7. Procedures describing the methods and requirements for preparing, reviewing, approving, and performing modifications to BFN were reviewed. One area that was somewhat fragmented related to the assignment of responsibilities for tasks accomplished during the process when DCR's/ECN's have been released by EN DES and are physically implemented into the plant facilities. Specifically, the tasks to be accomplished are:

   a. Implementation of special requirements or precautions stated in the USQ determination.

   b. Implementation of FSAR revisions (text and drawings necessitated by the modification).

   c. Obtaining NRC review and approval of Technical Specification revisions necessitated by the modification.

   The QA Topcial Report discussed modification control (section 17.2.3) and stated the following responsibilities: "The Plant Operations Review Committee has the final responsibility to verify that:

   1. All requirements of the review and approval process have been satisfied.

   2. All prerequisites to safety have been met.

   3. Required drawings and installation instructions are approved and available.

   4. Quality assurance controls have been incorporated in the modification."

   The Topical Report statement implies that the PORC is responsible to assure implementation of the three items discussed previously.

   With this in mind, each of these tasks are discussed separately below:

   a. BF SP 8.3, "Special Requirements or Precautions," discussed the QA Staff responsibilities for reviewing the work plan. Specifically, on page 18 the procedure states: "The Quality Assurance Staff will review the work plan and ensure that all required documents are included, all applicable plant requirements are met, all the requirements of the ECN, DCR, FCR and/or the USQD are met, and the quality assurance requirements are included. The Quality Assurance Supervisor will verify that the modification

package is complete and return it to the work plan coordinator." Work plans were reviewed to assure that the above instructions were being implemented. Two work plans (Nos. 9893 and 6668), which modified the standby liquid control system, were reviewed. Each had an unreviewed safety question determination which had a special requirement that a seismic analysis be accomplished. It was recognized that the seismic analysis should be performed by EN DES, but this does not alleviate the QA Staff nor PORC responsibility to ensure that all requirements are met. The work plans did not include documentation that the seismic analysis had been accomplished prior to modification implementation.

b. Implementing FSAR revisions. BF SP 8.3 was reviewed to ensure the process for implementing FSAR revisions existed. The only problem identified was that a formal documented method of transmitting proposed FSAR revisions to the CO for action was missing. The review did not attempt to verify that implemented modification had been incorporated into the FSAR.

c. Review of Technical Specification revisions. The Office of Power Quality Assurance Plan in the procedure entitled "Modification Control," section 5.19, states, "P PROD will initiate any Technical Specification or FSAR changes resulting from proposed modification."

BF SP 8.3 discusses this subject on page 8 and states: "Nuclear Power coordinates with EN DES any approval of Technical Specification changes which require an EN DES safety review. As appropriate, EN DES and Nuclear Power are responsible for coordinating with the regulatory staff the obtaining of NRC authorizations. Upon EN DES concurrence and preliminary scoping, the P-DCR will be returned to the plant work plan coordinator." Also, on page 17 the procedure states: "Each section shall review the modification, determine what plant instructions, technical specifications, and vendor manuals will require revision and list the affected documents on form BF 74. The maintenance sections will also list any maintenance history records to be updated."

BF SP 8.3 requires that the affected technical specification and responsible plant section be identified. The SP also requires the work plant coordinator's signature to verify that all Technical Specification changes are issued.

Work plans were reviewed to ensure that proposed Technical Specification revisions were reviewed and approved by NRC prior to modification implementation.

Modifications to unit 3 during the recent refueling outage included the addition of a bypass valve for the HPCI outboard steam line isolation valve. The modification included the addition of a primary containment isolation valve and therefore necessitated NRC review and approval and Technical Specification revisions. To date, these actions have not been accomplished.

A review of the procedural controls previously established indicates that adequate controls are in place to assure implementation of these special processes. However, the examples provide indications that the tasks have not been accomplished.

8. ANSI N18.7-1976, "Administrative Controls and Quality Assurance for the Operational Phase of Nuclear Power Plants," discussed the subjects requiring independent review (section 4.3.4). Specifically, paragraph 4.3.4(2) states: "Proposed changes in procedures, proposed changes in the facility, or proposed tests or experiments, any of which involves a change in the technical specifications or an unreviewed safety question as defined in 10CFR50.59(c). [1] Matters of this kind shall be referred to the independent review body by the onsite operating organization (see 4.4) following its review, or by other functional organizational units within the owner organization, prior to implementation." However, a requirement for independent review of proposed Technical Specification changes were not included in the N-OQAM procedure (part II, section 3.2A) for processing core component design change requests.

   The documentation available for the previously implemented core component DCR's did not include a documented determination that the changes had been reviewed to ascertain if a Technical Specification change was involved.

9. ANSI N18.7-1976, "Administrative Controls and Quality Assurance for the Operational Phase of Nuclear Power Plants," discussed the subjects requiring independent review (section 4.3.4). Specifically, paragraph 4.3.4(2) states: "Proposed changes in procedures, proposed changes in the facility, or proposed tests or experiments, any of which involves a change in the Technical Specifications or an unreviewed safety questions as defined in 10CFR50.59(c). [1] Matters of this kind shall be referred to the independent review body by the onsite operating organization (see 4.4) following its review, or by other functional organizational units

within the owner organization, prior to implementation." However, a requirement for independent review of proposed Technical Specification changes and unreviewed safety questions was not included in the Nuclear Fuel Quality Assurance Manual Procedure (NFQAP 1.10) for processing core component DCR's.

NFQAMP 1.10 outlines the formal process within the Nuclear Fuels Planning Branch for review and dispositioning proposed modifications to the design of nuclear fuel and related core components. The procedure does not establish the process for independent review and approval of proposed modifications that necessitate a Technical Specification revision or involve an unreviewed safety question. The procedure revision should specify the organization responsible for obtaining and documenting the independent review and approval process.

10. The review of procedures for handling DCR's/ECN's failed to identify a formal, documented means to inform EN DES if an issued ECN will not be implemented into the plant. This information flow to EN DES is needed to assure that the EN DES design drawings are accurate. This also simplifies the transformation of drawings from as-designed to as-constructed by plant personnel.

11. The review of procedures for handling DCR's/ECN's failed to identify a formal, documented means to inform EN DES when a modification is field complete and all affected drawings are issued as-constructed. Follwing the issue of all as-designed drawings for an ECN, EN DES will send the site a data invetory sheet. This is the site's notification that all drawings for the associated ECN are as-designed. The only identified transmittal from the site to EN DES was by 45D. One recent 45D to EN DES dated February 23, 1981, stated, "Additional ECN's and DCR's that have been totally field completed." A review of the 17 ECN's listed on the 45D revealed that EN DES had not issued all as-designed drawings for three of the ECN's. The rationale by the site that ECN's are "totally field complete" without having all as-designed drawings issued by EN DES is not understood.

12. A few of the work plans reviewed were not field complete. Specifically, they were utilized to implement plant modifications during the recent unit 3 outage which was started November 23, 1980, and was completed January 18, 1981. It was not apparent that any work had been done to complete the work plans since the outage.

    The NSRS concern in this area was the apparent lack of documentation to verify that the appropriate level of management review had been accomplished to determine that

sufficient implementation and testing of the modifications had been completed to functionally utilize the affected systems and allow plant startup.

Partially implemented work plans 9916, 7833, and 7828 each contained a 45D indicating conditions were OK for unit startup, but the following items had not been documented for any of the work plants.

a. Post-modification test and/or inspection performed

b. Post-modification test and/or inspection reviewed and approved

c. Marked-up drawings submitted to Drawing Control Center

d. Changes to plant instructions and technical specifications

e. Quality Assurance review of work package

J. PROCUREMENT

Responsibility for operational quality assurance in procurement had been assigned in the N-OQAM, part III, section 2.1. Material and equipment required to maintain and modify BFN had been purchased by the PURCH. Within the POWER, responsibility for procurement activities had been assigned variously to the Power Stores Section, Plant Staff, and CO staff. Within the POWER, all organizations involved in procurement had been obliged to comply with the plant's SP's, division procedures, and N-OQAM as applicable. Regulatory commitments on which the program was based were found principally in 10CFR50, Appendix B; TVA Topical Report (TVA TR-75-1A); ANSI N18.7-1976; ANS N45.2.2-1972; and ANS N45.2.13-1976.

The policies, directives, organizational documents and administrative procedures that comprised the nuclear procurement program for BFN were reviewed against regulatory requirements, with no adverse findings. The N-OQAM, part III, sections 2.1 and 2.4, concerning procurement and vendor surveillance activities was being upgraded by the NCO staff. These changes were being made both to implement more fully TVA's regulatory commitments and also to combine policy and procedure within a single self-implementing directive for use throughout the NUC PR organization. The plant's standard practices were noted to be very complete, understandable, and formatted in an easily implemented form.

Job descriptions, structure, and staffing levels of the Power Stores organization were judged to be excellent. It was noted that the separation of modification from maintenance activities

by staff function as well as by material storage facilities lent added emphasis to the service needs of both the maintenance and modification programs at BFN.

The fuel procurement documents for vendor surveillance and fuel receipt for BFN units 2 and 3, cycle 3, were reviewed against the requirements of the Nuclear Fuel Quality Assurance Manual. Required surveys had been conducted as scheduled, and vendor performance was very good, as judged by the few minor deficiencies noted in survey and receipt inspection reports for this fuel.

Program implementation was reviewed in the NCO and in the office of the Nuclear Fuels Planning Branch.

Three QA surveillance level 1 purchase requisitions were reviewed against QA requirements found in DPM N76A10, "Purchase Specifications for Critical Stock Metal Materials, Wire, and Cable Used Inside Primary Containment, Welding Materials, Valve Parts, and Pump Parts," and the N-OQAM. No discrepancies were noted.

The CO QA Staff's program for vendor surveillance was reviewed. This program had been upgraded significantly within the past year. It appeared that substantial improvements were being made, including the following:

a. The QA procedure (N-OQAM, part III, section 2.4) was in the process of being upgraded from the DPM to an N-OQAM section.

b. Administrative evaluations had been performed recently on all suppliers on the Qualified Vendors List.

c. A program of periodic vendor audits had been recently instituted. Documents were reviewed to verify existence of a schedule and to sample results of this program. Audits were being conducted according to schedule.

Program awareness of POWER personnel was examined during discussions with a broad cross-section of POWER personnel. It was concluded that these personnel have generally a clear understanding of the responsibilities of their positions and are aware of the resources and capabilities of their own and interfacing organizations.

K. QUALITY ASSURANCE

Criterion II of Appendix B to 10CFR50 requires the operator of nuclear power plants to establish at the earliest practical time, consistent with the schedule for operating the plants, a QA program which complies with the requirements of Appendix B. Criterion I of Appendix B requires the authority and duties of persons and organizations performing activities affecting the safety-related functions of structures, systems, and components

to be clearly established and delineated in writing. These activities include both the performing function of attaining quality objectives and the QA functions. The QA functions are those of (a) assuring that an appropriate QA program is established and effectively executed and (b) verifying, such as by checking, auditing, and inspection, that activities affecting the safety-related functions have been correctly performed. The persons and organizations performing QA functions shall have sufficient authority and organizational freedom to identify quality problems; to initiate, recommend, or provide solutions; and to verify implementation of solution. Such persons and organizations performing quality assurance functions shall report to a management level such that this required authority and organizational freedom, including sufficient independence from cost and schedule when opposed to safety conditions, are provided.

The TVA QA Topical Report contained in chapter 17 of the FSAR describes the TVA QA program designed to satisfy the Appendix B requirements. The program is detailed in the N-OQAM (some requirements are also contained in the DPM at present) and is implemented at the plant through a family of procedures as specified by Regulatory Guide 1.33, "Quality Assurance Program Requirements (Operational)." The organization responsible for carrying out the QA program is the NUC PR. The independent organization responsible for defining and measuring the overall effectiveness of the quality assurance program is the POWER QA&A Staff.

There are three organizational units at various levels within POWER that have been labeled with QA titles. Each of these organizational units is discussed in the succeeding paragraphs in sufficient detail to describe its relationship to the overall QA program. Any deficiencies or weaknesses identified in the specific areas are also listed and discussed.

