V. DETAILS

The following is a discussion of the results of the NSRS evaluation of the Office of Power Water Quality Program. The structure of the discussion is in the following format for each of the functional review area topics evaluated at each facility:

- Upper-tier requirements--regulatory, license, industry practice.
- TVA commitment actions.
- Office of Power quality assurance program requirements.
- NSRS assessment criteria.
- Organizational/facilities reviewed:
    - Facility working requirements applicable to the NSRS functional review area topic.
    - Facility activities reviewed against NSRS evaluation criteria.
    - NSRS findings (positive and negative).

A. Training and Qualification of Personnel

Criterion II, "Quality Assurance Program" of Appendix B to 10CFR50 requires that a QA program be established which shall take into account the need for special skills to attain the required quality for activities affecting quality and to provide that personnel performing these quality-related activities be trained and indoctrinated, as necessary, to assure that suitable proficiency is achieved and maintained. The description of the QA program for POWER involving (QA) training is contained in subsection 17.2.2 of the TVA Topical Report TVA-TR75-1A, R5.

Basically, the TVA Topical Report specifies that the Office of Power Quality Assurance Manager shall develop, maintain, and document a quality assurance indoctrination and training program for POWER Central Office management and supervisory personnel and other "offsite" employees performing quality-affecting activities excepting those in NUC PR. NUC PR is cognizant over their own QA training program.

The POWER Quality Assurance Program to document the implementing controls for the Topical Report commitment to NRC is detailed in OP-QAP-2.2, "Quality Assurance Training."

NUC PR's QA training program requirements as defined in 17.2.2 of the TVA Topical Report involve developing, maintaining, and documenting training for those personnel performing quality-affecting activities at the NUC PR Central Office and for plant staff personnel ("onsite"). NUC PR accomplishes this commitment through the issuance of formal training plans and by the establishment of a Nuclear Training Branch which not only develops, implements, and administers the division's prescribed technical training programs such as radiochemical analyst training among others, but is responsible for the operation and maintenance of the Power Operations Training Center.

In addition, TVA Topical Report TVA-TR75-1A Table 17.2-5, commits TVA to the use of ANSI N18.1-1971, March 1971 as endorsed by Regulatory Guide 1.8, R1, September 1975 which specifies the selection, training, and experience requirements for the various disciplines necessary for the operation of nuclear power plants.

The evaluation of training in this area involved a determination that:

- water chemistry training programs have been established,
- adequate qualification selection criteria had been identified,
- nuclear power plant personnel responsible for water quality have the combination of education, experience, health, and skills commensurate with their level of responsibility, and
- assessments had been made as to the adequacy of the training program.

The areas of specific training for this review involved general employee training, engineer and supervisory training, and radiochemical and chemical analyst training.

1. Division of Nuclear Power Central Office (NCO)

The procedure specified by NUC PR to satisfy the TVA Topical Report requirements on QA training is outlined in N-OQAM, part III, Section 6.1, "Selection and Training of Personnel for Nuclear Power Plants." DPM N79A7, "Nuclear Plant General Employee Training Program," was also instituted by NUC PR to provide all persons regularly employed in the nuclear power plant some degree of minimum training to assure the safe execution of their duties while employed at the station. Both procedures further implement the criteria of ANSI N18.1 by addressing themselves specifically to the responsibilities, qualifications, and training of personnel who have a direct relationship to the technical aspects, operation, or maintenance of the nuclear power plant. This includes personnel who (1) perform, (2) direct or supervise, and (3) approve preoperational startup and operational test procedures and test results.

For this review the training requirements established in the N-OQAM for the following responsible chemistry program personnel were evaluated:

- Engineering Section Supervisor (M-5)
- Chemical Unit Supervisor (M-4)
- Chemical Engineers/Chemists (SD-1 through -4)
- Chemical Engineer Associate (SE-7)
- Radiochemical Laboratory Analyst Shift Supervisors (SE-6)
- Radiochemical Laboratory Analysts (SE-3 through -5)

In addition to the training and qualification criteria outlined in Part III, section 6.1 of the N-OQAM for RLA qualification, NUC PR has established a separate, distinct and formalized RLA training program entitled "Training Plan for Radiochemical Laboratory Analysts" to satisfy the ANSI N18.1-1971 requirements that technicians receive as a minimum:

- two years of working experience in their speciality before being placed into responsible positions

- one year related technical training in addition to their work experience

The one year technical training requirement is resolved through preemployment selection of candidates having satisfactorily completed college-level work with second-year level technical training in mathematics and chemistry or equivalency beyond high school level.

