 stated that:

> We are in the process of preparing an office-wide awareness bulletin to address tube fitting design; assembly, reassembly, and inspection criteria; policy on interchanging components; failure modes (including those identified by the SQN and WBN maintenance craft personnel); hazards involved in working on pressurized fittings; and to specify special precautionary measures when maintenance on pressurized fittings is necessary. The bulletin will be distributed to all plants for incorporation in plant instructions and training.

For this follow-up review, the awareness bulletin and training documentation was reviewed in addition to having discussions with POTC, SQN, WBN, BFN, and BLN personnel to determine the status of craft training programs identified in the awareness bulletin.

The office-wide awareness bulletin was sent to BFN, SQN, and WBN management; however, it was not sent to BLN. During this review, telephone conversations were held with the BLN Maintenance Superintendent and Mechanical Maintenance General Foreman and it was determined that the office-wide awareness bulletin had been recently received by them. It was also determined that SQN had developed Hazard Control Instruction HCI-M23, "Tube Fittings," which is as an integral part the Nuclear Power bulletin. The bulletin references NRC IE Information Notice 84-55 which describes the significant events at Zion Generating Station and the SQN thimble tube ejection. The Zion event occurred when a fitting (SWAGELOK) "broke loose" at the guide tube causing an unisolatable leak of reactor coolant. The cause of the event was attributed to the fitting ferrule assemblies in most of the guide tube being displaced from their original position. The NRC notice indicated that in both events maintenance was being conducted on a high-pressure system with what was equivalent to single valve protection (the fitting). The bulletin also states that hazards associated with pressurized fittings (high temperature and high pressure) are compounded in a nuclear plant by the possibility of contamination. These two events described in the bulletin emphasize the importance of proper tube fittings and assembly.

The awareness bulletin also provides a policy statement that compression-type tube fittings shall be installed consistent with the manufacturer's instructions; maintenance activities involving these fittings shall not degrade the integrity of these fittings; fitting components made by different manufacturers or tube fitting components which are different types made by the same manufacturer are not to be interchanged with each other. The awareness bulletin provided a brief description of the POTC training class on proper tube fitting and provided a brief summary of the class. The training class summary as described in the bulletin is as follows:

1. Discusses SQN practice which states, "tube fitting components made by different manufacturers or tube fitting components which are different types but made by the same manufacturer are not interchanged with each other."

2. Emphasizes the designs of different brands of fittings and the proper orientation of components.

3. Provides specific preparation instructions for proper assembly, disassembly, and subsequent reassembly of pressurized tube fittings (i.e., tube cutting, bottoming tube in fitting body, tightening).

4. Discusses inspection and use of "SWAGELOK" gap inspection gauge.

In summary, the awareness bulletin addresses the following aspects of the recommendation: (a) identifies hazards, (b) provides the policy on interchanging components, (c) and special precautionary measures when maintenance on pressurized fittings is necessary. The training

program also covers precautionary measures. Additional precautionary measures are described in the thimble tube maintenance instruction MI-1.9, "Bottom Mounted Instrument Thimble Tube Retraction and Reinsertion," and MI-1.10, "Incore Flux Thimble Cleaning and Lubrication." These precautions are identified in section 3.0 of MI-1.9 and section 4.0 of MI-1.10. The specific one related to the hazards of pressure and temperature is covered by the precaution (in both procedures) that:

> There is to be no maintenance on the high pressure fittings while the primary system is pressurized above atmospheric or head pressure from inside the guide tube. If there is to be any tightening or loosening of the fittings with the primary system above atmospheric or head pressure a unique procedure reviewed by PORC and approved by the plant manager is required.

In addition, procedure MI-1.9 prerequisite 2.1 requires that:

> All personnel working on tube fittings should have had the tube fitting class.

Other instruction issues related to SWAGELOK-type fittings are discussed in detail in section IV.MM (I-85-02-SQN/WBN-02) of this report. In summary, the thimble tube instructions have been modified (subject to recommendations in section IV.MM of this report) to cover the precautionary measures on maintenance and cleaning of the thimble tubes, the hazards and risks involved in working on the pressurized fittings have been removed by not performing cleaning and lubrication or thimble tube retraction and reinsertion if the system is above atmospheric pressure.

The SQN tube fitting training was identified in a July 22, 1985 memorandum from B. M. Patterson to Robert H. Harris, "Tube Fitting Class," that stated the SQN plant had decided to require the tube fitting class as a qualification for steamfitters who will be responsible for initial installation of tubing systems and for selected cognizant engineers and inspectors. The course material was developed by POTC and SQN personnel and is documented in manual MMT-28 "Student Manual, Initial Tube Fitting." The training material and awareness bulletin were transmitted to the BFN, WBN, SQN, and BLN sites. The BFN maintenance training supervisor stated that it was planned to train the instrument mechanics, mechanical steamfitters, and machinists at the rate of two sessions per day (availability of personnel permitting) until the required personnel had completed training. SQN training has been going on for a long period, and a significant number of instrument mechanics, quality assurance, modifications, mechanical maintenance, engineering, and test group personnel have completed training. The BLN training had not been initiated, but a program was being actively developed with POTC. Based upon discussions with the WBN Maintenance Training Supervisor, training was being conducted for maintenance, modifications construction, and Nuclear Service Branch personnel, and was about 90 percent complete.

The MMT-28 training course incorporates the NSRS recommendations in the following manner:

1. Tube Fitting design - Segment II, "Fitting Identification and Installation," has photographs of parts in disassembled/assembled configurations for SWAGELOK, Parker CPI Type BZ (Short Parker), Gyrolok, Parker Ferulok Type BU (Long Parker), Imperial-Eastman (Hi-Seal), and Tylok fittings.

2. Assembly-reassembly: Segment II, Sections II, IV, V, VI, VII, and VIII provide instructions on disassembly-reassembly of the fittings. In addition to the instruction material practical training was conducted for the craftsmen on the course work. Retightening procedures are provided, as stated in Appendix B.

3. Inspection Criteria - Segment II, Section III, specifically addresses the SWAGELOK gap inspection gauge and describes its use.

4. Policy on Interchanging Components - Page 1 of the introduction specifically states:

> It is the policy of P&E (Nuclear) that tube fitting components made by different manufacturers, OR tube fitting components made by the same manufacturer which are different, ARE NOT INTERCHANGED with each other. Use the same brand and type nut, ferrule, and fitting body for each individual tube connection. . . . This does mean that all individual components of a single tube connection will be the same brand and type. For example, if you are using a short Parker fitting body, use a short Parker nut and ferrule.

5. Failure Modes and Hazards - This is addressed by the statement:

> Improperly installed tube fittings may seal well enough to hold a limited amount of pressure sometimes to the point of passing a hydro-test; however, the installation will not be mechanically sound and will not withstand the vibration that occurs once the system is operational.

Also, procedure revisions on thimble tube to retract and clean at atomspheric pressure precludes temperature pressure hazards. At the training session the instructor provides a description of some significant safety events that have occurred in the industry with tube fittings to depict the types of problems that are occurring. At the end of the training session, practical and written exams are given. A 70 percent grade is considered passing.

With respect to the recommendation that a permanent instruction at each plant for future awareness of new employees be implemented, the SQN maintenance practice require the use of craftsmen trained in MMT-28 for work conducted on tube fittings. The SQN INPO Accreditation Self Evaluation Report dated January 1986 for Mechanical Maintenance Craftsmen Training also addresses this issue. In the mechanical maintenance area, the responsibility for ensuring that only individuals who are qualified to perform tasks independently is delegated to the foreman and general foreman by sections 5.3 and 5.4 of MMSL-A65, "Mechanical Craft Training Program." The supervisors and foreman maintain a current listing of training qualifications for the craftsmen to ensure that qualified individuals will perform the work. The "Task-to-Training Matrix" of the INPO Accreditation Safety Evaluation Plan for Craft Training, Tasks SFP 112, "Install Steel Tube Fittings," and SFP 113, "Install Copper Tube Fitting," identifies MMT-28 training as a requirement to perform this work. Based upon the training requirements to perform tasks independently, new employees will not perform tube fitting on safety related components without appropriate training.