1. <u>Plant Quality Assurance Staff</u>

Section 3.4.2 of ANSI N18.7-1976 specified that an individual or organizational unit at the plant knowledgeable and experienced in nuclear power plant operational phase activities and quality assurance practices shall be designated and assigned the responsibility to verify that the QA program is being effectively implemented. Depending on the organizational structure, the individual or organizational unit may report functionally to onsite plant management or an offsite organization. The ANSI standard also indicates that reporting to onsite plant mangement is preferable since such an arrangement usually results in improved communications in identifying problems and initiating corrective action. The Plant QA Staff satisfies these requirements. The QA Staff performs both the QA and

quality control (QC) functions. The overview QA function is accomplished through a survey program which serves the same purpose that an audit program would. The basic goal is to critically assess on a sampling basis the activities being performed by plant personnel and assure that deficiencies identified in the implementations of programs are brought to the attention of plant management. The QC function is accomplished through the inspection process. The inspections are performed for special process and essential activities by trained and qualified QC inspections. By requiring all these inspections to be done by QC inspectors, TVA has gone a step beyond industry practice which provides for peer inspections for many activities. This is an indication that management desires that quality work be performed. The deficiencies that were identified in the areas of plant QA were as follows:

a. Involving Regulatory Requirements

(1) Criterion V of Appendix B to 10CFR50 requires that procedures which prescribe activities affecting quality be followed. BF SP 10.1 specified that corrective action for CAR's must be completed within 30 days. The results of a review of a limited number of CAR's provided reasonable doubt that this requirement was being regularly satisfied. A contributing factor to this condition appears to be the failure by the QA Group to evaluate the CAR's in a timely manner and get them to the section responsible for effecting corrective action. The following CAR's are representative of this situation.

80-08-QA Identified 11/20/80. Had not been approved by QA Supervisor when reviewed on 2/4/81.

80-72-OT Identified 12/17/80. Approved by QA Supervisor on 1/22/81.

80-15-OT Identified 1/15/81. Had not been approved by QA Supervisor when reviewed on 2/4/81.

80-16-OT Identified 1/19/81. Had not been approved by QA Supervisor when reviewed on 2/4/81.

80-17-OT Identified 1/21/81. Had not been approved by QA Supervisor when reviewed on 2/4/81.

80-18-OT Identified 1/21/81. Had not been approved by QA Supervisor when reviewed on 2/4/81.

(2) CAR 80-72-OT appeared to contain at least two significant items that did not seem to be receiving prompt attention. The CAR was written on December 17, 1980, and the deficient conditions still existed on February 3, 1981. The particular items in question were:

(a) The seismic class I cabinets containing H_2-O_2 instrumentation had been anchored with bolts that were only about half the strength that was specified in the work plan. The installation of these low-strength bolts could have affected the seismic qualification of the cabinets. If the cabinets should become separated from their mountings, they could possibly damage other equipment in the area.

(b) The instrument sensing lines for the H_2-O_2 analyzers were not anchored every seven feet as specified by the "Criteria for Seismically Qualifying Field Run Piping (sizes 1/2 through 2 inches)." In addition, the lines were not anchored at the top of each vertical run as required. NSRS understands that a representative of the EN DES provided NUC PR with a written statement which, in effect, justified plant operation with the existing H_2-O_2 sensing line conditions. This was discussed with an EN DES representative on March 6, 1980. It was concluded from this discussion that an EN DES representative had inspected the lines and provided a list of items that needed corrective action. There was some potential for line damage under specified conditions until the corrective action had been completed. The EN DES representative thought that the risk factors associated with the potential for damage was low when considered over a short period and that plant operation should be permitted. It was felt by EN DES that a procedure was needed which would require a uniform and consistent system for installing and checking small lines of all types. (See section VI.B.2.b for additional details.)

b. Weakness

A significant amount of discontent was expressed with the plant QA program. This included a variety of concerns, many of which had been discussed in other reports. However, some of the opinions expressed, such as "the QA program was out of control" and "QA personnel were being given trivial work assignments to prevent them from identifying QA problems," were more significant than any NSRS had heard previously. NSRS did not obtain any specific information that would substantiate such serious claims, but the fact that a significant number of individuals had such strong feelings indicated that management and subordinates needed to work toward a better understanding.

2. NUC PR Quality Assurance Staff

The NUC PR Quality Assurance Staff is responsible for identifying and defining the requirements and commitments which form the operational boundaries within which TVA must perform while operating its nuclear power plants. These requirements and commitments are then translated by NUC PR QA into a set of QA instructions that are implemented by the plant procedures. The group is also responsible for the preservice inspection program, inservice inspection program, and the vendor inspection program for TVA nuclear plants. There are no regulatory requirements that mandate a QA group within NUC PR. The NUC PR QA Staff was established as a tool to provide NUC PR management with a higher confidence level that a quality program is being implemented which satisfies the regulatory requirements and commitments. The group could have been given any other title or could have been placed within the line organization and still perform its assigned responsibilities. It is a quality performing group and is a part of the organization that is directly responsible for the QA program and its implementation.

One weakness was identified which dealt with the lack of a system within the NUC PR QA organization to assure that all QA requirements and commitments were being satisfied. It appeared that the existing N-OQAM did not contain all the QA requirements and commitments and therefore did not constitute the entire QA program. Many of the requirements and commitments were contained in the procedures of the DPM. All personnel involved with the QA program and its implementation did not have a full knowledge of where all requirements and commitments were covered. The QA staff and NUC PR management appeared to have a full knowledge of the situation and were working to correct it. Several individuals described plans for the development of a matrix which would list all the requirements and commitments and would show the basis for each and how it was being satisfied. This appeared to be an excellent approach. It is recommended

that this or a similar approach be developed on a timely basis.

3. Office of Power Quality Assurance and Audit Staff

The QA&A Staff represents an independent QA organization within POWER that has responsibility for defining and measuring the overall QA program and its implementation. This group has authority to assess any areas involved directly or indirectly with the operation of the TVA nuclear plants. Other QA groups within the line organization do not reduce the responsibility or authority of the QA&A Staff. The QA&A Staff has top-to-bottom and side-to-side QA responsibility within POWER. The only relationship this staff should have with other QA staffs within POWER should be to audit them and measure their effectiveness as a part of the overall QA program. The QA&A Staff responsibilities and authority is generally described in the TVA QA Topical Report. The program for carrying out those responsibilities and authority is contained in the POWER QA Manual. With the exception of one item in the Topical Report which assigns responsibility to the QA&A Staff to review and concur with the procedures of the Nuclear Fuels QA Manual and the N-OQAM, these two documents appeared to adequately define a satisfactory QA&A program. It appeared that the QA program as described was being implemented. No items contrary to regulatory requirements in the areas of QA&A responsibilities were identified during the review. The following is a discussion of a number of weaknesses which have, in the opinion of NSRS, reduced the effectiveness of the QA&A Staff.

a. The management point for resolution of QA problems or disagreements between the line organization and QA appears to be too far removed from the mangers of these organizations. The classical theory of QA holds that there must be a management apex to which the line organization and the independent QA organization comes for the resolution of difficult problems in which they both have important interests. The ideal situation would be for the line manager responsible for the functional QA program and QA manager responsible for measuring the effectiveness of that program report to the same immediate supervisor. Anything less than this ideal situation will diminish the effectiveness of the QA program in the real world. Within POWER, the managment apex is far removed from these respective managers. Four sets of meetings between various groups in the line and QA organizations and progressing through higher levels of management had been established for resolving QA identified problems. Theoretically,

the final meeting would be held and an unbiased position established at the POWER manager level during the fourth meeting. Some management representatives have suggested that this system of meetings represents an efficient mechanism for resolving problems at the lowest possible level and thereby avoiding the necessity for flooding top management with lower priority activities. The problems apparently do get resolved at a lower level. Some might be legitimately negotiated resolutions. Some could also be decided on the basis of the strongest negotiator, the most available information, or the greatest resources devoted to the support of a given position. A negotiator could also be more easily persuaded to relinquish pertinent points if he/she was not held accountable for the final decision. NSRS was unable to determine a single case that had been elevated to the Office Manager for resolution. The Manager of POWER is the accountable manager because he is the license holder and because he is the lowest level at which both the line and QA organizations report. NSRS is not suggesting that all or even the important QA problems be elevated to the Office Manager. One alternative to this would be to delegate the accountability to a lower level of management along with the authority to assure quality activities. This would imply that the manager so delegated would have authority over both the functional (line) and measuring (QA) organizations.

One conclusion that could be drawn from the fact that no problems have been elevated to the accountable manager for resolution could be plant activities have been performed in a quality manner. This would support the TVA Board stated desire that TVA be a leader in the safe operation of nuclear plants and set an example for the rest of the industry. However, the NRC systematic appraisal of licensee performance indicated that TVA performance has been below average as compared with other utilities operating nuclear power plants in the South East. It appears that the group responsible for measuring the overall effectiveness of the progam would have identified some serious problems with the performance of the functional QA group worthy of the attention of the accountable manager before performance degenerated to this point. It is not the intent of NSRS to be critical of any one group. We realize that quality cannot be audited or inspected into the functional activities, but responsible management can and should be made aware of program and implementation weaknesses. NSRS believes that NUC PR has established an adequate functional QA program and

that the program is being implemented. However, we do not believe that the program is as effective as it should be. Further, we believe that one of the basic reasons for this ineffectiveness is the lack of assignment of accountability for the program to an appropriate manager.

This subject was discussed at the exit meeting with POWER in Chattanooga on March 3, 1981. Since that meeting NSRS has received feedback information indicating that some members of POWER interpreted the discussions to mean that NSRS was suggesting that the QA&A Staff be made a part of NUC PR with the QA manager reporting to the Director of NUC PR. This was not the intent of any statements made by any NSRS member at the meeting. NSRS has identified what is considered to be a serious weakness. It is expected that POWER management will further evaluate the seriousness and determine the appropriate action.

The QA&A Staff has an undesirable concurrence authority over the procedures that make up portions of the N-OQAM. This is considered an improper practice by NSRS even though we realize that it was initiated because of pressures from the NRC. The QA&A Staff has the authority and responsiblity to audit the NUC PR QA program and to recommend corrective action. Concurrence in N-OQAM procedures distracts from the delegated authority and inflicts a possible conflict of interest in carrying out its responsibility. It approaches the point of requiring the QA&A Staff auditors to audit themselves. The necessary independence does not appear to be maintained. The fact that QA&AS desired this concurrence is indication that the group is operating from a weak position. A strong QA group functioning with the support of a management process committed to quality could effect any necessary program improvements through the audit process, and the NRC probably would not have been interested in gaining additional authority for such a group at the expense of other aspects of the program.

The audit staff resources appeared to be inadequate to properly implement the audit program. The lead auditors performed audits approximately every other week. Auditors worked on about the same frequency. To prepare, perform, and document

audits on this type schedule would seem to require that either the scope or depth of the audits be compromised. (See section VI.G.4.e for additional details.)

There was a possible conflict of interest built into the QA&A Staff management structure. The supervisor of the QA&A Staff reported to the Manager of NRS. The Manager of NRS was also also responsible for TVA licensing activities. Licensing activities and QA activities can easily represent conflicting positions.

L. RADIATION PROTECTION

Radiation protection is everyone's responsibility, but in broad terms the TVA Code and Organization Bulletin defined the responsibilities of each office. Basically the H&S was given the responsibility to interpret the As Low As Reasonably Achievable (ALARA) policy; audit and evaluate TVA's ALARA effort; develop and implement radiation protection programs; and assist the TVA staff in site and facility assessments, design reviews, and licensing proceedings. POWER, through NUC PR, was responsible for establishing ALARA implementing procedures and for incorporating ALARA requirements in operating and maintenance procedures and ensuring that these are followed. The effectiveness of these broad requirements were reviewed and are reported in the following areas:

1. H&S Organization

Organizationally the H&S was independent of POWER and located under the Office of Management Services (OMS). Physically H&S and its office director was located in Muscle Shoals. Principally the responsibilities of H&S in radiation protection were delegated downward through the Director, OC H&S to the Branch Chief, Radiological Hygiene Branch (RHB) for implementation. An onsite Health Physics Staff was maintained by the RHB Branch Chief. This staff reports administratively to RHB, and functionally reports to the Plant Manager and provided the hands-on-implementation of the OC H&S radiation protection program. Routine implementation problems and site specific implementing procedures were handled at this level. Policy type problems were referred upward to the RHB in Muscle Sh[illegible]'s by the plant Health Physicist and to the NUC PR Assistant [illegible]or (Operations) by the plant superintendent for resoluti[illegible].