At the time of NSRS' review, the 24-month work experience requirement was satisfied through a four phase program of training and on-the-job experience with nuclear plant process systems and radiochemical methods and equipment. Phase one, the basic phase, is presented to newly hired SE-3 RLA candidates at the Power Operations Training Center and consists of approximately 14 weeks classroom and practical instruction in the principles and theory of various aspects of nuclear plant chemical process equipment. Requirements study is also provided during this phase to identify NRC and EPA regulations as they pertain to radiochemical and chemical plant activities.

In phase two, the intermediate phase, the RLA candidate receives 10 weeks of inplant training at a TVA nuclear plant on administrative controls and specific plant system awareness training as to operation, sampling methods, and requirements.

Upon certification of satisfactory completion of the basic and intermediate phases of the course, the employee is reclassifed to RLA-trainee (SE-4) and commences phase three, proficiency training, at the same or at a similar TVA nuclear plant.

During the proficiency phase, which lasts about six months, the trainee learns to perform and performs conventional and radiochemical analyses of liquids, gases, and solids encountered in the nuclear power plant assigned. Upon completion of the proficiency phase of the program the trainee undergoes 12 months of phase four, on-the-job training. When a total of 18 months experience as an SE-4 trainee is acquired, the employee will then be eligible to fill a certified RLA SE-5 vacancy position.

The engineer/chemist and supervisory training programs are not formalized as is the RLA training program and consists basically of degree-conferral and on-the-job progressive training. A basic supervisory management course is also available and is periodically administered to personnel in supervisory positions which would include the M-levels, SD-4s, SE-7s, and SE-6s on a first-come, first-serve basis.

NSRS review of NCO's activities in this area concluded that:

a. BFN and SQN technical specifications both require through Section 6.0, "Administrative Controls," that station and replacement personnel are to be trained and retrained in accordance with the criteria specified in ANSI N18.1-1971. NSRS review of BFN's and SQN's chemical personnel training and chemistry activities found several inconsistencies which indicates the NUC PR training committee has failed to provide adequate guidance for ensuring division training programs are in compliance with licensing and regulatory requirements. Some of these inconsistencies include:

   - Chemical engineers interviewed lacked knowledge of cognizant system technical specification bases; operation of cognizant equipment and systems; analyses that are required of their cognizant systems; what constitutes a chemical trend or what to do with the trend when identified; and overall process awareness.

   - RLA training once outside the cognizance of the POTC was observed by NSRS to have weakened in that proper techniques for sampling and analysis were no longer stressed nor periodically checked by senior RLAs. This conclusion may have resulted from lack of Nuclear Training Branch direct involvement in the training program's activities being accomplished at each plant.

   - The lack of a formal RLA retraining and replacement training program in the division RLA training plan has led, in some degree, to the BFN failure to institute these programs for RLAs.

   - It was found, in some cases, that chemical laboratory and chemical activity supervisors were not aware of or familiar with topics that may directly affect plant work. These topics include quality assurance and quality control, regulations, standards, and their expected function in the conduct of nuclear operations, such as administering engineering, shift, or laboratory activities versus reviewing analytical procedures, performing sample analyses or preparing engineering judgment documents. In unusual circumstances, the latter activities may be necessary but should not be routine practices because of manpower inadequacies or inability of subordinates to perform.

2. <u>Browns Ferry Nuclear Plant (BFN)</u>

Browns Ferry implements the requirements specified in the N-OQAM; DPMs N79A7 and N78S2; and the NUC PR division RLA Training Program through standard practices BF 4.4, "Training and Qualifications - Policy," BF 4.5, "Plant General Employee Training Program," and BF 4.6, "Specialized Training Program." These documents are further implemented for specific RLA inplant training through the Radiochemical Laboratory Manual (SIL 16), section 1900, "BFNP Laboratory Analyst Training/Retraining Program." Formal training programs established for supervisory personnel and engineers consist basically of General Employee Training (GET) and on-the-job familiarization training.