It is concluded that the awareness bulletin, procedures, and the INPO accreditation craftsman training program satisfactorily incorporate all of the aspects of this recommendation. This item is closed.

MM. R-85-02-SQN/WBN-02, Maintenance, Operating, and Test Instructions

In the original review (reference A.41), NSRS reached the following conclusion concerning the SQN incore instrument tubing seals.

> Instructions at SQN did not contain sufficient clarity, precautions, warnings, and other measures to provide the desired level of confidence that the high-pressure mechanical seals will not be degraded during maintenance activities or to lessen the severity of the consequences of a failed seal.

NSRS made the following recommendations:

> Applicable maintenance, operating, and test instructions should be revised as necessary to provide consistent guidance for system assembly, reassembly, and inspection of all SWAGELOK and mixed fittings; address replacement of ferrule assemblies on previously undisturbed tubing; address lubrication and inspection of fitting threads to minimize or detect wearing, galling, and cross-threading; specify limiting forces while using the low-pressure seal; add cautions and warnings against interchanging fitting components, cross-threading, turning of fitting bodies, excessive forces, working on seals while the primary system is pressurized above atmospheric, and increasing primary system pressure while thimble tubes are disconnected from the overhead path transfer system.

For this follow-up review, NSRS reviewed the applicable maintenance, operating and test instructions, and a workplan, and interviewed mechanical maintenance personnel. The individual recommendations were addressed as follows:

Consistent guidance for system assembly, reassembly, and inspection of SWAGELOK and mixed fittings: The necessity for separate criteria for mixed fittings and fittings other than SWAGELOK has been removed by ensuring that all the fittings are SWAGELOK. The original installation on unit 2 was all SWAGELOK and the changeover to SWAGELOK on unit 1 was completed in late 1985 by workplan 11878 (ECN 6537). Maintenance Instruction MI-1.9, "Bottom Mounted Instrument Thimble Tube Retraction Reinsertion," revision 7, and special maintenance instruction SMI-0-94-3, "Seal Table High Pressure Seal Repair," revision 1, both include the appropriate instructions and criteria for assembly, reassembly and inspection of SWAGELOK fittings. Special maintenance instruction SMI-1-94-5, "Thimble Tube Installation," revision 1, is not intended to be used to remake the high pressure seals, but it does not state that this is the case. It includes the SWAGELOK inspection gauges in the list of tools and work aids, which implies that the fittings are to be remade as part of the activity covered by this procedure. A proposed new instruction, MI-1.11, "Thimble Tube Installation," when issued will replace SMI-1-94-5 and should fix this problem. The draft of MI-1.11 reviewed includes the appropriate instructions for making up the high pressure seals.

Replacement of ferrule assemblies on previously undisturbed tubing: MI-1.9 and SMI-0-94-3 both require installation of new ferrules on a previously undisturbed surface of the guide tube.

Lubrication and inspection of fitting threads to minimize or detect wearing, galling, and cross-threading: MI-1.9 requires inspection of the threads of high pressure fittings for signs of galling, wearing, or cross-threading, and application of NEOLUBE to the threads. SMI-0-94-3 requires inspection of nuts and reducer union bodies and replacement if damaged, but does not specify inspection for galling, wearing, or cross-threading. This is acceptable because visually detectable galling, wearing, and cross-threading are "damage," and because this instruction would normally be used as a result of activities conducted under MI-1.9 which specifies the inspections. SMI-0-94-3 does not specify the use of a thread lubricant, but states under precautions that a coat of NEOLUBE may be applied to the threads. NSRS believes that a thread lubricant should be consistently used. A proposed revision to SMI-0-94-3 requires the use of thread lubricant.

Specify limiting forces while using the low pressure seal: MI-1.9 specifies the method of tightening the low pressure seal to achieve proper torque and cautions against overtightening due to possible ferrule damage. This is the only procedure that addresses use of the low pressure seals.

Cautions and warnings against interchanging fitting components: All fittings are now SWAGELOK and applicable procedures use the name SWAGELOK frequently so that it should be obvious that other fittings are inappropriate. Training provided to the crafts provides policy on not interchanging components. This is also discussed in detail in section IV.LL (R-85-02-SQN/WBN-01) of this report.

Cautions and warnings against cross-threading: Both MI-1.9 and SMI-0-94-3 address assembly of compression fittings, but neither caution against cross-threading. Cross-threading potential and checking for cross-threading is covered in detail in the craft training program MMT-28. This is discussed in section IV.LL (R-85-02-SQN/WBN-01) of this report.

Cautions and warnings against turning of fitting bodies: MI-1.9 includes the appropriate caution when disconnecting and remaking the fittings. SMI-0-94-3 does not presently caution against allowing the fitting body to turn, but the proposed revision to this procedure does include this caution. The proper disassembly and reassembly procedure for fittings is also provided in the crafts training program MMT-28. This is discussed in section IV.LL (R-85-02-SQN/WBN-01) of this report.

Cautions and warnings against excessive forces. - The intent of this recommendation was to ensure that excessive forces both apparent such as over-tightening, and less obvious, such as bending due to improper use of a wrench would be considered. MI-1.9, MI-1.10, SMI-0-94-3, and possibly special maintenance instruction SMI-1-94-5 should include such precautions. Presently, they do not include any precautions against excessive forces except for the cautious against overtightening in MI-1.9 and SMI-0-94-3. At the exit meeting the plant agreed to review the thimble tube maintenance instructions for steps that could apply excessive forces. This review was documented in a memorandum (reference A.78) which states:

> . . . (MM outage and major Maintenance Support Supervisor) and . . . (Mechanical Engineering) have review the tasks involved in the following MI's/SMI's:
>
> MI - 1.9
> MI - 1.10
> MI - 1.11 (Replaces SMI 1-94-5)
> SMI - 0-94-3
>
> In their expert opinion, all steps which could apply excessive forces to high pressure seals have sufficiently detailed and clear instruction to control the possibility of over stressing or compromising the integrity of the high pressure seals.

Proper assembly techniques are also covered in the craft training program MMT-28. This is discussed in section IV.LL (R-85-02-SQN/WBN-01) of this report.

Cautions and warnings against working on the high pressure seals while the primary system is pressurized above atmospheric: MI-1.9 and MI-1.10, "Incore Flux Thimble Cleaning and Lubrication," revision 3, include appropriate precautions. MI-1.9, MI-1.10, and SMI-0-94-3 include prerequisites that the reactor be in mode 5 or 6. SMI-0-94-3 should include the same precaution that appears in MI-1.9 and MI-1.10.

Cautions and warnings against increasing primary system pressure while thimble tubes are disconnected from the overhead path transfer system: None of the applicable instructions include this precaution. NSRS considers this extremely important because it would prevent complete ejection of a thimble tube in the event of a high pressure seal failure. Inclusion of this precaution in GOI-1, "Plant Startup from Cold Shutdown to Hot Standby," would be adequate, but other methods of addressing the problem mayalso be appropriate.

This item remains open pending completion of the following items:

1. Issuance of the proposed MI-1.11, "Thimble Tube Installation," which will replace SMI-1-94-5, and addresses several of the original recommendations.

2. Issuance of the proposed revision to SMI-0-94-3 that to require the use of an appropriate thread lubricant, and cautions against allowing fitting bodies to turn.