Interfacing between OC H&S and NUC PR on policy matters and for the resolution of unresolved site specific problems was established between the H&S Director, OC H&S Director, and to a lesser extent at the RHB Branch Chief level, and

the NUC PR Assistant Director (Operations) and NUC PR Assistant Director (Maintenance and Engineering Services). According to personnel at these levels there have not been any unresolvable problems with this relationship.

The RHB includes a central office technical staff in the functional areas of radiation exposure management, radiological assessment, nuclear plant radiation control, radiological emergency planning, and quality assurance/ALARA. These groups provide technical assistance in radiological protection to the site and to other TVA organizations. Program development, recommendations on ALARA policy interpretations, design reviews, and environmental and personnel dosimetric evaluations are among other responsibilities of the central office staff. Overall, the organizational structure appeared to be appropriate and adequate to satisfy TVA's radiation protection requirements.

2. H&S Budget

Funding of the majority of the RHB activities was supplied by POWER to OMS. The budget for onsite operations was prepared at the site and forwarded to RHB. The Plant Superintendent had no approval authority over its submittal or content. The overall RHB budget was prepared in Muscle Shoals and informal discussions were held between RHB and NUC PR. A budget POWER was willing to support was prepared and submitted through line management to the Manager, OMS, for review and approval. In FY 1981 the staffing level for RHB, previously agreed to by NUC PR and H&S, was cut seven positions according to OC H&S to meet OMS personnel ceiling restrictions. This cut did not affect basic programs but did affect program enhancement. Although the budgetary process appeared awkward, it was functioning satisfactorily. Care should continue in fiscal management to avoid any conflict with the Board policy of establishing TVA as leader in the nuclear industry which will include to some extent program enhancement.

3. As Low As Reasonably Achievable (ALARA)

As early as 1974-75 TVA recognized its responsibility to keep radiation exposures as low as reasonably achievable. However, with the exception of lowering the annual radiation exposure limit from 5 rem to 4 rem, little evidence could be found that TVA had an active ALARA program. Presently TVA's efforts in ALARA are directed at distributing radiation doses among employees reducing the number with high exposures. This in part is ALARA, but overall, ALARA is concerned both with dose at an individual level and at a total man-rem level for a plant as well. While there was evidence that

dose reduction had been a part of some specific activities--there was a decrease in man-rem per unit length of outage since the first outage, and Electrical Maintenance was scheduling more work during outages when dose rates were less--there did not appear to be a coordinated effort toward dose reduction.

In 1974 DPM N74A19 was issued with the concurrence of the then existing equivalent of NUC PR and H&S. That DPM and all the resulting plant and H&S implementing procedures required in part that activities which may result in a 5 man rem exposure would be preplanned and a document prepared including how the activity would be accomplished, method(s) used to keep exposures ALARA, and the anticipated man-rem exposure specified. It also required that a report be prepared 30 days after the activity describing actual performance. The capability of complying with this DPM did not exist at the time the implementing procedures were prepared and still did not exist at the time of this review. The method of recording and retrieving dose information on specific activities was performed in a manner that was not capable of providing the data required by DPM N74A19. Data that was available could not be retrieved in a timely fashion to make it useful. Efforts were underway to correct this problem. Outage at BFN was probably further along solving this problem. In their case a computer program using the plant PRIME computer had been developed for other purposes but included dosimetric data which was probably adequate. It had just been started prior to this review, and the data produced had not been used yet.

During the same 1974-75 time period, an interdivisional committee on ALARA was formed. This committee consisted of representatives from OC H&S, POWER, and EN DES and was given the responsibility under DPM N74A19A to audit the ALARA programs of the respective divisions. Authority, as defined in that DPM, was advisory to the members respective division director. In approximately 1978 the committee was disbanded because it could not function. Two reasons given for its demise were (1) the lack of an ALARA policy and (2) the governing document DPM N74A19A was a POWER document and not binding to EN DES and OC H&S even though it was signed by all three division directors.

In October 1980 TVA established a policy regarding ALARA in TVA Code VIII Occupational Radiation Protection. This code adopted as TVA's policy a very broad endorsement of the concept of ALARA, and as such, requires considerable interpretation of what is ALARA. Recognizing this, the code assigned that interpretative responsibility and the associated development of implementing criteria to OC H&S. At the time of this review there was

no identifiable effort to define ALARA or implementing criteria within OC H&S; and it was their position, for example, that ALARA implementing criteria for design purposes was not their responsibility.

With the advent of TVA Code VIII another attempt was begun to promote an overall coordinated TVA effort in ALARA. This is considered essential by NSRS. A task force with members from OC H&S, EN DES, and POWER was formed and had prepared a draft interdivisional agreement which would govern their activities. That draft agreement was essentially the carbon copy of DPM N74A19A with two exceptions. Firstly, the task force was given the responsibility to ensure that procedures were developed and implemented within their respective divisions, were compatible with the procedures of other divisons, and satisfied the the Code requirements. This task force, like its predecessor committee had only advisory authority to the directors; consequently, it cannot ensure. Secondly, the audit responsibility was removed from the task force and assigned to the RHB Quality Assurance/ ALARA Section (QAAS). If this task force is to develop implementing procedures, then the removal of the audit function to a group independent of the task force is advisable and appropriate.

However, the draft interdivisional agreement as provided to the review team had basic problems that, unless solved, could produce the same fate as its predecessor. Foremost is the lack of ALARA interpretation. Since the TVA Code VIII is so broad, interpretation was required to specify what ALARA is. Without this definition and resultant implementing criteria, the net result could be the same as if no policy existed. This task force is not charged with the responsibility of interpreting ALARA; OC H&S has the charge and at the present it is not being performed. Therefore, this task force will have to interpret policy by default to be able to write implementing procedures.

The draft agreement, since it was a copy of DPM N74A19A which had been written to support an audit function, was more appropriately written for the QAAS audit function than for the task force. Auditing of defined programs is essential to assure implementation. Even though the QAAS was performing that function for the task force, the draft agreement did not speicfy any formal or informal QAAS tie to the task force for either receiving instructions or reporting audit results.

To develop an overall TVA ALARA program OC H&S should first define how it is going to implement its responsibility under the Code by interpreting ALARA and developing implementing criteria that is acceptable and binding to POWER, OEDC, and OC H&S. Once this is accomplished and once criteria are developed, then the respective divisons, through an interdivisional task force, can produce their implementing procedures.

Necessary in an ALARA program is the evaluation of dose information, radiological incident reports, radiation and contamination survey reports, etc., for trend information and methods of reducing exposure or the potential for exposure. Trending was recognized as important in the BFN Health Physics Manual section 1A as well as in Regulatory Guide 8.8 and is considered good practice industry wide. The basic data collection systems were in place and a tremendous amount of data was being collected which would to benefit analysis and trending. However, according to BFN Health Physics personnel this was not performed due to a lack of time and an effective dose tracking system. The necessity of an effective dose tracking system has been recognized by RHB and an effort was underway to develop a system. Once completed this system should be capable of providing the trending data required. If trending were to be initiated now without the computerized dose tracking system, a rather large manpower effort would have to be diverted from more necessary work to manually trend dose data for anything more than a narrowly scoped single area or job. Therefore, under the constraints present at the time of the review, the deferment of a major effort in trending was considered appropriate. However, minimum scoping trench should have been an integral part of the radiation protection program. While basically good ideas and desires for an ALARA program exist, at present these ideas and desires are fragmented, lack direction, and with regard to dose tracking are incapable of being implemented. Considerable effort is required to develop an overall viable TVA ALARA program.

4. Special Work Permits (SWP)

The system of SWP's (SWP, SWP routine, continuing SWP) were reviewed; and the documented procedure, if implemented, is judged to be adequate to identify radiation problems and to specify appropriate safety equipment requirements. A very large number of these SWP's were being written every month. Outage times requiring more as one would expect. During December 1980 approximately 2,561 SWP's were written; and of those approximately 48 were lost or unaccounted for. In and of itself, the loss of 48 SWP's was a small fraction of the total. However, SWP's are sequentially numbered QA records which require lifetime storage. Therefore, the loss of 48 is unacceptable. According to RCI 10, partially revised October 18, 1980, SWP's (excluding SWP routines and continuing SWP) are generally issued for only one shift, and when the activity is complete the SWP used at the work site is to be returned to Health Physics. In the Health Physics Lab copies of the SWP's issued were posted on a bulletin board and were removed when completed SWP's were returned. By the procedure all SWP's should have been returned by the end of a shift unless extended for a longer period of time. Two different Senior Health Physics Technicians, responsible for SWP preparation, were asked if they tried to locate SWP's that had not been returned. Both stated they did not until they were tired

of looking at them on the bulletin board. This may have been several days after the expiration date and increases the difficulty of locating them. Of the approximately 48 lost in December 1980, seven were issued from the Health Physics Lab.

During an outage the Outage Health Physics Groups issue all SWP's associated with the outage unit. A similar procedure of issuance and retrieval of SWP's existed with this group and of the approximately 48 lost SWP's, 41 were issued by this group.

SWP routines were issued on a monthly basis to operating sections that have personnel who routinely enter radiological control zones, which would normally require a SWP, in the normal performance of the their duty. Personnel must receive additional health physics instruction in the limitations and procedure for the use of the SWP routine and must be approved by the Plant Superintendent before being allowed to work under an SWP routine. Personnel were required to sign a timesheet, in accordance with RCI 9, when they have entered a radiological control zone showing the length of time in the zone and dose received. According to the timesheet reviewed in the Shift Engineer's office during the review, some operations personnel had signed into a zone a few days previous to the review and were still there. According to the timesheet in the Health Physics Lab at least one person who should have signed the sheet did not. Health Physics personnel stated that the data on the timesheets was not used and that the timesheets were only filed for record.

The requirments specified in RCI 9, Section III, dated November 21, 1978, for SWP routines listed three situations where they were not valid. The BFN Health Physics Manual, Section III.H, dated November 12, 1979, listed four situations where SWP routines were not valid. The additional one in the Health Physics Manual was when "The area is posted as special work permit area." Health Physics personnel stated that the Health Physics Manual provided the basis for the site programs and requirements; therefore, the requirements should be consistent between documents.

Assuming that SWP routines were not valid when a SWP was in effect, which plant Health Physics personnel agreed was the case, presented another problem. It was observed that six people during a 20 minute time period walked through the SWP posted high radiation area near unit 1 scram discharge header without signing in or out as required. One Health Physics Technician, who did not sign in or out, stated that it was unnecessary because the technician was on an SWP routine. Furthermore, the technician did not sign the SWP routine timesheet. Failure to do both constituted two violations of plant procedures. The other six employees observed were not questioned as to their reason for not signing the SWP because it was considered an academic question. The fact that they did not was, in and of itself, a violation of plant procedures.

Confusion existed among the Health Physics supervisors as to the proper procedure to be used when signing in and out on the SWP at the unit 1 scram discharge header. This confusion stemed from the fact that a copy of the same SWP was located at both entrances to the passageway beside the header. One procedure was quoted as signing in and out on the same copy recording the time and dosimeter reading in and estimated time and dosimeter reading out before going through the area. The other procedure was to sign in on one copy recording the time and dosimeter reading in and sign out on the other copy recording the time and dosimeter reading out after passing through the area. There were no instructions at the control points to specify what method was correct. This confusion within the Health Physics Group could be transmitted to the rest of the BFN personnel. Unless a specific procedure is developed and strictly adhered to, it will probably be only a matter of time before BFN receives an NRC citation.

Considering the length of time required to log in and out on this SWP, it is possible that a larger dose is received filling out paper than passing through the area. If this proved true the rationale for keeping this area an SWP area could be questioned from an ALARA standpoint. The reasoning behind the 10CFR10.203 requirements is most appropriate for large areas and its appropriateness for small areas produced by isolated sources, such as is the case in the passageway by the scram discharge header, could be questioned. Therefore, if a study showed the intent of ALARA was not being met under the present method of controlling access, it would be in BFN's interest to develop reasonable procedures to prevent exposures 10CFR20.203 is supposed to prevent and to petition NRC for a change in the Technical Specifications to include the new procedures.

Overall, the written procedures covering SWP's are capable, if fully implemented, of protecting personnel. However, implementation needs improvement; and it needs to start within the Health Physics Group and then extend into the Operating and Maintenance Groups.