The BFN RLA inplant training program consists of four parts once the RLA trainee arrives onsite from the 14-week POTC training course. Part I, "Basics," a 10-week personal study course concerns the SE-3 trainee with the station's administrative control system. It consists basically of many checklist item signature checkoffs whereby the trainee reads plant documents and demonstrates his/her knowledge by verbal expression to the chemical engineering associate or to the plant chemical engineer for their signature of satisfied approval. Once all checklist line item signatures have been obtained, a comprehensive, written examination is administered. If the test results are satisfactory, the trainee then receives a comprehensive oral examination. Upon successful completion of the written test and oral exam the trainee is advanced in grade to SE-4 and allowed to continue his/her training to Part II, "Surveillance Tests."

Part II is completed similar to Part I except that the trainee must also demonstrate that she/he is fully capable of doing each instruction to completion, by actually performing each instruction a specified number of times. Once all conditions of Part II are satisfied, the trainee advances to Phase III, "Chemical and Radiochemical Techniques, Analyses, Limits, Analytical Equipment, Actions, and Process Instrumentation."

Part III is conducted exactly like Part I whereby the trainee demonstrates by checklist item signature checkout that she/he has acquired satisfactory knowledge through verbal expression to the chemical engineer associate or plant chemical engineer. Once complèted, the trainee receives another written and oral examination before proceeding on to Part IV, "Plant Systems."

In Part IV the trainee must demonstrate a substantial knowledge of each system and/or item listed in the qualification guide. Again, once all signatures of satisfactory completion have been obtained, another written and oral examination is administered.

After completion of the six month Parts II through IV training program, the trainee then completes 12 months on-the-job training by being involved in special projects or other tasks as outlined by the supervisor. Once 18 months of SE-4 experience has been acquired, the trainee is then eligible for an SE-5 analyst position provided the individual can show compliance with the qualification criteria specified on the TVA Vacancy Announcement.

GET training is also provided to all analysts and is administered through the plant training office.

NSRS review of BFN plant chemistry personnel training activities involved review of GET training records and of completed/ongoing RLA training documents, qualification books, tests, and classroom training examinations. NSRS concluded that:

a. The initial training program established for RLA trainees conceptually meets or exceeds the requirements specified in the division training plan for analyst training. In practice RLAs were observed lacking some understanding of proper sampling and analysis technique, and plant system awareness. Examples of this observed weakness include:

    - RLAs were not fully aware of the sample flow path as to acquisition and return paths through the process systems.

    - RLAs were observed raising sample sink hood doors greater than the maximum allowed for adequate ventilation of the sink area. A particular, observation involved the raising of the Reactor Water Cleanup (RWCU) sample station hood door to the top to allow the RLA to place his head into the contaminated sink area with hard hat on.

    - Timers were not being used during sample analysis.

BFN should provide a mechanism to ensure basic laboratory and sampling principles including systems operation are communicated to the RLAs during initial training and on a continuing basis (see also V.A.2.c.(1) below on retraining).

b. The annual post-accident sampling drill program whereby a critique form is completed and discussed with the analyst of his performance during the drill was considered by NSRS to be an exceptionally good idea and should be of value to the analyst and to the BFN chemistry program.

c. Inadequacies in the RLA training program include:

(1) A retraining and replacement program for RLAs had not been established as required by section 6.1.F of the BFN Technical Specification. The RLA continual training program consisted only of the post-accident drills as described in V.A.2.b above for SE-5 analysts and of technical specification review for the RLA SE-6 shift supervisors. A continual retraining program had not been established after plant startup to ensure that chemistry personnel remain proficient in good laboratory techniques and safety; plant equipment; regulatory and procedural changes; record and document controls; BWR chemistry operating experience; procurement and material controls; and radiation safety.

In addition, no formal replacement training program was found in effect, rather, only verbal communications on RLA limitations were discussed with transferred or on-loan personnel before their newly assigned duties were assumed.

Formal retraining and replacement training programs should be established.

(2) Of five randomly chosen RLAs (two SE-4s, two SE-5s, and one SE-6) none had completed all of their GET training within the six month allotted time frame specified by DPM N79A7 and BF 4.5 for completion after station personnel report for assignment at the plant. The conditions of BF 4.5 to pull the delinquent individuals' unescorted access badge until successful completion of the scheduled GET course should be strictly enforced or revised in such a way to prevent personnel from performing quality-affecting activities until their required QA indoctrination training is complete.