3. Further revision of SMI-0-94-3 to include a precaution against working on the high pressure seals when the primary system is pressurized above atmospheric.

4. Revision of appropriate instructions to preclude pressurizing the primary system withthe thimble tubes disconnected from the overhead path transfer system or at least preclude any work on the seals with the primary system pressurized above atmospheric and the thimble tubes disconnected from the overhead path transfer system.

The above procedure revisions should be made prior to the next use of the procedure.

NN. R-85-03-NPS-01, Inadequate Definition of Responsibility

In the original report (reference A.54), NSRS concluded that the responsibility for determining the identification and availability of spare parts was not clearly defined in SQN procedures. The recommendation was to procedurally define this responsibility. The Nuclear Power response said that:

> SQN has adequately defined the responsibility for identification and availability of spare parts. The job description for the maintenance planners is the most definitive document but is not comprehensive due to the diversity of problems associated with

material. Planners, foremen, craftsmen, and engineers all have some responsibility for the various aspects of identification, availability, and location of materials depending on the complexity of material/parts specification, priority of the job, and whether the items are being obtained from Power Stores or being procured from a vendor.

NSRS commented on the response by saying that if the plant chooses to define this responsibility in job descriptions (such as in the draft for maintenance planners included in the response) rather than in a separate document, this is acceptable.

For this follow-up review, current job descriptions for four maintenance planners (two mechanical, one electrical, and one instrumentation) were reviewed. The four job descriptions were identical and did place responsibility for identifying and determining the availability of spare parts/material with the planner. One of the mechanical planners and the electrical and instrumentation planners were interviewed concerning their responsibility in this area. They were all aware of their responsibility for identifying and determining the availability of spare parts. It should be noted that generally the identification of spare parts does not occur in the planning phase because most of the maintenance are for repairs rather than scheduled maintenance. This item is closed.

OO. R-85-03-NPS-04, ASME, Section XI Postmaintenance Valve Testing - SQN

In the original review (reference A.54), NSRS determined that the SQN Instrument Maintenance Section did not identify the need for ASME Section XI valve testing when they performed work on Section XI valves and recommended they be trained in the purpose of the ASME Section XI pump and valve program and in how to identify pumps and valves which are included in it.

The NUC PR response was:

> Our investigation has determined the three MRs identified in Section III.C.3.a of the subject report appear to be isolated cases for Section XI postmaintenance testing. The valves listed, 1-PCV-01-12 and PCV-01-5, are tested using SI-166.3, "Full Stroking of Category 'A' and 'B' Valves During Cold Shutdown," and the unit must be in mode 5 in order to perform SI-166.3 for these valves. For the examples cited, unit 1 was in mode 5 only when MRs A-245631 and A-28872[illegible] re worked. However, the

Instrument Maintenance Section has emphasized to section personnel the importance of identifying postmaintenance testing requirements on MRs.

NSRS commented on the response as follows:

The corrective action taken by the plant appears to be adequate. However, the mode information included in the response is misleading. The fact that the unit may not be in the mode necessary to perform the Section XI postmaintenance testing does not waive the need to schedule the required testing when the plant is in a mode that would permit testing.

For this follow-up review, NSRS interviewed the instrument maintenance planners and determined that they were well acquainted with the ASME Section XI program for valves as it affects the Instrument Maintenance Section. There are no pumps in the Section XI program for which instrument maintenance is responsible. The planners were familiar with all the pertinent documents including SQM 2, "Maintenance Management System," TI-59, "Summary of Pre- and Post-Maintenance Valve Tests for ASME Section XI and 10CFR50 Appendix J," and the SI-1.66 series. They were using an informal checklist they had prepared to assure that they considered all the necessary items when planning work. All the planners understood that Section XI postmaintenance tests must be specified even if the plant is in an operating mode that precludes the necessary testing at the time the maintenance is done. In addition to the Section XI awareness of the planners, the instrument mechanics are made aware of Section XI requirements by training. This training is provided as part of an annual training course on pneumatic valve stroking. NSRS reviewed the training course and found it to be appropriate and very comprehensive in its discussion of Section XI requirements as they relate to the work of the Instrument Maintenance Section. This item is closed.

PP. R-85-03-NPS-06, Postmaintenance Testing Program-Generic

In the original review (reference A.54), NSRS determined that there were no guidelines to ensure that postmaintenance testing instructions verify that the component or system worked or still functioned as designed. NSRS recommended that each site prepare an instruction outlining the criteria to be followed in selecting or preparing postmaintenance tests.

The response from SQN was:

PMT requirements are covered in surveillance instructions and not by the Special Test Program as indicated in the report and recommendation section. Maintenance requests are reviewed by appropriate plant personnel prior to commencing work to determine PMT requirements. The appropriate surveillance testing,

as identified in the technical specifications, must be completed prior to declaring the component or system operable and returning to service.

In commenting on this response, NSRS noted that it did not address the concern expressed in the recommendation. However, NSRS noted that the SQN response to an NRC level IV violation (50-327-328/85-24) may address the problem. This response was:

> Standard Practice SQM-2, "Maintenance Management System," will be revised to include direction for when PMT is required for maintenance activities and descriptions of what should be required in the PMT. Personnel who plan maintenance requests will be instructed in proper PMT requirements.

For this follow-up review, NSRS determined that Change No. 85-1699, issued December 31, 1985, does add appropriate criteria for selecting and preparing postmaintenance tests to SQM 2, "Maintenance Management System." All the maintenance planners were trained to the procedure change. Several maintenance planners were interviewed concerning postmaintenance testing and all were aware of the need to verify proper functioning of the component or system after maintenance, and all were familiar with the criteria in the change to SQM 2. Ten recent maintenance requests were reviewed and all were found to have had adequate postmaintenance tests specified and required. This item is closed for SQN.

QQ. R-85-03-NPS-07, Common Mode Failure-Generic

In the original review (reference A.54), NSRS determined that the Mechanical Maintenance Section had no method of avoiding common mode failure. NSRS recommended that a program be developed and implemented which provides a method of avoiding common mode failure.

Nuclear Power responded as follows:

> SQN will implement a program in accordance with NQAM, Part III, Section 7.3, "Common Mode Failures, Maintenance-Initiated." The program will be implemented by January 1, 1986.

For this follow-up review, NSRS determined that Mechanical Maintenance Section Instruction Letter MMSL-A36, "Common-Mode Failures, Maintenance-Initiated," revision 3, had been issued July 29, 1985. This section instruction letter is adequate to address the problem of maintenance initiated common mode failures with two notable exceptions.

1. The potential exists for common mode failures to be caused by the use of the same calibrated tool on redundant pieces of equipment. While this is not specificelly addressed in the NQAM except for reactor protection and engineered safety features

instrumentation, the potential for problems is significant, and NSRS recommends that it be addressed in MMSL-A36. The Mechanical Maintenance Supervisor agreed.

2. The NQAM, part III, section 7.3, paragraph 3.3 states: "An important aspect of specific controls is redundancy -- redundancy of people, equipment, inspections, review. . ." It also includes the following as an example of a specific control method which may be employed: "The same individual should not be assigned to perform an identical activity on all similar units of multiple or redundant systems or components." MMSL-A36 states that: "Supervisors shall support the concept of maintenance redundancy, i.e., redundancy of people, equipment, inspections, and review," and includes the example noted above from the NQAM. NSRS interprets this to mean that the same individual should not perform the same maintenance activity on redundant equipment. The practices of the electrical and instrumentation maintenance sections appear to be based on this interpretation.