5. Radiation Exposure Limits

The reduction by TVA of the annual whole body penetrating radiation exposure to 4 rem was a very positive ALARA step. Exposure limits and health physics procedures, for the most part, have built in conservatism which reduces the possibility of an employee receiving a radiation exposure in excess of allowable limits. One exception to this was what appeared to be an error in the RCI 3 stated upper limit for full face respiratory protection ($6x10^{-7}$ micro Ci/cc). Procedure BF RCI 3 specified a protection factor (PF) of 50 for full face respirators will be applied. This is one half that allowed by ANSI Z88.1-1980 but is equivalent to those allowed

in NUREG-0041. With the maximum permissible concentration (MPC) established at $3x10^{-9}$ micro Ci/cc for unknown mixtures of Beta/gamma emitting radionuclides, the maximum concentration an employee should have been allowed to enter, with a full face air-purifying respirator and assuming a PF of 50, should have been $1.5x10^{-7}$ micro Ci/cc which is the limit specified in the BFN Health Physics Manual. If a PF of 100 were assumed, the maximum concentration could have been $3x10^{-7}$ micro Ci/cc. In either case an employee exposed at $6x10^{-7}$ micro Ci/cc could have been exceeding the MPC for continuous exposure by a factor of 4 or 2 depending on the PF assumed.

This error was compounded when the basic limit of $3x10^{-9}$ micro Ci/cc for unknown concentrations was examined against NRC 10CFR20 requirements. According to Part 20, $3x10^{-9}$ micro Ci/cc can be used if it is known that alpha emitters are not present and Sr 90, I 129, Pb 210, $A_{c\ 227}$, Ra 228, Pa 230, Pu 241 and Bk 249 are not present. According to RHB personnel, after three years out of the reactor the concentration Sr 90 in the fuel can no longer be ignored. As such, it appears that a concentration of $3x10^{-10}$ would be more appropriate for unidentified airborne contaminants. In a similar manner the $7x10^{-11}$ micro Ci/cc limit for alpha emitters appears too high. After approximately one year out of the reactor, the Cm-242 content decays to the point where the plutoniums and other alpha emitters with more restrictive MPC's dominate.

With the factor of 10 difference between the limit specified in Part 20 and TVA documents, the error in upper limit for full face respirators now becomes a factor of 40 too high. Thus, an employee working in an airborne concentration of $6x10^{-7}$ micro Ci/cc could have been exposed to 40 MPC hours for every hour in that concentration. An evaluation of previous monitoring data, for which isotopic concentrations were determined, may show that the $3x10^{-9}$ micro Ci/cc limit was appropriate.

BFN and RHB personnel were informed of this information during the appraisal, and they indicated these findings would be reviewed immediately.

6. <u>Radiation Exposure Monitoring</u>

The basic program provided that each employee be supplied a thermoluminesent dosimeter (TLD) and a self reading pocket dosimeter. The TLD provided the permanent record of recorded dose and the pocket dosimeter provided dose data during the month prior to TLD processing. Once the TLD was processed, its data was exchanged for the previously recorded pocket

dosimeter data. It was required that when a pocket dosimeter has recorded a 50 mrem dose the dosimeter reading was to be recorded and rezeroed by Health Physics. This was to be accomplished by the employee who was cognizant of the dosimeter reading, or it to be was brought to the employee's and Health Physics' attention by Public Safety when they read the dosimeters at the end of the shift.

During the operating historoy of BFN, only one person had received a recordable radiation exposure in excess of the published limits. The overexposure was reviewed as a part of the appraisal; it was determined that it was not due to a shortcoming in any of the written procedures, and the validity of that exposure is in question.

There was a possibility, however, that a breakdown in procedure implementation could occur that would prevent the early detection of increased exposure. A very serious breakdown in procedures (RCI 2 and HPSIL 11) occurred to one of thr reviewers and is elaborated as follows:

a. A self-reading pocket dosimeter (later found to be leaking) was issued without placing the name and TLD badge number of the assignee on it. According to Health Physics personnel, the proper procedure was not followed. However, the procedure was not documented in either RCI 2 or HPSIL 11. The dosimeter was deposited with the TLD in the proper location at the end of the day and was reading approximately 100 mrem. The next morning the pocket dosimeter was off scale and brought to the attention of the Public Safety personnel at the gate.

b. No note to report to Health Physics for dosimeter rezeroing was attached.

c. No report to Health Physics specifying by name that this person exceeded 50 mrem was prepared.

d. The TLD and dosimeter were not pulled from the rack so they could not be reissued.

e. Health Physics was not called to escort the person into the plant.

f. The dosimeter was rezeroed at the gate (probably by Public Safety) and the employee was allowed to enter the plant.

That evening when leaving the plant the dosimeter was properly deposited at the gate with a reading of approximately 100 mrem. The next morning a new dosimeter was attached to the TLD.

g. No note to go to Health Physics was attached to the TLD and dosimeter.

h. Health Physics was not informed that the dosimeter exceeded 50 mrem.

In the above case there were at least two different shifts involved, either of which could and should have taken corrective action. Therefore, this was not an isolated case of an individual not knowing the procedure but where several people could have been involved. Various scenarios could be developed where exposures could be lost until TLD processing time. Health Physics was informed of this situation during the review and took "corrective action." They also stated that this had happened before. The seriousness of each error is obvious. It is equally obvious there is a need to assure that "corrective action" will work.

A review of the exposure history of the first six outages at BFN, as provided by the Outage Group, revealed a trend toward a man-rem per day dose reduction with each successive outage (2 percent reduction between cycle 1 and cycle 2 for unit 1, 5 percent for unit 2, and 40 percent for unit 3). Extreme care must be exercised when viewing this data because no allowance has been made for any large man-rem jobs not associated with each subsequent outage. Therefore, if an analysis of repetitive tasks from outage to outage were performed, the data might be quite different in either direction.

If the total man-rem attributable to outage during the scheduled outage was subtracted on a prorated basis from the total man-rem estimates calculated from the BFN annual wholebody exposure report to NRC for 1977, 1978, and 1979, it can be shown that the total man-rem plant personnel and Outage personnel is receiving during non outage times is increasing. The total man rem for the plant was calculated assuming the exposure received for a dose range was the arithmetic average of the dose range. Personnel reported as receiving no exposure were omitted from all calculations. After performing the calculations and subtracing the outage exposures, the nonoutage plant exposures were 352, 727, and 1,101 man-rem for the years 1977, 1978, and 1979 repectively. These were increases of 10 percent and 51 percent over the previous year's exposure. This trend holds true if the minimum exposure in the dose range were used rather than

the average. Refinement of this type data was not being performed; therefore, the increases could not be evaluated as legitimate due to plant age, required modification, etc., or whether or not they were attributable to a breakdown in controls. They certainly could not be evaluated as to whether or not the doses are meeting the intent of ALARA. These increases cannot be attributed to an increase in plant population because the appreciable increase in population was among those receiving no exposure.

The benefit of establishing a dose tracking system was realized as early as 1974; and NUC PR, OC H&S, and BFN procedures described this system and the use of the data collected. However, at the time of this appraisal the system described in 1974 had not been developed. Basically, the intent was and, as expressed during the appraisal, still is to document exposures according to craft, job, and system. The method of accomplishment was to use the RAD PERS computer program in Muscle Shoals. The coding of data collected and turnaround time for analysis were too long to be meaningful. This system was not capable of providing data to support the procedural requirement to prepare a written, preplanned program of exposure control for specific jobs that may result in estimated man-rem exposures of 5 man-rem or more. It was also not capable of providing dose data in time or in sufficient detail to prepare the required annual report on the assessment of radiation exposure trends, problem areas, and resultant steps which have or should be taken to reduce exposures. One exception to this may be the BFN Outage Group.

In conjunction with the need to track the man-hours devoted to specific jobs, a computer program was developed by Outage which included the capability of tracking man-rem. This program was on the plant PRIME computer and was too new to have provided any experience on its capability of dose trending or providing estimated dose projections. A portion of the data available from unit 3 outage 3 was reviewed, and it appeared to have the capability of providing the necessary information.

Inability to provide analyzed dose data was expressed as a concern at all levels of OC H&S. Health Physics personnel stated they had been working for many years to develop something better; but due to Federal restrictions on computer usage and workload of the Compter Services Group they had not gotten very far. The present plan was expressed as consisting of reviewing the BFN outage program, modifying program as necessary, and developing a program for use on the plant PRIME which would cover plant employees. NUC PR

had given its support to this approach. As OC H&S and NUC PR stated they were working on a dose tracking system that would be capable of trending and dose projection estimates, NSRS will not make a recommendation in this area but would like to be provided a timetable for completion.

Another problem identified by OC H&S and NUC PR involved the transfer of dose information from one operating plant to another. It was recognized that as more plants come on the line, key personnel would be routinely rotating between plants. The present systems of dose tracking PRIME at the BFN and RAD PERS at Muscle Shoals were described as being incapable of transferring data from one plant to another. Health Physics stated they were presently transferring data verbally by telephone and that it presented no problem at this time. It was recognized, however, that this would not continue to be the case; and efforts were being made to develop a system of data transfer between sites. NSRS concurs in the need for this capability and wants to be kept informed of its progress.

7. Portable Instrumentation

The Laboratory Services Branch (LSB) in OC H&S recently (February 1, 1981) assumed the responsibility for calibration and repair of portable radiation survey instruments for all those RHB used including those used by the nuclear plant Health Physics staff. This function was previously performed by Data Services Branch. The need for two people to prepare procedures and perform other functions was expressed by LSB. One additional replacement will be needed at the Eastern Environmental Radiation Laboratory to replace an employee due to retirement. Efforts to fill these slots have been hampered by the freeze on Federal hiring.

LSB management expressed its desire to establish and run a top notch services program. To this end they were upgrading their repair and calibration procedures and had estabished a committee of experts to review and recommend procurement of specific types of portable radiation survey instruments. This committee approach was an attempt to standardize for TVA the types of instruments available. In doing so this was supposed to provide better service (fewer numbers of spare parts and electrical differences for different instruments), better calibration (fewer procedures to write and more standardization), and standard instruments from plant to plant.

8. Quality Assurance

A Quality Assurance/ALARA Staff was recently formed (summer 1980) and reports directly to the RHB Branch Chief. Previously,

this function resided within the Technical Assessment Section. Their function is to audit the adequacy of RHB's radiation protection programs and the ALARA efforts of OC H&S, NUC PR, and EN DES. At the time of this appraisal, no ALARA audit had been performed. The plan was to develop interdivisional agreements and procedures associated with ALARA before performing an audit. This is considered desirable by NSRS for the reasons described in section L.3.

Several QA audit reports prepared since the group was formed were reviewed. Findings and recommendations contained in those reports were considered substantive and indicated thoroughness on the part of the QA review team. Recommendations were receiving the support of the RHB Branch Chief, who transmits the QA reports, and appeared to be receiving adequate attention toward implementation. In the opinion of NSRS, this is a strong point of the overall health physics program.

9. Respiratory Protection

This program was not examined in detail; however, in conjunction with the review of radiation exposure limits and the associated error in the respirator maximum permissable airborne limit discussed in section L.5, a few comments appear warranted.

Procedures that were in effect at the time of the appraisal required only an initial quantitative full-face respirator fit test at the time of initial respirator training. Procedures required respirator retraining at least every two years, but not refitting. Facial physical characteristics of the respirator wearer, among other factors, play a large role in the ability to obtain the protection a particular device is capable of providing. As such, changes in weight, dentures, facial creases, scars, etc., affect the quality of a mask fit. These factors are recognized in the respirator industry; and ANSI Z88.2-1980, "Practices for Respiratory Protection," requires that respirator users be retrained, which includes refitting, at least annually. Contrarily, NUREG-0041, "Manual of Respirator Protection Against Airbone Radioactive Materials," which the TVA program is in part developed from, references ANSI Z88.2-1969 which does not specify a frequency for retraining. At the time the 1969 version was published, it was generally accepted practice to retrain and refit users every two years; and it was considered ideal to retrain and refit annually. It is apparent the latest version is taking a more conservative approach.

Recent information produced by work sponsored by the National Cancer Institute apparently indicates that monodisperse dioctyl phthalate (DOP) is midly carcenogentic on rats. A report on this work is supposed to be available later this summer. As such, the advisability of the continued use of this chemical as the test atmosphere for respirator fitting should be questioned. There are apparently substitute materials, corn oil for one, that are acceptable. Once published data is available, it is suggested that RHB evaluate the data with regard to continued use of DOP in quantitative mask fitting.