(3) The BFN training program established for radiochemical analysts (RLM 1900) has not been formally reviewed by PORC and approved by the plant superintendent prior to its implementation at the station. Part III, section 1.1, paragraph 4.2 of the N-OQAM specifies that standard practices which are required by the technical specifications are to be written and reviewed by PORC to provide documented instructions of the plant superintendent governing employee actions and establishing standards for plant operation. The paragraph goes on to define the formalized system of instructions which is employed through PORC review and plant superintendent approval before actions which could affect quality are implemented. Section Instruction letters and division training plans which are the controlling mechanisms for RLA training are not among these formalized methods.

NSRS review of Standard Practice BF 4.5 dated June 4, 1982 which endorses the division training plan for RLA training would be acceptable if the referenced support document, attachment 3 to N-OQAM, part III, section 6.1, were still in effect However, the N-OQAM section was revised on January 15, 1981 and deleted the attachment 3 RLA training plan. Since the division RLA training plan was not replaced by a division DPM such as was the case with the NSGPO program (previously attachment 2 to N-OQAM, part III, section 6.1 now DPM N78A13), the division training plan should be either incorporated into BF 4.5 or RLM 1900 should undergo PORC review and plant superintendent approval.

(4) RLA training files were found not centrally located nor being properly controlled. NSRS attempts to review completed RLA training records were impeded due to the noncentralized control of the files as specified by the BFN Information Management Manual (IMM) and BFN Standard Practice BF 2.0.

In addition to the difficulties in locating RLA training records, NSRS found that conflicts existed concerning what documents should be maintained in the plant's training files. N-OQAM, part III, section 6.1, paragraph 1.5.6, which implements the provisions detailed in ANSI N18.1-1971. Paragraph 5.6, specifies that a training file is to be maintained on each member of the plant organization (upon transfer the individual's training file shall accompany the individual to each new permanent station assignment). This file consists of qualifications, experience, training, and retraining records. N-OQAM, part III, section 4.1, appendix I, further states that this file is to be maintained six years past employee's work termination or transfer. The conflicts noted included:

(a) RLA preentrance qualifications such as education and previous experience were being maintained in personnel files, Division of Nuclear Power Central Office. POTC also maintains a qualification summary on the RLAs provided by the trainees when they report in at the center as SE-3s. This information was not provided in the plant training/ personnel files.

(b) RLA qualification training books were being maintained in the radiochemical laboratory and initial qualification tests and examinations, including post-accident sampling retraining drills, were being maintained by the training officer. Storage of these items were contrary to the document control requirements of the IMM.

(c) Current experience history tabulation was being maintained via service reviews (form TVA 9898, 9880, and 3031) and Reports on Individual Participation in an Educational Activity (form TVA 1453) with the Administrative Services Officer.

(d) BF 4.4 specifies technical training records for other than NRC licenses and GET are not considered quality assurance records and have a retention period of three years.

d. A formalized training program for chemical engineers and supervisors is needed.

Interviews conducted by NSRS reviewers with BFN chemical engineers (SD-2s, -3s) and supervisory personnel (SE-6s, SE-7, M-level) found the personnel to lack some abilities to implement chemistry practices effectively. For example, engineers interviewed lacked knowledge of cognizant system technical specification bases; analyses that are required of their cognizant systems; what corrective actions to take if an adverse trend develops including what constitutes an adverse trend; and overall process awareness. Supervisors were found not fully aware of or familiar with technical topics that may directly affect plant work, such as quality assurance and quality control, regulations, and standards.

In addition, of two engineers randomly chosen for qualification and training review, neither had completed the GET training within the allotted six month period specified by DPM N79A7 and BF 4.5. Actions similar to that discussed in V.A.2.c.(2) for RLAs delinquent in receiving their GET training should be taken to ensure this required training is accomplished as specified.

A formalized training/retraining program should be established for all chemical engineers and supervisory personnel on the principles and bases of chemical technical specifications; operation of cognizant equipment and systems; analyses required of cognizant systems and why; and overall chemistry process awareness--why certain chemicals were chosen for system control, how anaytical procedures are chosen and qualified, how to change division procedures, regulatory change implementation controls, etc.

3. Sequoyah Nuclear Plant (SQN)

Sequoyah implements the requirements specified in the N-OQAM, DPM N79A7, and the NUC PR division RLA Training Program through Administrative Instruction AI-14, "Plant Training Program." The procedure provides training outlines and requirements by position as to GET, QA, and specialized training. In addition, through appendix F of this document, the RLA training program is defined in detail and acts as the working document for RLA qualification. The division training plan is also included in the appendix F package for completeness and reference.