   Item 5 under Responsibilities in MMSL-A36 states: "Assign Maintenance Request Planners the responsibility for identifying and indicating on the MR the possibility of common - mode problems prior to placing CSSC MRs on the available status; i.e., similar maintenance on both RHR pumps should not be performed by the same person, or two qualified craftsmen should be assigned to the work." NSRS cannot agree that using two qualified craftsmen constitutes redundancy of people, and recommends that the phrase . . . or two qualified craftsmen should be assigned to the work" be deleted.

NSRS also verified that foremen were being trained to MMSL-A36 and attended one of the training sessions. The training was appropriate and pertinent and should increase awareness of the potential for common mode failure. As a possible improvement, NSRS suggests that a checklist of things to consider in addressing common mode failure be distributed to the trainees.

This item remains open pending revision of MMSL-A36 to: (1) address the role of calibrated tools in potential common mode failures, and (2) to meet the intent of "redundancy of people" as stated in the NQAM.

RR. R-85-03-NPS-08, Surveillance of Maintenance Program-Generic

In the original review (reference A.54), NSRS determined that surveillance of maintenance activities by onsite QA

groups had not been adequately performed. NSRS recommended that onsite QA groups perform indepth surveillances of the maintenance program including review of items described in other findings of the report. These items were concerned with proper CSSC classification, post maintenance testing, ASME Section XI testing, and common mode failure.

The Nuclear Power response indicated that the Division of Quality Assurance (DQA) had issued a Management Review Guideline (MRG)-3.1, "Maintenance Performance" and planned to issue an MRG on postmaintenance test (PMT). The MRGs are intended to assist in achieving more indepth surveillances. The response also described the maintenance activities surveillances that had been performed.

For this follow-up review, MRG-3.1 and MRG-3.9, "Postmaintenance Testing," were reviewed and found to address all the items of concern except common mode failure. The checklist for surveillance of PMT activities had not been prepared and no PMT surveillances had been scheduled.

This item remains open pending: (1) addition of common mode failure to the surveillance program of maintenance activities, (2) issuance of the PMT checklist, and (3) NSRS review of the implementation of surveillances on the maintenance program and PMT.

SS. New Recommendation R-86-01-SQN-01, <u>Increased Effectiveness of ALARA Program</u>

For this follow-up review of I-84-12-SQN-13, it was determined that sufficient corrective action has been taken to satisfy the NSRS open item. However, discussions with the HP staff, ALARA engineer, and review of documentation led the reviewer to conclude that additional specific actions should be taken to strengthen the ALARA program at SQN.

Discussions with SQN personnel combined with information contained in each of the following documents was used to generate suggestions that can be used to determine what actions SQN will take: INPO Operational Experience Note REN/OEN-08A, "A Good Practice for the ALARA Program," Quality Audit Branch Audit Report No. QSS-A-85-0016, RC-14, "Radiation Work Permit (RWP) Program," and RCI-10, "Minimizing Occupational Radiation Exposure." The following is a brief description of the pertinent background information in each of the reports and the corresponding NSRS suggestion of possible actions SQN could take to improve the ALARA program.

1. Quality Audit Branch (QAB) Report No. QSS-A-85-0016

The QAB ALARA program audit was conducted at BFN and SQN to verify that these plants have established and implemented an effective ALARA program within the scope of the quality assurance program to maintain low exposures. The deviations identified in the QAB report will not be addressed here; however, the observations and NSRS suggestions are provided.

a. Staffing. The QAB report stated that BNF has five senior health physics technicians assigned to specific ALARA activities working under the direct supervision of the ALARA engineer. During the follow-up review, the SQN ALARA engineer said that there is one full time HP technician assigned to him; however, at the time of this follow-up review, he was supporting the ALARA engineer on a half-time basis. The HP technican attended the morning maintenance meetings to provide ALARA input on HP, RWP shielding, and some ALARA preplanning. Based upon the current half-time effort, no coverage is being provided on backshifts, planning, modifications, or other areas. There were also 104 ALARA preplans, and postplans prepared in 1985 and 12 in 1986 (as of February 21, 1986) which the ALARA engineer is required to approve. It is highly questionable that a single ALARA engineer and a half-time, or even a full-time, technician can effectively accomplish the required tasks. The BFN staffing level of five full time HPs may not be the appropriate number for SQN; however, more than one is considered to be necessary. NSRS suggests that SQN determine the appropriate HP staffing level required to effectively perform the ALARA duties during normal and off-normal hours. This determination needs to consider all plant functions that require ALARA considerations; such as, maintenance, operations, modifications, outage planning, test, design, and site services. A job-task analysis could be used to determine an effective staffing level.

b. ALARA Review Committee The QAB audit recommended that SQN consider the merits and possible benefits of an SQN ALARA review committee as is currently operating at BFN. For this follow-up review, it was determined that the INPO Operational Experience Note also recommends an ALARA committee that has: (1) responsibility for overall coordination of the ALARA program, (2) be composed of members from the major functional

departments, (3) meet on a regular basis to review the status of the ALARA program, (4) and review exposure reduction plans for specific jobs with estimates of 25 man-rem or greater.

The BFN ALARA review committee, in its third year of operation, has the responsibility to review and direct the implementation of approved ALARA suggestions. In addition the committee· reviews planning schedules; discusses specific and timely ALARA problems; such as, reports of unnecessary loitering in dose areas; reviews personnel contamination reports; reviews corrective action on delinquent postjob; ALARA reports; reviews status of ALARA projects.

There was no evidence at SQN to suggest that any of the above areas are effectively being performed; e.g., the SQN 1985 ALARA goal was established late (March 1985) at 750 man-rem and the actual was approximately 1100 man-rem. The ALARA engineer (nor others) was not aware of any critique that was performed to attempt to improve future performance and reduce doses. An ALARA committee would do so. Considering the apparent success at BFN and the INPO Good Practice recommendation, NSRS suggests that the SQN plant consider establishing an ALARA review committee composed of members from the major functional areas with the responsibility for overall coordination of the ALARA program. Specific functions would include:

(1) Review exposure reduction for specific jobs with exposure estimates greater than 25 man-rem.

(2) Direct the implementation of approved ALARA suggestions.

(3) Review planning schedules.

(4) Review specific and timely ALARA problems, such as, reports of unnecessary loitering in dose areas.

(5) Review personnel contamination reports.

(6) Review corrective action on delinquent postjob ALARA reports.

(7) Review status of ALARA projects.

(8) Other.

The ALARA Committee composition and responsibilities could be incorporated into a plant instruction, e.g., an SQN Standard Practice or RCI.

c. ALARA Suggestion Program. The QAB audit determined that participation in the ALARA suggestion program has been poor at SQN. In the first year (1984) of the SQN ALARA suggestion program, approximately 35 legitimate suggestions had been submitted. Less than ten were submitted by November of 1985. For this follow-up review, the ALARA engineer confirmed the lack of employee participation to the NSRS reviewer and also stated that no suggestions were received in 1986 as of February 21, 1986. The QAB audit recommended (and the NSRS concurs) that an employee award system (similar to BFN) be considered for SQN to stimulate additional employee involvement. Several award mechanisms identified were: day off with pay; savings bond; reserved parking spot; picture in plant newsletter; and ALARA T-Shirts, hats, or pens.

NSRS suggests SQN take action to increase employee participation in the ALARA suggestion program. Adoption of an awards program could be a way to increase participation.

d. ALARA Coordinators This item was not specifically addressed in the QAB audit report; however, the INPO Good Practice recommends the use of department ALARA coordinators. This is a staff position within the Radiological Protection Department with functional authority for implementation of the ALARA program and maintenance of the necessary records and data bases. For this follow-up review, discussions were held with the HP Section Supervisor who stated that this type of function is being considered at SQN by assigning of an M-3 HP to assist the maintenance planners in ALARA preplanning and RWPs. This is a positive step and should be pursued. However, assignment of ALARA qualified individuals to other groups (modifications, operations, test, site, services and design) should be made.