The medical fitness of an individual to wear a respirator according to procedures required an initial exam and one every three years thereafter by a physician. As a supplement BFN required the respirator user to complete form TVA 17186 (OC H&S 6-79) which asked eight questions regarding the health of the individual. That form also contained a statement that if the individual answers yes to any of the questions he/she would be referred to a medical facility to be reassessed for fitness to wear respirator protection. With that statement an individual more concerned about taking home a paycheck than their health would know the appropriate answers to the questions. This question and the compliance of an interim health questionnaire with NUREG-0041 were under evaluation by OC H&S and the Division of Medical Services. It is anticipated by NSRS that this problem will be appropriately resolved and wants to be informed of the final solution.

10. Documentation

NUC PR, RHB, and BFN procedures associated with radiation protection were reviewed in some detail. For the most part the DPM's were out of date; and RHB and BFN procedures were relatively up to date, for example:

a. DPM N74A19 described an ALARA program that did not exist. (See Section VI.L.3 and L.6 for more details.)

b. BF SP 5.5 implements DPM N74A19 and also describes a program that does not exist.

c. DPM N73A16 revised May 1, 1978, stated that personnel monitoring badges assigned to Chattanooga based personnel are retained in Chattanooga. This practice was stopped years ago.

c. DPM N75C05, September 30, 1975, discussed in detail the method of new plant design review between NUC PR and RHB. No evidence of this being implemented could be found.

d. BFN Health Physics Manual and RCI 9 did not agree on when a SWP routine was invalid.

From this, in no way a detailed review of procedures, it appears quite evident that some effort should be directed periodically toward reviewing these procedures and instituting changes where necessary. NUC PR is presently undergoing a major revision of the DPM's and it is anticipated that these deficiencies will be corrected.

11. Plant Modifications, Additions, New Plant Designs

TVA Organization Bulletin 1 Management Services assigns the responsibility to OC H&S to review the subject changes from a health and safety standpoint. TVA Code VIII requires the OEDC to coordinate interdivisional reviews of the subject changes for ALARA purposes. NUC PR in DPM N75C05 discusses in detail the coordination of new plant design reviews with RHB. This review investigated this area in enough detail to determine that RHB is probably not performing its assigned review function. The examples used to make this determination were the onsite low level waste storage facility and the procurement of a low level radioactive waste solidification service. (See ection VI.M for details.) It was determined that a thorough evaluation of this area would require additional time involving EN DES, NUC PR, and RHB and was beyond the scope of this review. Further comments will be withheld pending a later more detailed evaluation.

12. Contamination Control

BFN had a full-time staff of 21 persons performing decontamination and related activities. There was a labor general foreman, three foremen, two crews of two laborers that pick up trash in regulated areas, two crews of eight laborers doing actual decontamination, and a health physics technician. According to plant personnel, 145 contaminated or potentially contaminated areas will probably be as few as they can maintain. Discussions with personnel performing decontamination revealed some frustration because they were never done. For example, they stated that often the 519 level in the reactor building and 535 level in the turbine building would become contaminated, after it had been cleaned. The cause was identified as the sump pumps being turned off

because the liquid radwaste tanks would become full. This was described as resulting in backing up of water in the sumps to overflowing. This happended during the review.

There appeared to be only a marginal effort to mitigate the consequences of leaks through the use of simple mechanical solutions. For example, pump seals on fuel pool cooling pumps reportedly fail routinely resulting in approximately 3.5 mandays of decontamination every two weeks. When the seal fails, the turning pump shaft slings contaminated water some distance. An attempt to catch water running down the concrete pump mount was seen on unit 2; but it was in a state of disrepair and was thus ineffective. A dam was built on the floor around the unit 1 pumps creating a large catch pan. It appears that a better solution would be to reduce the spread by reducing the slinging action with the installation of a light metal sling ring around the pump housing and channel that water to a floor drain. It was estimated by Health Physics that maybe 12 of the 145 contaminated areas could receive similar treatment which could reduce the spread of contamination.

M. RADIOACTIVE WASTE

Shipments of solid radioactive waste were being made almost on a daily basis to the burial ground at Barnwell, South Carolina. The procedures developed for the preparation of these shipments if followed were adequate to ensure a safe shipment. During the review the low level cask/trailer on one shipment of waste was found to have cracks in welds when it arrived at Barnwell. One of the cracks was observed in the trailer fender and documented on the inspection check sheet at BFN before shipment. The Maintenance Supervisor decided that the cracks were cosmetic, and not having time to repair it, he sent the shipment on its way. The other crack was found during the Barnwell inspection but not the BFN inspection. It was located on the trailer behind the low level cask, and in the opinion of the maintenance mechanic inspecting it upon arrival at BFN, it too was cosmetic. Since these shipping casks are used so frequently, there was a problem expressed, by Mechanical Maintenance, in scheduling rapid maintenance in the Muscle Shoals service shop. Also, the maintenance mechanic in charge of these casks stated that with the age of these shipping trailers and casks, weld breaks are becoming increasingly prevalent. On January 22, 1981, a structural weld defect was found in the trailer behind the high level cask. That structural crack was repaired, and on the next shipment a similar weld crack was found on the other side by a Barnwell inspector. Mechanical Maintenance assured the NSRS reviewer that every shipment is inspected prior to leaving BFN and that the results of the inspection are documented. The inspection process appears appropriate and

adequate; however, it is recognized that with the current age on these vehicles, weld cracks will probably continue to occur while the vehicles are in transit. As such, Barnwell, as well as BFN inspectors, will probably continue to identify these cracks. It would, therefore, appear appropriate for NUC PR to evaluate the effect of age on the structural integrity of the welds on these vehicles through radiography or some other approved method and to repair as appropriate.

According to BFN personnel, all scrap materials leaving the regulated area are considered contaminated and are disposed of as contaminated waste. One exception to this was described. Empty bags which contained new demineralizer resin were surveyed for contamination and if found clean were disposed of as clean trash. Plastic bags used for contaminated trash are color coded to avoid being mixed with clean trash. Dumpsters used to collect clean trash were surveyed for radiation once per shift as a last check on the segregation procedure. This is considered necessary since contaminated trash had been found in the past.

Clean scrap metal and cable originating in the shop area were placed in a small trailer. Prior to being transferred to outage stores for scrap sales, this material was surveyed by plant Health Physics. During this appraisal contaminated scrap was found in this trailer during one of these surveys. This indicates that the surveys are effective and also indicates that procedures over what can be placed in this trailer need to be reemphasized.

One apparent gray area was found with regard to the transfer offsite of such things as desks, file cabinets, typewriters, vehicles, etc., that may have been in a regulated area or come in contact with contaminated equipment. The frequency of such transfers could not be established since these things were not transferred through a central group like Power Stores. Apparently each section is responsible for its own office equipment and vehicles are assigned out of Muscle Shoals. Personnel in the Health Physics Group could not remember a case when a desk or some such thing was last surveyed. This may not indicate anything more than that such tranfers are infrequent. Procedures according to Health Physics require that everything coming out of a regulated area be green tagged to show it is free of contamination. Similarly, Public Safety requires a green tag on everything being taken out of the plant. However, when questioned by BFN health physist during this review, Public Safety indicated they would not expect a green tag for a vehicle and probably not for office equipment. Experience has shown that desks and file cabinets are notoriously good places to store souvenirs which result in occasional contamination and that vehicles are used to carry things, some of which could be contaminated. It appears, due to the lack of definable controls, appropriate to review practices associated with contamination control over these types of equipment and to establish or modify procedures where necessary.

The new onsite low level waste storage facility was reviewed from a radiation protection ALARA design review standpoint. The formal site HP involvement was nonexistant. According to RHB their involvement was informal by verbal requests to perform dose calculations on preestablished design criteria. The question of ALARA or allowable dose rates or man-rem dose commitments were not raised or answered. No formal or informal requirement to obtain Health Physics input on new designs or modifications could be found.

The procedures to obtain radioactive waste processing contracts out of the NUC PR CO were reviewed as a followup to an NSRS investigation of the purchase of an unsatisfactory solidification contract for SQN. Considerable work had been performed regarding CO purchases. NUC PR QA personnel were reviewing all CO purchases. More specific and detailed bid specifications were being prepared. All submitted bids were receiving wide spread review within NUC PR and QA, and CO Materials were reviewing all comments and recommendations for contract award. These changes should improve the overall process. One area still not receiving attention was the Health Physics review of purchases having radiation exposure or contamination potential. The review process of service contract purchases for radioactive waste treatment, for example, should not be any different than if the service and equipment were to be designed and operated by TVA. TVA Organizational Bulletin I, Management Services, July 17, 1980, specifically states "It [the Divison of Occupational Health and Safety] reviews and evaluates new projects and facilities on major modifications to existing installations for adequate health and safety provisions."

N. TRAINING

The evaluation of training involved a determination that programs had been established, an assessment of the adequacy of the established programs had been made, and an assessment of the degree of implementation of the programs had been made. Only a minimum effort was devoted by NSRS to the examination of the reactor operator training program. Frequent changes and additions to NRC requirements in the area of operator training have transpired since the TMI accident. To account for this fluid condition, the TVA operator training program has been under continuous revision for the past year. NSRS performed a review of the operator training program prior to Sequoyah unit 1 operation. An indepth review in this area is planned later this year. Other areas of training that were assessed during this review included general employee training, fire brigade training, technician training, craft training, QA and QC personnel training, and engineer and supervisor training. ANSI N18.1, "American National Standard for Selection and Training of Nuclear Power Plant Personnel," specifies the training and experience requirements for the various disciplines necessary for the operation of nuclear power plants. These requirements

are defined and incorporated into the quality assurance program through the N-OQAM and DPM's. They are implemented at the plant through Standard Practices.

Within the areas evaluated, the programs for training instrument mechanics and radiochemical laboratory analysts appeared to be the strongest and most comprehensive programs. The areas in which weaknesses were identified were general employee training and fire brigade training. The weaknesses which are discussed in the following paragraphs were considered minor; and, in most cases, action has been initiated to correct or improve the conditions described.

1. General Employee Training

The requirements for general employee training were contained in DPM N79A7, "Nuclear Plant General Employee Training Program." These requirements were implemented by BF SP 4.5, "Plant General Employee Training Programs." A form BF-54 had been completed for each plant employee showing the general employee training that he/she was required to complete for the specific job assignment involved. Discussions with plant personnel indicated that they were aware of the training requirements and the system used to inform them of retraining needs; however, the following weaknesses in program implementation were identified:

a. A review of the training records indicated that a significant number of employees had not been trained in all the general employee categories specified on BF-54. This appeared to be due to a communications problem which was in the process of being corrected. The manager responsible for training had not been made aware that personnel were not attending the classes when taught. The training coordinator had been instructed, and was carrying out the instructions, to inform the responsible manager when all required personnel did not attend the classes. Management appeared to be fully committed to meeting the requirements for general employee training. Therefore, no further recommendations are being made in this area.

b. Discussions with plant personnel indicated that the selection of material presented for general employee training classes might not be appropriate for effective communication to the optimum number of employees. The general feeling was that the material was being presented at a level that engineers would be expected to understand and that it was not appropriate for technicians and craftsmen. NSRS understands that NUC PR is presently evaluating the effectiveness of the general employee

training including the method and content of the presentations. Based on this understanding, NSRS will make no additional recommendations in this area at this time.

2. Fire Brigade Training

During the review at the plant, NSRS had questions concerning the frequency of scheduled and surprise fire drills and concerning the maintenance of training records for fire brigade members. SP BF 14.47, "Fire Training," was issued on February 5, 1981. The instructions contained in this SP provided satisfactory answers to our questions in this area.

O. CONFIGURATION CONTROL

The evaluation of configuration control included an assessment of the program establishment, adequcy, and personnel responsibilities to ensure control, status, and distribution of "as-constructed" drawings.