To delineate the training/retraining requirements specifically for engineering section new employees, the engineering section has established Engineering Section Letter ES SIL A24 which translates the AI-14 outlines into more definitive training requirements. The SIL provides technical knowledge and skill requirments for the chemical engineers and radiochemical analysts. Supervisor training is not provided.

The SQN RLA inplant training program differs from that previously described for BFN but compares favorably with the program outlined in the division training plan, that is, completion of three phases beyond the 14-week POTC technical theory and regulatory requirements basic phase versus the four specified at BFN. These three phases were the ten week intermediate phase training, 6 months proficiency training, and 12 months on-the-job training.

A retraining program has also been established for RLAs whereby each analyst must demonstrate annually a practical knowledge and understanding of selected surveillance instructions and technical instructions through performance of the instructions.

NSRS review of SQN plant chemistry personnel training activities involved review of GET training records and of the AI-14, Appendix F RLA training program including completed/ ongoing RLA training document's qualification books, quarterly tests, and classroom training examinations. NSRS concluded that:

a. The initial inplant training program established for RLAs conceptually meets or exceeds the requirements specified in the division training plan for analyst training. In practice, however, RLAs certified were observed to lack some understanding of proper sampling and analysis techniques including plant system/ surveillance requirement awareness. See f. below for additional details.

b. A retraining program had been established for RLAs to be accomplished on an annual basis.

c. SQN Chemical Unit supervisory personnel (SE-6s, SE-7, and M-4) were knowledgeable of their particular responsibilities and process flow. They were also found actively involved in correcting perceived problems demonstrating the unit was "in charge."

d. Of 12 chemistry-related personnel randomly chosen by grade qualification and training review (one M-5, one M-4, one SD-3, two SD-2s, one SE-7, two SE-6s, two SE-5s, and two SE-4s), none had received their GET training within the DPM N79A7 required 6 month time interval after the individual(s) reports for assignment at the plant. Five of the twelve still had some GET training outstanding. This item was pointed out to management as a management control problem.

   AI-14 requires all section supervisors to ensure that their cognizant personnel receive this training within the allotted timeframe. Action should be taken to ensure that all personnel receive the required QA indoctrination training before they are assigned any quality-affecting activities to perform.

e. RLA training records were not being maintained or centrally controlled as QA records as required by AI-14, paragraph II.F, Appendix F. In addition, NSRS found conflicts concerning what documents should be maintained in the plant's training files, similar to that identified for BFN in paragraphs V.A.2.c.(4)(a), (b), (c) of this report.

   NSRS alerted SQN as to the possibility that they may not be able to provide documented certification as to the qualification status of their personnel.

f. The RLA training program needs some improvements. NSRS discussions held with the SQN plant chemical unit supervisor and chemical engineering personnel determined that station chemical engineers do not perform system cognizant functions, such as parameter trend analysis and system surveillance performance characteristic checks to identify problem areas as other TVA nuclear facilities have required their chemical engineers to do. RLAs at SQN are given these assignments while the engineers mostly perform reactionary (troubleshooting) functions and oversee review of technical specification related surveillance completions.

Because of this arrangement, NSRS conducted interviews with RLAs to ascertain their knowledge of trend analysis techniques, technical specification bases, operation of analyzed systems, and equipment not specifically covered by a key engineer.

NSRS found the RLAs knowledge of these items limited and requested SQN management to expand the RLA inplant training program to cover these activities. In addition, during the discussions described above and observation of sample performance and analysis, NSRS discovered the analysts have certain weaknesses in proper laboratory, sampling, and analysis techniques. For instance, RLAs were not aware of:

- The calibration characteristics of volumetric apparatus such as "to deliver (TD)" and "to contain (TC)" volumetric pipets.

- The proper labeling of sample containers as to time sample taken, location, analyses to be accomplished for that particlar sample, etc., including identifying the sample as radioactive through radioactive materials identification tape.

- The need to perform a two-point bracket standardization around the expected pH sample range.

- The maximum level the primary sample sink hood door is allowed to be raised to ensure maximum ventilation is available to the sample sink. No maximum level marking was identified on the unit 1 primary sample sink door, which prompted this particular question.

SQN was requested to develop a mechanism to ensure basic laboratory and sampling principles including systems operation are being communicated to the RLAs during their initial inplant training and on a continuing basis.

g. A formalized training program for engineers is needed.