NSRS suggests that consideration be given to assigning that ALARA coordinators to all SQN site functional groups (modifications, maintenance, operations, test, design, site services, etc.) to provide these groups with the ALARA expertise to effectively implement the ALARA program. Their function would be to assist in preplan preparation, postplan critique, dose reduction suggestions, maintain the necessary records and data bases, and incorporate industry experience into the SQN operations. This is considered to be an extension of the M-3 assignment mentioned previously.

e. Training. For this follow-up review, the SQN ALARA engineer stated that the work supervisors that prepare ALARA pre and postplans, in many cases, cannot do an effective job. The HP section supervisor stated that an extensive ALARA an training program had been prepared but

never implemented. NSRS suggests that SQN consider preparing ALARA training program and that it be given to all individuals responsible for the ALARA effort, such as, the ALARA committee members, ALARA coordinators, and the individuals responsible for the preparation of the ALARA pre and postplans. This training program could include the fundamental principles of all radiation shielding and attenuation, and provide descriptive methods available to reduce dose levels in addition to time, distance, and shielding, e.g., changing test frequencies or times of test, preventive maintenance or design changes (such as moving high failure rate components or high frequency maintenance items out of radiation areas or provide permanent shielding), and cleaning or draining/refilling systems, etc.

V. LIST OF PERSONNEL CONTACTED

A. Sequoyah Nuclear Plant

Kathryn W. Allen, Reactor Engineer

Larry D. Alexander, Mechanical Supervisor, Field Services Group

Ronald D. Bates, Mechanical Engineer

Robert C. Birchell, Plant Compliance, O&PS

Gary S. Boles, Mechanical Group Supervisor

John G. Brady, Mechanical Engineer

Mark E. Brock, Electrical Maintenance, POB

Donna M. Bruno, Personnel Clerk

Larry S. Bryant, Mechanical Maintenance Supervisor

Marcia A. Cooper, Mechanical Testing, O&PS

David L. Cowart, Quality Surveillance Supervisor

Edward A. Craigge, Safety Supervisor, Industrial Safety Engineer

Doug Craven, QA Supervisor

Donald E. Crawley, Health Physics Supervisor

Don L. Deakins, Jr., Operations, POB

John F. Denver, Mechanical Engineer

Hugh D. Elkins, Jr., Instrument Maintenance Supervisor

Steven V. Emert, Electrical Engineer

Richard W. Farner, Instrument Engineer

Ronald W. Fortenberry, Reactor Engineering Supervisor

Timothy M. Galbreth, Employee Concern Program Site Representative

Gary W. Gault, Reactor Engineering Supervisor

John L. Hamilton, QA/QC Engineering Supervisor

Philip R. Hitchcock, Mechanical Engineer

Stephen P. Holdefer, HP Unit Supervisor, Support

John F. Klein, Mechanical Engineer

Tom D. Knight, Assistant to Site Director

Tom Kontovich, Electrical Engineer

Bennett C. Lake, Operations

John A. Leamon, HP ALARA Engineer

Frank H. Lewis, QA Engineer

Timothy E. Massey, Mechanical Engineer

Mildred M. McGuire, Configuration Control Manager

Manoj P. Mehta, Modifications Scheduling Supervisor

Lawrence M. Nobles, Operations & Engineering Superintendent

Robert W. Olson, Modifications Branch Manager

Roger D. Poole, Instrument Engineer

David C. Queen, Mechanical Engineer

Heyward R. Rogers, Compliance Engineer

Roswell F. Schnur, Instrument Engineer

Michael R. Sedlacik, Electrical Modifications Supervisor

Mark A. Skarzinski, Electrical Maintenance Supervisor

Joseph S. Steigelman, Unit Supervisor, Operation

John M. Stitt, QC Shift Supervisor

Victor M. Taylor, Safety Specialist

Gary E. Tiner, Instrument Engineer

Philip R. Wallace, Plant Manager

Patricia Wilson, Administrative Services

B. Watts Bar Nuclear Plant

Gerald Brantley, Employee Task Force

Jerry Collins, Mechanical Maintenance Supervisor

Ed Dudley, Maintenance Training Supervisor

Edward Elam, Mechanical Engineer

Craig F. Faulkner, Reactor Engineer

Gary J. Johnson, Reactor Engineer

Marvin K. Jones, Engineering Group Supervisor

Samuel Lingenfelter, Acting Mechanical Engineering Supervisor

Robert C. Manley, Planning Supervisor

Charley Margraves, Preoperational Test Engineer

C. Chattanooga

Douglas A. Bateson, Plant Training Officer

Howard B. Burdette, Mechanical Maintenance Instructor, POTC Nuclear Service

Frank Chicketto, Power Operations Training Center

John Fox, Supervisor of Welding and Metallurgical Section, Nuclear Service

Robert M. Harris, Supervisor, Maintenance Training Unit, POTC

Ellen Hensley, Health Physics Technician

Charles E. Kent, Jr., Nuclear Services

David Lambert, Licensing

Felix A. Szczepanski, Chief, Nuclear Safety Staff

D. Browns Ferry Nuclear Plant

Bill Nichols, Maintenance Training Supervisor

E. Bellefonte Nuclear Plant

John Bynum, Mechanical Maintenance General Foreman

Jay Krell, Maintenance Superintendent

F. Muscle Shoals

John L. Lobdell, Nuclear Services

Gilbert F. Stone, Director of Occupational Health and Safety

VI. REFERENCES

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61. Memorandum from R. L. Lewis to T. F. Ziegler dated October 25, 1985, "BFN - Tube Fitting Awareness and Initial Training" (R36 851021 904)

62. Memorandum from K. W. Whitt to H. G. Parris dated November 22, 1985, "Sequoyah (SQN), Browns Ferry (BFN), and Watts Bar (WBN) Nuclear Plants - Review of Maintenance Program - Response to Nuclear Safety Review Staff (NSRS) Report No. R-85-03-NPS" (Q01 851122 051)

63. Memorandum from M. R. Harding to P. R. Wallace dated November 29, 1985, "CO2 Protected Areas at Sequoyah Nuclear Plant"

64. Memorandum from R. J. Mullin to K. W. Whitt dated December 19, 1985, "Sequoyah (SQN), Browns Ferry (BFN), and Watts Bar (WBN) Nuclear Plants - Review of Maintenance Program - Nuclear Safety Review Staff (NSRS) Report No. R-85-03-NPS" (L04 851217 859)

65. Memorandum from P. R. Wallace to Those listed dated December 19, 1985, "Technical Review of all SURVEILLANCE INSTRUCTIONS - Schedule For Review of Surveillance Instructions (Instrument Maintenance Group)"

66. Memorandum from G. W. Killian to Those listed dated December 20, 1985, "Transmittal of Quality Audit Branch Audit Report No. QSS-A-85-0016" (L17 851220 800)

67. Memorandum from J. A. Domer to H. R. Denton dated December 27, 1985, "Address Employee Concern Program"

68. Memorandum from G. W. Killian to H. L. Abercrombie dated December 30, 1985 "Evaluation of Corrective Action Taken - Deviation Report Closure" (L17 851230 809)

69. Memorandum from M. M. McGuire to H. L. Abercrombie dated January 8, 1986, "Program Plan for Conversion to Configuration Control Drawings" (L16 860108 809)

70. Memorandum from C. C. Mason to Those listed, dated January 23, 1986, "Use of Vendor Manuals" (L12 860122 801)

71. Memorandum from G. B. Kirk to H. L. Abercrombie dated January 29, 1986, "Independent Safety Engineering Group (ISEG) Investigation on Loss of Spent Fuel Pit Level on December 18, 1985" (S00 860129 800)