Recent actions by management personnel had included the assurance that adequate manpower and program direction were alloted to the configuration control program. These actions had been beneficial in ensuring the establishment of a program to control the issuance of drawings, including changes, and adequate approval control and distribution for use by the appropriate individuals. The NSRS review in this area identifed the following apparent weaknesses:

1. Interdivisional Quality Assurance Procedure, ID-QAP-6.1, "Configuration Control," provides the following information regarding the Drawing Information System (DIS):

2.3.2 <u>Drawing Information System</u>

The DIS is a computer data base of information pertaining to the status of TVA drawings, TVA contracted design drawings, and manufacturer's drawings. The computer data base is a central respository of status data concerning drawings used by TVA through which several organizations can coordinate their individual activities and remain informed of each other's progress. The DIS shall have printout capability on an ECN basis, *system basis, *unit basis, **daily basis, as-designed basis, and as-constructed basis. This provides the capability to obtain a list of the latest revision as-constructed drawings for any system on a given data (for example: fuel loading date).

*Future capability.
**Last issued revision of drawing on a given date

ID-QAP 6.1 also assigns the responsibility for maintaining the as-constructed drawing status for licensed units on DIS to the NUC PR drawing control center (DCC).

Part III, section 1.1, of the N-OQAM specified that the DCC was responsible for updating the DIS to reflect the latest drawing status.

Conversations with site personnel indicated that the DIS had never been operational. The DIS process was conceived to provide readily available tabulation of information concerning drawing status. However, the configuration control process utilized by the site does provide much of the same information with a different format.

Responsible personnel had been actively pursuing this situation to determine if the existing program could be utilized (following the incorporation of any needed changes) or if the DIS should be utilized.

2. ID-QAP 6.1 and N-OQAM, part III, section 1.1, discussed the process for control of drawings to support the identification of as-constructed status of plant systems. Both procedures specifically stated that the term "drawings" referred to TVA and vendor drawings. DPM N76A5, "Changes to Vendor Manuals," defines the responsibilities and process for identifying and implementing vendor manual changes. Assigned individuals had been pursuing the means available to implement a program to assure documented as-constructed status of vendor manuals and drawings.

VII. PERSONS CONTACTED

OFFICE OF POWER

R. Cole - QA&A Staff Plant Coordinator

A. Crevasse - Manager, QA&A Staff

T. Galbreth - Nuclear Safety Staff

T. Lee - QA&A Staff Supervisor

L. Mills - Manager, Nuclear Regulation and Safety

R. Moore - QA&A Staff Lead Auditor

C. McWherter - QA&A Staff Lead Auditor

H. Parris - Manager, Office of Power

W. Polling - Assistant Manager, QA&A Staff

F. Szczepanski - Supervisor, Nucelar Safety Staff

E. Thomas - Director, Power Operations

M. Wisenburg - Nuclear Regulation and Safety

DIVISION OF NUCLEAR POWER

W. Andrews - QA Staff Chief

R. Arnold - Rotating Equipment Group Supervisor

D. Baker - Reactor Analysis Group Supervisor

C. Bauden - Management Compliance Unit Supervisor

G. Belew - Codes and Standards Section Supervisor

H. Bounds - Electrical Equipment Group Supervisor

C. Breeding - Plant Performance and Analysis Section

C. Brooks - Lead Engineer, BWR Systems Unit, Training Center

T. Campbell - Chief, Outage Management Branch

T. Childers - Outage Support Section Supervisor

J. Coffey - Assistant Director of Nuclear Power (Maintenance and Engineering Services)

R. Daniel - QA Staff Supervisor

J. Dewease - Assistant Director of Nuclear Power (Operations)

C. Faureau - Stationary Equipment Group Supervisor

D. Gardner - Fuel Management and Core Analysis Supervisor

J. Green - Director, Division of Nuclear Power

D. Goetchens - Metallurgy Analysis Section Supervisor

L. Hambley - Assistant Chief, Technical and Crafts Training Section, Training Center

B. Hamby - Methods, Materials, and Facilities Section Supervisor

C. Holt - Manpower Planning and Employee Development

D. Harvey - NDE Inspector

J. Hufham - Assistant to the Director (Radiation and Environmental Activities)

J. Hutton - Low-Level Rad Waste Group Supervisor

J. Jewett - Shart Range Planning Section Supervisor

R. Johnson - Chief, Nuclear Training Branch, Training Center

G. Jones - Assistant Chief, Outage Management Branch

T. Knight - Chief, Reactor Engineering Branch

J. Lan - Quality Programs Section Supervisor

E. Law - QA Staff Supervisor

J. Lehner - Chief, Engineering Maintenance Services Section, Training Center

T. Lundy - Lead Engineer, PWR Systems Unit, Training Center

G. Minton - QA Auditor Examiner

L. Moreland - NCO Materials Supervisor

B. Morris - Reactor Engineering Section Supervisor

D. McCloud - Modifications Section Supervisor

M. McCuistion - Outage Support Section

M. McGuire - Document Control Supervisor

L. McIntosh - Outage Planning Section Supervisor

J. Olson - Nuclear Operations Staff Supervisor

R. Parker - Assistant to the Director (Program and Administration)

W. Pattison - Long Range Planning Section Supervisor

J. Pleva - Chemical Engineering Section Supervisor

G. Pitzl - Metallurgy Engineering Application Section

J. Ratliff - Nuclear Fuels Planning Branch Supervisor

J. Robinson - Modifications and Outage Support Supervisor

B. Rogers - Radwaste Operations Section Supervisor

R. Russell - Reactor Systems Group Supervisor

L. Sain - Engineering Training Section Supervisor, Training Center

R. Sessoms - Chief, Controls and Test Branch

E. Sliger - Nuclear Safety Staff Supervisor

R. Thompson - Fire Protection Engineering Supervisor

P. Wallace - Nuclear Operations Coordinator

E. Webb - Project Engineer

W. Wilburn - Performance Engineering Group Supervisor

T. Ziegler - Chief, Nuclear Maintenance Branch

BROWNS FERRY NUCLEAR PLANT

H. Abercrombie - Plant Manager

L. Bilstein - Materials Control Clerk

G. Blackburn - Management Services Supervisor

R. Burns - Instrument Engineer

A. Burnett - Assistant Operations Supervisor

J. Bynum - Assistant Plant Manager, Operations

G. Campbell - Plant Services Supervisor

T. Chinn - Compliance Supervisor

A. Clements - Chemical Engineer

R. Cockrell - Reactor Engineer

E. Corgill - Assistant Health Physics Supervisor (Outage)

C. Cummin - Assistant Health Physics Supervisor (Operations)

J. Crowell - Plant Modifications Coordinator (Outage)

J. Ferguson - Oudate Assistant Director (Modifications)

R. Finch - Health Physics Shift Supervisor

J. Glover - Operator Training Coordinator

W. Haney - Mechanical Maintenance Supervisor

J. Harness - Assistant Plant Manager

G. Harrison - Secretary

G. Holden - QC Inspector

J. Hood - Power Stores Assistant Section Supervisor

R. Howard - Health Physics Supervisor

R. Hunkapiller - Assistant Operations Supervisor

G. Jones - Safety Engineer Aide (Fire Protection)

W. Lynch - Drawing Control Supervisor

J. Lynn - Safety Engineer (Outage)

E. Mansfield - Power Stores Section Supervisor

R. Metke - Results Section Supervisor

J. Miller - Outage Assistant Director (Maintenance)

E. Milton - Health Physics Section Leader

D. Mims - Engineering and Test Supervisor

L. Moreland - NCD Materials Unit Supervisor

E. Nave - Nuclear Engineer

J. Norris - QA Engineer

B. Owens - Management Services Clerk

J. Owens - Property and Supply Officer

W. Perkle - Electrical Engineer (Outage)

R. Phifer - Safety Engineer

D. Phillips - Document Control Supervisor

J. Pittman - Instrument Maintenance Section Supervisor

J. Price - General Employee Training Coordinator

J. Raulston - Health Physics Shift Supervisor

W. Roberts, Jr. - Mechanical Engineer

R. Shadrick - Mechanical Engineer (Outage)

R. Smith - Plant QA Staff Supervisor

J. Smithson - Civil Engineer (Outage)

J. Studdard - Operations Section Supervisor

J. Swindell - Outage Director

J. Teague - Electrical Maintenace Section Supervisor

R. Thigpen - Assistant Mechanical Maintenance Section Supervisor

B. Thomison - Assistant Results Supervisor

V. Vargas - Specifications Engineer

J. Watson - Mechanical Engineer

B. Weeks - Power Stores Unit Supervisor (Operations)

R. Westbrook - Fire Protection Engineering Staff Supervisor

J. Wilcox - Instrument Engineer (Outage)

Four Shift Engineers

One Assistant Shift Engineer

Two Unit Operators

One Assistant Unit Operator

Four QC Inspectors

Five QA Engineers

Six Crafts Foremen

Four Craftsmen

Three Health Physics Technicians

OFFICE OF HEALTH AND SAFETY

G. Bugg - Radiation Exposure Management Group Supervisor

R. Doty - Radiological Assessment Group Supervisor

B. Hobbs - Chief, Laboratory Services Branch

C. Kent - Radiological Emergency Planning and Preparedness Group

J. Lobdell - QA/ALARA Staff Supervisor

R. Maxwell - Chief, Radiological Hygine Branch

J. Politte - Radiation Control Group Supervisor

R. Rodriquez - Radiological Hygiene Training Section Supervisor

H. Sorrell - Radiation Control Group Coordinator

G. Stone - Director, Occupational Health and Safety Division

VIII. DOCUMENTS REVIEWED

Topical Report TVA -TR75-1A, revision 4, "Quality Assurance Program Description," Section 17.2

BFN FSAR

POWER QA Manual

QA&A Staff Procedures Manual

QA&A Staff QA Audit Plan and Schedule dated December 23, 1980

QA&A Staff Audit Reports for BFN 1978, 1979, and 1980

TVA Radiological Emergency Plan

TVA Code II, Radiological Emergency Planning

TVA Code VII, Occupational Radiation Protection

TVA Instruction VIII, Radiological Hygiene

Organizational Bulletin I, Management Services

Organizational Bulletin I, Power

Draft TVA Interdivisional Agreement between the Divisions of Nuclear Power, Engineering Desing, and Occupational Health and Safety, "Requirements for Implementing the TVA Code on Occupational Radiation Protection," Revision 0, October 15, 1980

POWER Nuclear Safety Review Procedures Manual

POWER Safety Review Program Manual

NSRB Charter, Revision 7

NSRB Meeting Minutes, 1980

Nuclear Operations QA Manual

Criteria for Seismically Qualifying Field Run Piping (sizes 1/2 through 1 inches)

DPM BF 72A2, "GE Company Service Information Letters (SIL's)"

DPM N72A14, "Materials, Components, Spare Parts, or Service Procurement

DPM N72A20, "Procedure for Educational Assistance for Training Outside TVA"

DPM N72A36, "Assignment of Responsibilities to the Central Office for Direct Nuclear Plant Support During Startup, Normal Operation, and Refueling Outage"

DPM N72A38, "Assignment of Engineers and Engineer Trainees at Nuclear Plants"

DPM N72A39, "Review of Nuclear Plant Operating Experience Reports"

DPM N7203, "Clearance Procedures"

DPM N73A6 and 6A, "Training of Non-TVA Employees"

DPM N73A14, "Proposed Changes to Nuclear Plant Technical Specifications"

DPM N73A16, "Monitoring and Recording Occupational Radiation Exposures"

DPM N73A21, "Stores and Spare Parts Policy"

DPM N73A21A, "Saleable Scrap"

DPM N73M2, "Process Specifications for Welding, Heat Treatment, Nondestructive Examination, and Allied Field Operations"

DPM N73015B, "Nuclear Plant Reliability Data System"

DPM N73019, "Retention of Protective Tags"

DPM N74A6, "Posting of Documents as Required by AEC"

DPM N74A8, "Nuclear Plant Reportable Occurrences"

DPM N74A13, "Administrative Control of Employee Radiation Exposure"

DPM N74A17, "Housekeeping in Nuclear Plants"

DPM N74A19, "Operating Philosophy for Monitoring Occupational Radiation Exposures As Low As Reasonably Achievable (ALARA) - Commitment by the Division of Power Production

DPM N74A19A, "Procedure for Implementing Annual Audits of Nuclear Plants to Review TVA's Program for Keeping Occupational Radiation Exposures As Low As Practicable"

DPM N74A19C, "Prenatal Exposure - Instructions to Radiation Workers"

DPM N74A20, "Nuclear Plant Organization and Staffing"

DPM N74M7A, "Nuclear Plant Refueling Outage Management"

DPM N75A7, "Requests for and Recording Training (TVA Employees)"

DPM N75A8, "Plant Systems Familiarization Study Guide"

DPM N75A9, "Power Production Training Center Operating Information and Modifications"

DPM N75C01, "Qualification and Certification Program for Nondestructive Examination Personnel"

DPM N75C05, "Procedure of Understanding Between the Radiological Hygiene Branch and the Nuclear Generation Branch"

DPM N75C06, "Training of Radiological Emergency Team Leaders"

DPM N75O5, "Backup Controls for Shutdown from Outside the Control Room"

DPM BF76M7, "Augumented Inservice Inspection Program on Austentific Stainless Steel Piping Systems"

DPM N76A5, "Changes to Vendor Manuals"

DPM N76A9, "Outstanding Commitments to Outside Agencies"

DPM N76A10, "Purchase Specifications for Critical Stock Metal Materials, Wire and Cable Used Inside Primary Containment, Welding Materials, Valve Parts, and Pump Parts"

DPM N76M12, "Outage Organization for Modification and Addition Activities"

DPM N76O1, "Guidance for Operator Being at the Controls of a Nuclear Power Plant

DPM N76O13, "ASME Section XI System Pressure Tests"

DPM AP77C04, "Review of Proposed Design Changes"

DPM BF77M2, "Feedwater Nozzle Original, Interim and Final Fix Examination Recommendation"

DPM N77A5, "Nuclear Plant Operator License Examinations Scheduling with NRC"

DPM N77A11, "Open Item Status Followup System"

DPM N77A14, "10CFR21 Evaluation of Reporting Requirements"

DPM N78S2, "Safety and Hazard Control Manual," Section VII

DPM BF7901, "Administrative Controls for Plant Operations"

DPM N79A1, "Quality Control Program - Power Service Shops"

DPM N79A5, "Critical Structures, Systems, and Components (CSSC) Review Committee"

DPM N79A7, "Nuclear Plant General Employee Training"

DPM N79A12, "Operational Review of Training Required by Division Procedures"

DPM N7902, "Nuclear Plant Licensed Operating Shift Personnel Responsibilities"

DPM N7905, "Nuclear Plant Licensed Operations Shift Management"

DPM N80A3, "Nuclear Plant Management Services Section"

DPM N80A4, "Emergency Response Team"

DPM N80A16, "Radiation Safety Responsibilities and Relationships - All Nuclear Plants"

DPM N80C01, "Handling of Division Correspondence in C.O."

Training Plan for Instrument Mechanical Apprentice, September 1976

Radiological Hygiene Branch Mission Statement

Laboratory Services Branch Mission Statement

Radiological Hygiene QA Report Nos. QA-81-2, QA-81-1, QA-80-13, QA-80-12, QA-80-11, QA-80-10, QA-80-09, QA-80-7, QA-80-1

Radiological Hygiene Branch Progress Reports - March and April 1980; September - December 1980

Radiological Hygiene Branch QA Program Manual

ID-QAP-2.4, "Future Modifications"

ID-QAP-2.5, "Major Modifications"

ID-QAP-6.1, "Configuration Control"

ID-QAP-18.1, "Qualification Certification and Recertification of QA Audit Personnel"

NF-QAP-1.10, "Review of Modifications to Nuclear Fuel and Related Core Components"

NF-QAP-2.3, "Document Control"

Radioactive Material Shipment Manual

BFN Health Physics Manual

BFN Radiological Control Instructions

BFN Record of Annual Wholebody Exposures for Calendar Years 1977, 1978, and 1979

Series 1 Standard Practices, "Method of Operation"

Series 2 Standard Practices, "Document Management"

Series 3 Standard Practices, "Quality Assurance"

Series 4 Standard Practices, "Training and Qualification"

SP BF 5.5, "Maintaining Occupational Radiation Exposures As Low As Reasonably Achievable"

SP BF. 5.8, "Radwaste Segregation and Reduction Program"

Series 6 Standard Practices, "Maintenance"

Series 7 Standard Practices, "Activity Control"

Series 8 Standard Practices, "Modifications"

SP BF 9.2, "Refueling Outage Management"

Series 10 Standard Practices, "Corrective Action"

Series 12 Standard Practices, "Operation"

Series 13 Standard Practices, "Instructions and Guidelines"

Series 14 Standard Practices, "Industrial Safety"

Series 15 Standard Practices, "Reporting"

Series 16 Standard Practices, "Stores and Procurement Specifications"

Series 17 Standard Practices, "Technical, Testing, and Environmental"

Series 18 Standard Practices, "Forms"

Series 21 Standard Practices, "Information Systems"

SP BF 22.1, "Radiological Emergency Plan"

PORC Meeting Minutes, July-December 1980

BFN Operating Instructions

BFN Emergency Operating Instructions

Shift Engineer Journals, 1980

Unit Operator Journals, 1980

Shift Turnover Records, 1980

Unit Trip and Reactor Transient Analysis Reports, 1980

License Event Reports, 1980

Licensee Event Report Determinations, 1980

Corrective Action Reports, 1980

QA Survey Reports, 1980

Selected samples from:

- Section Instruction Letters
- Surveillance Test Records
- TVA-NRC Correspondence
- Interdivision Memoranda
- Intraoffice Memoranda
- Intradivision Memoranda
- Procurement Data Packages
- Personnel Job Descriptions
- Work Packages
- Safe Work Permits

APPENDIX

MANAGEMENT EVALUATION TREE

One of the primary goals of this management review was to assess the management controls system within POWER. To aid in the accomplishemnt of this objective, a fault tree was developed which NSRS believed would assist the reviewers in a systematic and uniform evaluation of the management system in each functional area. The fault tree which is attached to this appendix is entitled the "Management Evaluation Tree" and is commonly referred to as the MET chart.

The MET chart provided the reviewers with a structured approach to the assessment of the management systems that had been established for each functional area. By addressing each of the key elements of the MET chart, the reviewer should have been able to gain a good understanding of how business was being conducted in the area being reviewed. This management evaluation approach should have assured the following basic determinations.

1. If documented policy had been established to provide guidance in the management of the subject areas.

2. If a program had been developed and documented to successfully carry out the established policy in compliance with regulatory requirements, commitments, latest standards, and additional evaluation criteria.

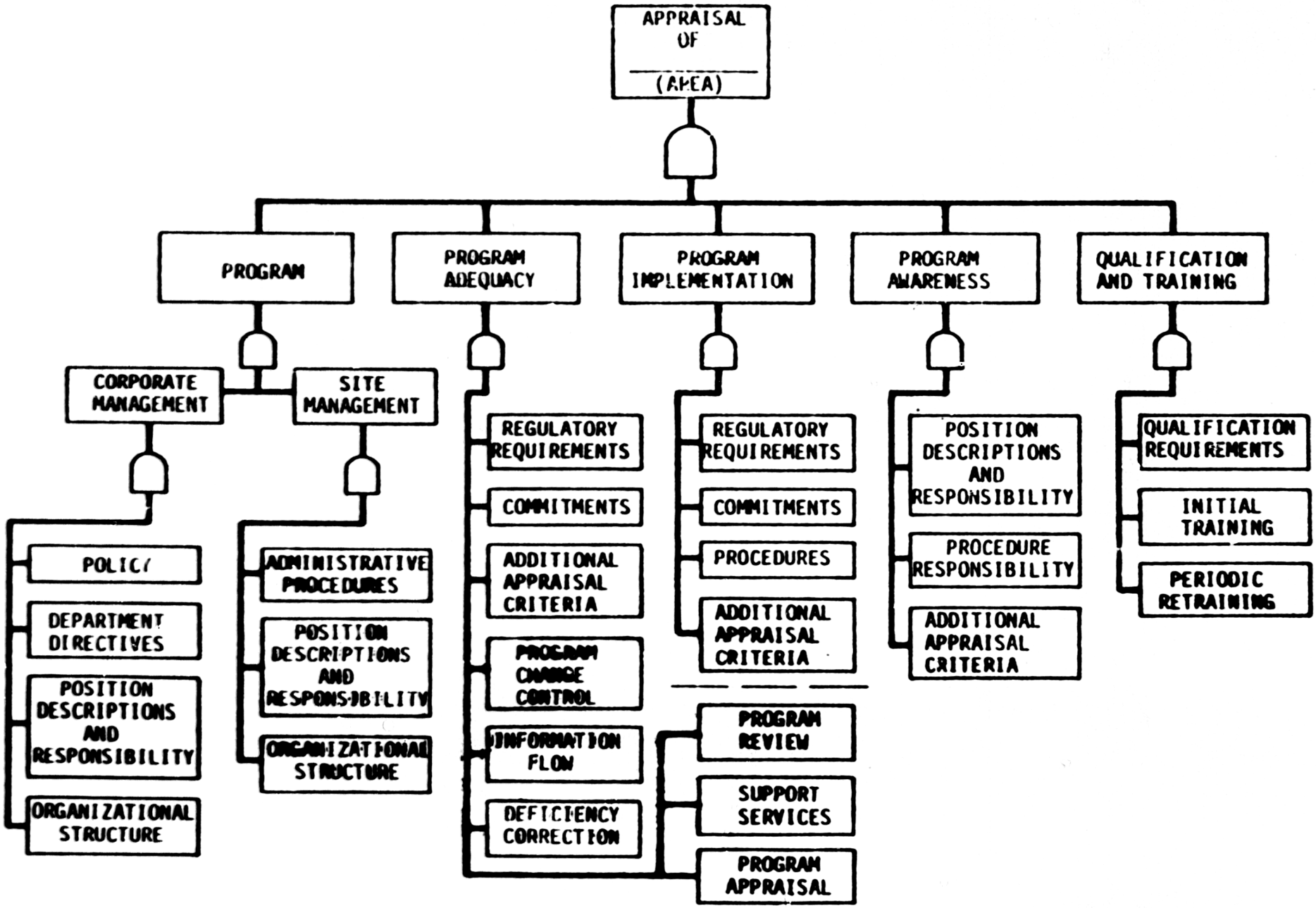
3. If the program was being implemented and implementing activities were being appropriately documented.

4. If responsible personnel were being adequately trained and qualified.

5. If those individuals having assigned responsibilities in the area being reviewed understood their roles in the accomplishment of activities within the area.

The various elements indicated by the MET chart were considered in some depth for each area reviewed. Additional detailed checklists appropriate for each specific area were also developed for use during the review.

MANAGEMENT EVALUATION TREE



TENNESSEE VALLEY AUTHORITY

NUCLEAR SAFETY REVIEW STAFF

REVIEW

NSRS REPORT NO. R-81-14-OEDC(BLN)

SUBJECT: MAJOR MANAGEMENT REVIEW OF THE OFFICE OF ENGINEERING DESIGN AND CONSTRUCTION

DATES OF REVIEW: MAY 4 THROUGH JULY 16, 1981

Team Leader:	Marvin V. Sinkule Marvin V. Sinkule	9/29/81 Date
Reviewer:	Henry L. Jones Henry L. Jones	9/29/81 Date
Reviewer:	Michael S. Kidd Michael S. Kidd	9/29/81 Date
Reviewer:	John W. Mashburn John W. Mashburn	9/29/81 Date
Reviewer:	Robert C. Sauer Robert C. Sauer	9/29/81 Date
Reviewer:	Bruce F. Siefken Bruce F. Siefken	9/29/81 Date
Approved by:	Marvin V. Sinkule Marvin V. Sinkule	9/29/81 Date

Also, Terry G. Tyler participated in the review but has left TVA employment prior to completion of this report.

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I. BACKGROUND

The basis for the establishment of the Nuclear Safety Review Staff (NSRS) was to provide an independent group to advise the General Manager and the Board on nuclear safety policy and to assist in making decisions affecting the safety of TVA nuclear plants. The need for this type of staff was established on the premise that nuclear safety questions should be reviewed independently of the normal engineering and operating divisions of TVA, and that this review should be incorporated into the decisionmaking process.

In order to fulfill its stated purpose, NSRS must independently assess all phases of TVA's nuclear program. Investigations and reviews are the two basic activities performed by NSRS in the assessment of the program. Investigations are usually reserved for employee concerns and significant events relating to safety. The reviews cover a large variety of activities and may involve an indepth evaluation of a very small area or the scope may be greatly expanded with a corresponding reduction in depth.