72. Memorandum from G. B. Kirk to H. L. Abercrombie dated January 30, 1986, "Independent Safety Engineering Group (ISEG) Investigation of Unreliability of the Units 1 and 2 Containment Hydrogen Analyzers (Monitors) of June 1984 and June 1985" (S00 860130 800)

73. Memorandum from S. A. White to Those listed dated January 30, 1986, "New TVA Employee Concern Program" (L12 860130 802)

74. Memorandum from H. D. Elkins to PORC CHAIRMAN-SQN dated February 3, 1986, "SQN-Instrument Maintenance Instructions (IM's)-Review in accordance with AI-4"

75. Memorandum from M. M. McGuire to H. L. Abercrombie dated February 5, 1986, "Sequoyah Nuclear Plant - Identification and Schedule of Startup Items of Program Plan for Conversion to Configuration Control Drawings" (S01 860205 929)

76. Memorandum from D. H. Tullis to B. M. Patterson dated February 11, 1986, "Sequoyah Nuclear Plant Maintenance Instruction (MI) Writer's Guide Summary Report"

77. Memorandum from H. D. Elkins to PORC Chairman-SQN dated February 24, 1986, "SQN - Instrument Maintenance Instructions (IM's) - Review in Accordance with AI-4"

78. Memorandum from B. M. Patterson to P. R. Wallace dated February 26, 1986, "Review of Thimble Tube Maintenance Instructions for Steps Which May Apply Excessive Forces to High Pressure Fittings"

B. Sequoyah Nuclear Plant

Administrative Instructions

1. SNP Administrative Instruction AI-3, Revision 29, "Clearance Procedure," dated January 30, 1986.

2. SNP Administrative Instruction AI-5, Revision 35, "Shift and Relief Turnover" dated December 17, 1985.

3. SQN Administrative Instruction AI-8, "Access to Containment," Revision 16, approved January 13, 1986.

4. SQN Administrative Instruction AI-9, "Control of Temporary Alterations and Use of the Temporary Alteration Order," Revision 19, approved October 25, 1985.

5. SQN Administrative Instruction AI-19 (Part III). "Plant Modifications: Modification Requests," Revision 12, approved May 15, 1985.

6. SQN Administrative Instruction AI-19 (Part IV), "Plant Modifications: After Licensing," Revision 13, approved January 23, 1986.

7. SQN Administrative Instruction AI-25 (Part I), "Drawing Control After Unit Licensing," Revision 12, approved January 30, 1986.

8. SQN Administrative Instruction AI-25 (Part II), "Revision of As-Constructed Drawings," Revision 0, approved October 25, 1985.

9. SNP Adminstrative Instruction AI-27, Revision 7, "Shift Technical Advisor" dated September 24, 1985.

Annual Trend Analysis

10. SQN - "Annual Trend Analysis of Estimated Section Exposure" dated February 6, 1986.

Change No.

11. SQN Change No. 85-1569.
12. SQN Change No. 85-1599.
13. SQN Change No. 85-1699 to SQM-2 approved December 31, 1985.

Electrical Maintenance

14. SQN Electrical Maintenance Section Instruction Letter EMSL-A36, "Common-Mode Failures, Maintenance Initiated," Revision 1, approved April 7, 1976

TVA 64 (05-9-65) (OP-WP-5-85)

UNITED STATES GOVERNMENT

Memorandum

TENNESSEE VALLEY AUTHORITY

001 '86 0321 050

TO: H. L. Abercrombie, Site Director, Sequoyah Nuclear Plant

FROM: K. W. Whitt, Director of Nuclear Safety Review Staff, E3 A8 C-K

DATE March 21, 1986

SUBJECT: SEQUOYAH NUCLEAR PLANT (SQN) - NUCLEAR SAFETY REVIEW STAFF (NSRS) FOLLOW-UP REVIEW OF OPEN ITEMS FROM PREVIOUS NSRS REVIEWS AND INVESTIGATIONS - NSRS REPORT NO. R-86-01-SQN

Attached is the approved subject report. Of the 44 open items reviewed, 40 are closed and four remain open. One new open item was generated. These five open items were discussed in detail at the exit meeting held February 25, 1986, at SQN. Two of these items, R-80-05-SQN-4B and R-85-02-SQN/WBN-2, need to be addressed prior to SQN restart.

Please respond within 30 days with your plan and schedule for implementing the recommendations associated with these five open items.

K. W. Whitt

HWB:LML
Attachment
cc (Attachment):
RIMS, SL 26 C-K
P. R. Wallace, Sequoyah Nuclear Plant
S. A. White, LP 6N 38A-C

0195W

Engineering Section

15. SNP Engineering Section Instruction Letter ES SIL A11, Revision 1 "Station Shift Technical Advisor Training" dated March 27, 1985.

General Operating Instruction

16. SQN General Operating Instruction GOI-01, "Plant Startup from Cold Shutdown to Hot Standby," Revision 56, approved December 6, 1985.

Hazard Control Instruction

17. SQN HCI-M23, "Tube Fittup," dated November 8, 1985.

Health Physics

18. SQN Health Physics Section Instruction Letter HPSIL-1, "Radiation Surveys, Revision 12, approved May 14, 1985.

19. SQN Health Physics Section Instruction Letter HPSIL-25, "ALARA Program," Revision 3, approved March 22, 1985.

20. SQN Health Physics Section Instruction Letter HPSIL-27, "Multiple TLD Badging," Revision 4, approved August 26, 1985.

21. SQN Health Physics Section Instruction Letter HPSIL-28, Attachment 1, "Quarterly Emergency Van Inventory," performed November 6, 1985, for van No. 10279.

Implementing Procedures Document

22. SQNP Implementing Procedures Document IP-20, "Environmental Monitoring During a Radiological Emergency," Revision 3, approved August 22, 1985.

Instrument Maintenance

23. SQN Instrument and Controls Training Continuing, Pneumatic Valve Stroking SQN-IMC-20, Revision 0, December 23, 1985.

24. SQN Instrument Maintenance Instruction IMS-A4, "Independent Verification," Revision 0.

25. SQN Instrument Maintenance Section Instruction Letter IMS-132, "Checklist Review of Plant Procedures," Revision 0, dated November 27, 1985.

Maintenance Instructions

26. SQN Maintenance Instruction Writer's Guide, DRAFT ONLY.

27. SQN Maintenance Instruction MI-1.9, "Bottom Mounted Instrumentation Thimble Tube Retraction and Reinsertion" Revision 7, dated September 9, 1985, and next revision DRAFT.

28. SQN Maintenance Instruction MI-1.10, "Incore Flux Thimble Cleaning and Lubrication," Revision 3, approved September 9, 1985, and next revision DRAFT.

29. SQN Maintenance Instruction MI-1.11, "Thimble Tube Installation," Revision 0, DRAFT ONLY.

30. SQN Maintenance Instruction MI-6.20, "Configuration Control During Maintenance Activities," Unit 0, Revision 6, approved November 26, 1984.

31. SQN Maintenance Instruction MI-6.24, "Inspection of High-Pressure Fire Protection Strainers," Revision 1, approved January 28, 1986.

32. SQN Maintenance Instruction MI 10.05.1, "Boric Acid Transfer Pumps, Revision 0, DRAFT ONLY.

Mechancial Maintenance

33. SQN Mechanical Maintenance Section Instruction Letter MMSL-A36, "Common-Mode Failures, Maintenance Initiated," Revision 3, approved July 29, 1985.

34. SQN Mechanical Maintenance Section Instruction Letter MMSL-A65, "Mechanical Craft Training Program," Revision 4, approved January 24, 1986.

Monthly TACF Status Report

35. SQN Monthly TACF Status Report for January 1986.

36. SQN Monthly TACF Status Report for November 1985.

Quality Assurance

37. SQN Quality Assurance Section Instruction Letter No. 5.1, "Plant Instructions - QA Staff Review," Revision 5, dated October 18, 1985.

38. Quality Surveillance Section Annual Plan 1985.

39. QA Survey, Checklist No. 8a-85-P-001, Equipment Status, May 8-17, 1985, dated May 28, 1985.

40. QA Survey, Checklist No. 4a-85-A-005, Maintenance Activity Surveillance, April 26-17, 1985, May 7, 1985.

41. QA Survey, Checklist No. 20a-85-P-002, TACFs, June 12-24, 1985, dated June 28, 1985.

42. QA Survey, Checklist No. 1c-85-S-004, Drawing Control - Unit 1, May 16-24, 1985, dated May 31, 1985.

43. QA Survey, Checklist No. 1c-85-P-005, Revision 1, "As-Constructed" Drawing Verification, November 7-14, 1985, dated January 21, 1986.

Quality Engineering

44. SQN Quality Engineering Section Instruction Letter No. 5.1, "Plant Instructions - FQE Section Review," Revision 3, dated April 17, 1984.

Radiological Control Instructions

45. SQN Radiological Control Instruction RCI-1, "Radiological Hygiene Program," Revision 28, approved December 20, 1985.

46. SQN Radiological Control Instruction RCI-3, "Personnel Monitoring," Revision 22, approved January 13, 1986.

47. SQN Radiological Control Instruction RCI-10, Revision 8, "Minimizing Occupational Radiation Exposures," dated June 7, 1983.

48. SQN Radiological Control Instruction RCI-10, Revision 10, "Minimizing Occupational Radiation Exposures," dated December 11, 1985.

49. SQN Radiological Control Instruction RCI-14, "Radiation Work Permit (RWP) Program," Revision 4, approved July 20, 1985.

Radiological Protection

50. SQN Reason Plan ECP Instructor Notes.

Special Maintenance Instruction

51. SQN Special Maintenance Instruction SMI-0-68-28, "Change-Out of the RCS Narrow Range RTDs," Revision 0, November 19, 1985.

52. SQN Special Maintenance Instruction SMI-0-94-3, "Seal Table High Pressure Seal Repair," Revision 1, approved January 17, 1986, and next revision DRAFT.

53. SQN Special Maintenance Instruction SMI-1-94-5, "Thimble Tube Installation," Revision 1, approved May 25, 1984.

Special Test Instruction

54. SQN Special Test Instruction SQ-STEAR-INST 82-12, "Turbine Benchmark Radioactive Tracer Test Unit 1," Revision 3, approved April 17, 1984.

Special Tool Evaluations

55. Special Tool Evaluation, M-3-26-4, "Fire Pump Stand," October 3, 1985.

56. Special Tool Evaluation, M-3-62-7, "Centrifugal Charging Pump Element Handling Beam," October 3, 1985.

57. Special Tool Evaluation, M-3-68-12, "Conoseal Tool", August 1, 1985.

58. Special Tool Evaluation, M-3-68-13, "RPV Stud Elongation Rods w/ends Machined Flat," October 3, 1985.

59. Special Tool Evaluation, M-3-68-14 "RPV Stud Nut Cleaner," October 3, 1985.

60. Special Tool Evaluation, M-3-68-15 "RPV Stud Cleaner," October 3, 1985.

61. Special Tool Evaluation, M-3-68-16, "Fast Stud Spinout Tool," October 3, 1985.

62. Special Tool Evaluation, M-3-68-17 "Steam Generator Sludge Lanceing Tools," October 3, 1985.

63. Special Tool Evaluation, M-3-68-18 "Steam Generator Tube Plugging Tools," October 3, 1985.

64. Special Tool Evaluation, M-3-74-6 "Residual Heat Removal Pump Motor Lifting Brackets," October 3, 1985.

65. Special Tool Evaluation, M-3-68-1, "Reactor Coolant Pump #1 Seal Housing Centering Bracket," October 3, 1985.

66. Special Tool Evaluation, M-3-68-2, "Reactor Coolant Pump Seal Handling Rails Fabricated from Aluminum," October 3, 1985.

67. Special Tool Evaluation, M-3-68-3, "Reactor Coolant Pump Motor Shaft Centering Brackets," October 3, 1985.

68. Special Tool Evaluation M-3-68-8, "Reactor Coolant Pump Guide Studs for #1 Seal Housing Piece Fabricated from Aluminum," October 3, 1985.

69. Special Tool Evaluation M-3-68-10, "Reactor coolant Pump Coupling Puller," October 3, 1985.

70. Special Tool Evaluation, M-3-68-11, "Reactor Coolant Pump #1 Seal Housing Lifting Brackets," October 3, 1985.

71. Special Tool Evaluation, M-3-82-5, "Turbocharger Lifting Beam," October 3, 1985.

72. Special Tool Evaluation M-3-68-19 "RPV Head Stud Lift Rig," December 6, 1985.

73. Special Tool Evaluation, 86-1, "Lifting Eye for Containment Air Return Fan Motor," February 11, 1986.

Standard Practices

74. SQN Standard Practice SQA 129, "Objectives in Plant Operation-Sequoyah Nuclear Plant," Revision 5, approved January 2, 1986.

75. SQN Standard Practice SQA 145," As Low As Reasonable Achievable (ALARA) Suggestion Program," Revision 0, approved January 19, 1986.

76. SQN Standard Practice SQA 166, "Program For Informing Employees How To Report Their Safety Concerns, Revision 4, approved January 7, 1986.

77. SQN Standard Practice SQA 168, "Systems Engineering," Revision 0, approved January 10, 1986.

78. SQN Standard Practice SQA 178, "TVA Office of Nuclear Power Employee Concern Program Line Organizations Procedure, Revision 0, dated February 6, 1986.

79. SQN Standard Practice SQM1, "Sequoyah Nuclear Plant Maintenance Program," Revision 0, approved January 18, 1983.

80. SQN Standard Practice SQM1, "Sequoyah Nuclear Plant Maintenance Program," Revision 4, approved January 8, 1986.

81. SQN Standard Practice SQM2, "Maintenance Management Program," Revision 16, approved December 27, 1985.

82. SQN Standard Practice SQM2, "Maintenance Management System," Revision 13, approved January 11, 1985.

83. SQN Standard Practice SQM63, "Special or Modified Tooling - Primary Systems," approved May 9, 1985.

84. SQN Standard Practice SQS7, "Hazard Control Plan," Revision 2, approved January 7, 1986.

Startup Instruction

85. SQN Startup Instruction SU-10.2, "Steam Generator Moisture Carryover Measurement," Revision 6, approved March 8, 1982.

Surveillance Instructions

86. SQN Surveillance Instruction SI-37, "Containment Spray Pump Test," Revision 16.

87. SQN Surveillance Instruction SI-146, "Reactor Coolant System Leak Test," Revision 12, approved May 1, 1984.

88. SQN Surveillance Instruction SI-250, "Reactor Coolant System Hydrostatic Pressure Test," Revision 1, approved September 2, 1981.

Technical Instruction

89. SQN Technical Instruction TI-69, "Summary of Pre- and Post-Maintenance Valve Tests for ASME Section XI and 10CFR50 Appendix J," Revision 9, approved October 28, 1985.