The review of the Office of Engineering Design and Construction (OEDC) as reported herein was broad in scope and somewhat limited in its depth and was similar to a review previously conducted at the Office of Power (POWER) (GNS 810515 001). The purpose of the OEDC review was to assess the overall management control systems throughout the office as they relate to nuclear safety/quality and as applicable to the Bellefonte (BLN) project. In addition, a companion effort was conducted at the Division of Purchasing (PURCH) concurrently with the OEDC review to evaluate the interfaces between OEDC and PURCH (GNS 810908 051).

II. SCOPE

This review of OEDC has been classified by NSRS as a major management review since it was designed to cover essentially all aspects of the management controls system associated with obtaining quality.

To accomplish this task, the programs for management controls of quality related activities were reviewed for compliance with regulatory requirements and commitments and with good quality or safety practices established by industry. In some instances the programs were also compared to the latest standards which relate to management controls.

The review was limited to some degree because it was directed only to BLN. Therefore, many of the activities and programs performed by EN DES and CONST were not reviewed. The QA programs for the other TVA plants in the design and construction phases will be examined by NSRS during management reviews in the future.

The review was intended to be broad in scope and was based on a concept that incorporates a number of key elements important to the

II.

management process. The methodology of this concept has been developed into a generalized model and is diagramed in a "Management Evaluation Tree" (MET) which is contained in Appendix B to this report.

The overall goal of the review was to formulate a composite assessment of the OEDC management controls over the activities described above through the review of the following functional areas as applicable to the OEDC Manager's Office and the specific divisions:

Management Controls
Quality Assurance
Training and Qualifications of Personnel
Interface Controls
Design Process Controls
Construction Processes
Design Changes
Configuration Control
Corrective Action
Records and Document Control
Procurement
Scheduling of Construction Activities
AMSE Section III QA Program
Special Process Controls
Equipment and Facilities Control

III. MANAGEMENT SUMMARY

The management review of OEDC has been conducted by NSRS to provide an independent assessment of the adequacy of the programs established to assure an adequate level of nuclear safety/quality has been provided in the activities assigned to that office. The management review was specifically directed toward determining whether written programs were established to satisfy TVA policy, regulatory requirements, and TVA commitments; whether the programs were adequate to satisfy the intended purpose; whether the programs were being implemented effectively; whether the cognizant personnel throughout the organization were aware of the programs and their responsibilities in carrying out the programs; and whether the personnel had been trained and were qualified to perform their responsibilities.

In the review, NSRS attempted to ascertain whether: OEDC top management had established sufficient policies and requirements to ensure that design and construction activities were performed in a quality manner; the divisions had established and implemented policies and procedures that reflected the requirements and policies established by OEDC top management; the branch or section level documents contained sufficient guidance to ensure OEDC management that all quality aspects would be considered; when problems occurred involving quality they were promptly identified, evaluated, and corrected; and when decisions involving quality were involved, they were made by the management level commensurate with the risk involved.

The findings of this review indicated that several programs were not sufficiently adequate to give management assurance that requirements, or commitments of the quality assurance program, would be met. The most serious deficiencies were found in the areas of: QA program requirements; QA program applicability; engineering procedures for the control of the design process and changes to the design; interface control; and construction activity planning. NSRS did observe a number of areas in which management controls were considered strong as follows: the structures-foundation team composed of CONST and EN DES personnel at BLN; the hanger program at BLN; the warehouse operation at BLN; and the QA procedures at the CONST division level.

The majority of the problems identified were programmatic (i.e, an essential element of the program to ensure that NRC requirements, TVA commitments, or quality considerations will be met). Implementation deficiencies were also identified; however, generally these were not considered to be as serious as those involving the program. A program deficiency does not mean that regulatory requirements were not being met in all cases. It may indicate that the program is personnel dependent and subject to program breakdown when experienced, well-qualified individuals who compensate for program deficiencies move on to other responsiblities. NSRS found this to be the case in some instances; in others the requirements were not being satisfied, and in some, implementation was not reviewed in sufficient depth to determine whether the requirement was being satisfied.

III.

Major deficiencies were discovered in the administrative controls utilized to provide management's controls over certain quality related activities. A discussion of some of them is contained in the following paragraphs.

- OEDC management had not undertaken an aggressive effort to define and maintain, in OEDC documents, specific requirements for design and construction of nuclear plants. Failure to provide this guidance forces decisions to be made at the lower management levels of the organizations and does not ensure management that requirements will be met. NSRS is recommending that provisions be established to ensure that specific requirements are provided and are current.

- A listing of safety-related structures, systems, and components is to be established for BLN to satisfy QA program requirements. The listing is to be utilized by TVA personnel to determine what structures, systems, and components will receive the special quality considerations required by the QA program. NSRS found that none of the established lists appeared to contain all of the safety-related systems required to be on a list and that provisions had not been established to keep any list current. This is an example of a program inadequacy which may be generic within TVA. A similar problem was identified during the POWER management review.

- Chapter 17 of the BLN FSAR describes the program and procedures utilized by TVA to satisfy the QA program requirements. Other sections of the FSAR describe the reactor and support systems and the performance characteristics of those systems. This report identifies a number of instances where changes had been made to programs, organizations, or procedures described in the FSAR without making changes to the FSAR and without NRC approval. This is contrary to the NRC OIE philosophy that the FSAR description of TVA's programs and systems and is considered a commitment to the NRC. After issuance of an operating license, the FSAR becomes the legal basis for making changes to the plant as stated in 10CFR50.59. Measures have been instituted to partially eliminate this problem; however, NSRS is concerned that OEDC management may not be fully aware of how the FSAR is utilized by the NRC.

- The system of administrative procedures established at the division level in CONST to ensure that QA program requirements were met appeared to be excellent. The BLN administrative controls established to implement these controls appeared to be only adequate to meet these requirements. There were several areas where administrative controls were not established. One example of this is in the area of initial work planning where no formal program for planning and controlling the construction activities existed. NSRS believes that a concerted effort is needed in this area to satisfy regulatory

III.

requirements, eliminate quality problems, and ensure more efficient construction practices. A review of the CONST nonconforming reports indicates that many were due to omitting and/or mislocating embedments, conduits, reinforcing steel, piping, sleeves, etc., during concrete pours and that many were due to internal interface problems involved in locating critical supports/hangers. NSRS believes more effective planning would be very beneficial in terms of both quality and efficiency.

- NSRS considers the procedures implemented by EN DES to meet the QA program requirements are weak. Specific responsibilities were contained in a number of different documents making it difficult for individuals working in the program to determine what their responsibilities were. Engineering procedures developed by EN DES to control the design process and changes to the design were not adequate to ensure EN DES management that a quality product would be attained nor that all QA requirements of 10CFR50, Appendix B, would be satisfied. A number of examples were identified where EN DES personnel were not following engineering procedures; however, it should be noted that a requirement had not been established for them to do so. The procedure inadequacies consisted of conflicts, inconsistencies, overlaps, and lack of specific guidance or requirements. NSRS is recommending that EN DES review and restructure the procedural system similar to those established by CONST such that EN DES policy, responsibilities, requirements, and guidance are systematically established in tiers of documents.

Other areas where NSRS believes improvements are needed are listed in the following paragraphs.

An important function of the OEDC staff is to provide or coordinate establishment of controls for activities involving more than one division or office. During this review NSRS identified several important areas where responsibilities were not established for interdivisional activities. For example, control procedures were not developed delineating interface responsibilties between EN DES and CONST for: handling of design changes; performing constructability and operability reviews; controlling vendor manuals; and reviewing operating procedures. Additionally, NSRS believes that improvements are needed in the EN DES/PURCH interfaces and in the EN DES/NSSS interfaces. Findings in this area appear to be consistent with concerns of the NRC involving interdivisional activities. NSRS is aware that OEDC had begun a review of interdivisional procedures; however, we recommend that the above specific areas be given additional consideration.

The OEDC QA and CONST QAB programs and their implementation for QA verification and overview activities appeared satisfactory to meet regulatory requirements. A number of changes had been made during the past year which appear to NSRS to strengthen the program. Because

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these changes are still being implemented in EN DES, it was difficult to arrive at a determination as to how effective this program is/will be. NSRS does believe that additional resources would be required to provide extension of the overview activities currently being performed, particularly in OEDC QA and EN DES QAB. As such, NSRS is recommending that additional resources be obtained.

In addition to the review of the QA programs established to meet NRC requirements, NSRS performed a review of the QA program designed to meet ASME Section III Code. The results of the review indicated that the activities and documents in this area were in general conformance with the Code. NSRS suggests that OEDC consider merging the QA ASME Section III code QA programs with the QA programs designed to meet NRC requirements in order to provide more effective utilization of documents.

Corrective action programs established were generally adequate to meet regulatory requirements; however, NSRS did not believe the programs had been effective in eliminating recurring problems. A review of the nonconformance reports generated during 1981 for BLN indicated many of the same types of problems were recurring. NSRS was also concerned that the program which was established to communicate possible generic problems between TVA construction sites was very narrow in scope. The program did not, for example, provide for communication of OEDC audit findings between the various nuclear plant projects. NSRS is recommending that additional emphasis be placed in both of these areas.

During the course of the review, two potential safety problems were identified and are discussed below. These concerns have been communicated in writing to OEDC previous to the issuance of this report.

- CONST had adopted the practice of grinding down structural steel welds on Category I structures. NSRS contends that this practice has the potential of masking weld defects and resulting in weld inspections not being performed during the most informative stage. NSRS is recommending that this practice be evaluated and that the practice either be discontinued or additional quality control inspections be conducted.

- During the review NSRS observed where a 2-inch-diameter stainless steel pipe on the chemical addition and recovery system had been visibly necked down as a result of welding hanger lugs to the pipe. Although the craftpersons who installed the lugs were aware of the problem, a nonconformance report had not been generated. NSRS is recommending that CONST evaluate this situation closely to determine if it is an isolated case and to determine the reasons why the conditions should go unreported and uncorrected.

During the review of the design process, it was not evident whether the program required that the final structural steel design be within the initial loading margin. The initial design did include loading margins

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for supporting cable trays; conduits; instrument lines; piping; and heating, ventilating, and air conditioning ducts. However, there was no verification that the final as-constructed configuration would be within the initial loading margin. NSRS is recommending that EN DES evaluate the final as-constructed design to verify that structural design for BLN is adequate for design basis considerations.

Generally, personnel interviewed appeared to be well qualified and aware of their responsibilities. Also, they appeared to exhibit good attitudes toward quality; however, this factor is very difficult to ascertain in a short discussion.

NSRS is concerned that several of the findings may point toward an incorrect philosophy concerning quality. It appeared to NSRS that the emphasis is on the quality verification function as opposed to the quality achieving function. Two situations that exemplify this concern are as follows:

- Major deficiencies were discovered in the programs for providing QA training of personnel performing quality-related activities, such as craftsmen, engineers, and designers.

- A program was not established for ensuring management of adequate control of initial work planning at the plant site. Work planning and control appeared to begin when deficiencies were found.

NSRS believes that quality can only be achieved by highly trained and motivated personnel performing well-planned quality related work and that OEDC management should concentrate on performing initial work correctly. In addition to this, NSRS is recommending that OEDC management develop: specific quality goals; implementation plans for attaining those goals; improved quality performance feedback networks; and personnel accountability policies for quality.

In summary, NSRS does not feel that the problem areas discussed in this report are conscious attempts to not perform activities correctly. Managers and personnel in OEDC are subjected to a number of pressures external to the organization which have an effect on how they manage the organization. For instance, there is pressure to keep costs down and to keep quality up. There is a continual unanticipated drain on engineering resources due to demands for resolution of post-TMI related items in both operating plants and plants under construction. These are coupled with the growing demand in the nuclear industry for qualified personnel and TVA's having to compete for those personnel.

Although the QA program deficiencies noted in this report were primarily directed to BLN, management controls at other projects should be reviewed to determine if the same deficiencies exist. The older plants such as BLN, SQN, and WBN had essentially developed plant specific QA programs while the later plants, such as PBN, HBN, and YCN, have a comparatively uniform program.

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Fifteen functional areas were reviewed and resulted in a total of 80 recommendations. While the absolute number of recommendations may appear large, it is not considered excessive for a review of this scope. It should also be realized that the number of recommendations depends to a large extent on the writing style of individual reviewers. The same material can be covered by a few general recommendations or many that are much more specific. Most of the reviewers that prepared this report had a tendency toward the specific.