Work/Maintenance Requests

90. SQN MR A-539610 dated September 3, 1985.

91. SQN MR A-563292 dated October 23, 1985.

92. SQN MR A-522137 dated November 29, 1985.

93. SQN WR 109473, MR A-532134 dated November 30, 1985.

94. SQN MR A-548350 dated December 5, 1985.

95. SQN MR A-563137 dated December 18, 1985.

96. SQN MR A-563138 dated December 18, 1985.

97. SQN MR A-563139 dated December 18, 1985.

98. SQN WR 105405, MR A-561999 dated December 24, 1985.

99. SQN WR 105786 dated January 6, 1986.

100. SQN WR B-112780 dated January 7, 1986.

101. SQN WR 103937 dated January 9, 1986.

102. SQN WR 103941 dated January 9, 1986.

103. SQN WR 103942 dated January 9, 1986.

104. SQN WR 103945 dated January 9, 1986.

105. SQN WR 113377 dated January 14, 1986.

106. SQN WR 103945 dated January 14, 1986.

Workplan

107. SQN Workplan 11878.

C. Office of Nuclear Power

1. Administrative Instruction Power and Engineering, "II Expression of Employee Views," Revision 2, approved June 11, 1985.

2. NQAM, Part II, Section 6.4, "Control of Temporary Alterations," November 5, 1984.

3. NQAM, Part III, Section 7.3, "Common-Mode Failures, Maintenance Initiated," dated January 15, 1981.

4. Quality Notice, NQAM Part V, Section 2.4, "Design Change Control System Using Design Change Supplements," effective date October 7, 1985 (L16 851007 806).

5. Nuclear Dispatch, "New TVA Nuclear Employee Concern Program I Place," dated February 14, 1986.

6. Office of Power Radiation Protection Plan Section A, "Nuclear Power Plants," Revision 0, dated August 12, 1983.

7. Office of Power Radiological Protection Plan, Section A, "Nuclear Power Plants, Revision 1, approved November 2, 1983.

8. Power and Engineering (Nuclear) Radiological Protection Plan Section A, "Nuclear Power Plants," Revision 2, dated December 6, 1985.

9. Procedure 0202.08, Revision 0, "Electrical and Mechanical Maintenance Craftsmen Training" dated January 6, 1986.

10. REP-IPD, CECC-IP-9, "Emergency Radiological Monitoring Procedures," Revision 4, dated December 4, 1985.

11. Management Review Guideline MRG-3.1, "Maintenance Performance," approved September 20, 1985.

12. Management Review Guideline MRG-3.9, "Postmaintenance Testing," approved December 16, 1985.

D. General Employee Training

1. General Employee Training GET-2.1, "Health Physics Level 1 Training."

2. General Employee Training GET-2.2, "Health Physics Level II Training."

3. General Employee Training GET-2.3, "Health Physics (Retraining)."

4. General Employee Training GET-2.4, "Health Physics Level 0 Training" H. P. and Security BY-PASS Exams.

E. Regulatory

1. U. S. NRC Report of Inspection, 50-327/84-24, "Thimble Tube Ejection Event of April 19, 1984 Tennessee Valley Authority - Sequoyah Nuclear Plant Unit 1" dated November 1984, Transmitted to TVA via Letter J. Nelson Grace to TVA dated March 7, 1985.

2. U. S. NRC Report Nos. 50-327/85-45 and 50-328/85-45 dated February 18, 1986.

3. U. S. NUREG/CR-1369, SANDBO-7054 Revision 1, "Procedures Evaluation Checklist for Maintenance, Test and Calibration Procedures used in Nuclear Power Plants."

F. Letters

1. Letter from L. M. Mills to Director of Nuclear Reactor Regulation dated October 2, 1984 - "Proposed Technical Specifications - SQNP," (L44 841002 800).

2. Letter from P. R. Wallace to USNRC dated October 11, 1984, "Tennessee Valley Authority - Sequoyah Nuclear Plant Unit 1 - Docket No-50-327-Facility Operating License DPR-77-Reportable Occurrence Report SQRO-50-327/84030, Revision 1," (S53 841012 992).

3. Letter from Gilbert Commonwealth Engineers and Consultants to TVA dated October 30, 1985, transmitting a report "Assessment of the Design Control Program for the Sequoyah Nuclear Plant," (B05 851031 004).

4. Letter from J. A. Domer to Director of Nuclear Reactor Regulation dated November 8, 1985," Proposed Technical Specification - SQNP," (L44 851112 803).

G. Watts Bar Nuclear Plant

1. Watts Bar Nuclear Plant, Surveillance Instruction, "Containment Spray Pump Test", SI-4.0.5.72-P, Revision 10, dated February 7, 1986.

2. WBN Maintenance Instruction MI-94.3, "Incore Flux Thimble Cleaning and Lubrication."

H. Industry

1. Heat Stress Management Program For Nuclear Plants, EPRI NP-4453, February 1986.

2. INPO 85-026 dated June 1985, "Writing Guidelines Form Maintenance Test and Calibration Procedures."

3. INPO Good Practice Operational Experience NOTE REN/OEN-08A "ALARA Planning for Station Work" dated September 1982.

4. Systematic Assessment of Licensee Performance, Inspection Report Numbers 50-327/85-22 and 50-328/85-22, Tennessee Valley Authority Sequoyah Units 1 and 2, March 1, 1984 through May 31, 1985, Attachment 2.

5. Westinghouse Electric Corporation Trip Report dated March 26, 1985, "To observe The Flux Mapping Operation For Unit 1,"

6. Workplan Hazard Assessment Manual, Division of Occupational Health and Safety, September 1982.

I. General

1. Commitment or Corrective Action Tracking Report No. 84148, dated October 2, 1984.

2. Commitment or Corrective Action Tracking Report No. 84149, dated October 2, 1984.

3. Commitment or Corrective Action Tracking Report No. 84153, dated October 2, 1984.

4. Commitment or Corrective Action Tracking Report No. 84158, dated October 5, 1984.

5. Corporate Commitment Tracking System NCO-85-0491-019, "17 new Maintenance instruction procedures to be issued June 30, 1986."

6. Corporate Commitment Tracking System NCO-85-0491-017, "All maintenance instructions to be reviewed with checklists by July 1987."

7. Final MR Review Class Training Record, February 6, 1986.

8. Hazard Assessment Worksheets dated May 3, 1983, August 13, 1985, October 28, 1985, November 4, 1985, and November 14, 1985.

9. Initial MR Review Class Training Records, January 30, 1986.

10. Instruction Reviews (by craftsmen) PM# 0920-030, 0921-030, 0921-030, 0233-031, and 0230-031.

11. Job Safety Anlysis dated November 10, 1984, "Entry into Pressurizer Enclosure with unit at 100% Power."

12. Lesson Program, "AI-3 Clearance Procedure Training/Retraining" Revision 2, dated May 24, 1985.

13. Maintenance Request monthly Report for January 1986.

14. Mechanical and Electrical SNP Clearance Procedure Examination (No date).

15. Official Notice Board Poster, "TVA Employee Concern Program."

16. PORC Maintenance Instruction Subcommittee Review Checklist.

17. Project U2 Force Target Schedule dated February 18, 1986.

18. Project U2 Force Working Schedule dated February 19, 1986.

19. Reactor Engineer Job Description Sc-4.

20. RWP for Reactor Building 02-1-85005, "Plugging Steam Generator Tubes Including All Related Support Activities. Manual Method" dated October 1, 1985.

21. Student Manual Nuclear Training Branch "Initial Tube Fitting Training", course MMT-28, Revision 1, dated October 8, 1985.

22. TVA Employee Concern Program," Policy and Reporting Instruction."

23. Work Permit (RWP) Program," Revision 4, approved July 10, 1985.

24. SQN Training Attendance Records AI-14, RCI-10/ALARA Program, dated January 21, 1985; February 4, 1985; March 18, 1985; March 25, 1985; March 27, 1985; April 30, 1985; June 25, 1985.