In practice the chemical engineers do not receive the training identified in ES SIL A24 but only undergo the standard three year on-the-job orientation program (SD-3: 18 months as an SD-1 and 18 months as an SD-2). SQN chemical engineering personnel lacked some abilities to implement their assigned chemistry practices effectively. For example, technical specification cognizant engineers were found to lack knowledge of their cognizant technical specification bases, specific analyses that were required of their cognizant technical specification sections, corrective actions to take for an out of specification chemistry condition and overall process awareness--why certain chemicals are chosen for system water chemistry control, how analytical procedures used to analyze cognizant surveillance samples were chosen, qualified, and used, etc.

NSRS discussed the need with plant management for a formalized engineer training program to demonstrate that the chemical engineers are capable of performing their technical specialty.

4. Watts Bar Nuclear Plant (WBN)

Watts Bar implements the requirements specified in the N-OQAM, DPMs N79A7 and N78S2, and the NUC PR division RLA Training Program plant through Administrative Instruction AI-10.1, "Plant Training Program." The procedure provides training outlines and requirements by position as to GET, QA, and specialized training. This document is further defined and implemented through Engineering Section Instruction letters ENSL A5, "Work Experience Documentation," ENSL A22, "Engineering Section Employee Training," and ENSL C24, "WBNP Radiochemical Laboratory Analyst Training Program." Technical knowledge and skill requirements provided by these documents as they related to chemical unit personnel involve only the RLA. No program has been formally established and detailed for the specific training of chemical engineers and chemical unit supervisory personnel.

The WBN RLA inplant training/retraining program as described in ENSL C24 is similar in concept to the RLA inplant training/retraining program presented for SQN in paragraph V.A.3 of this report.

NSRS review of the WBN plant chemistry personnel training activities involved review of GET and of the ES SIL C24 RLA training program including completed/ongoing RLA training documents, qualification books, quarterly tests, and classroom training examinations. NSRS concluded that:

a. The initial inplant training program established for RLAs conceptually meets or exceeds the requirements specified in the division training plan for analyst training. In practice, completion of the program to gain practical experience with chemical treated and contaminated systems is impossible due to the current stage of construction and procedure development at WBN. Presently, spiked samples and carrier solutions are being used to train RLA personnel and loan-outs are being made to Sequoyah to allow the analysts to gain some functional operating experience. Recertification of the RLAs will be required prior to fuel load to demonstrate their technical knowledge and skill adequacy on completed WBN systems and procedures.

b. WBN chemical unit supervisor personnel (SE-6s, SE-7, and M-4) were found knowledgeable of their particular responsibilities and process flow. They were also found actively involved in correcting perceived problems at the WBN facility as well as those which have occurred or are occurring at SQN, demonstrating the unit was "in charge."

c. RLA training records were not being maintained or centrally controlled as QA records as required by AI-4.1, attachment 10, as implemented by ENSL C24, part II, section F. In addition, NSRS found conflicts concerning what documents should be maintained in the plant's training files similar to that described in the SQN writeup presented in V.A.2.e of this report. The corrective action specified by that section should also be considered here.

d. Of 13 chemistry-related personnel randomly chosen by grade for qualification and training review (one M-5, one M-4, one SD-4, one SD-3, one SD-2, two SE-6s, two SE-5s, two SE-4s and one SE-3), only one had received the GET training within the DPM N79A7 required six month time interval after the individual(s) reported for assignment at the plant. None of the 13 met the ENSL C24 requirement of four months. Three of the 13 individuals still had some GET training outstanding. This item was pointed out to management as a management control problem since AI-10.1 requires all section supervisors to ensure their cognizant personnel receive this training within the six month time frame. Management should take appropriate action to ensure all personnel receive their required QA indoctrination training before assigning them any quality-affecting activity to perform.

e. The WBN RLA training program should be PORC reviewed and plant superintendent approved. This item is similar in nature to the item discussed in paragraph V.A.2.c.(3) of this report for BFN where they too had not placed their RLA training program into the station QA system of control. N-OQAM, part III,section 1.1, paragraph 4.2 requires that standard practices are to be written to provide documented instructions of the plant superintendent governing employee actions and establishing standards for plant operation. A formalized system of written instructions is also provided by the N-OQAM to support the standard practices, of which, section instruction letters and division training plans are not part.

NSRS discussed the need with plant management to place the WBN RLA training program into the station's formalized QA system by either placing the division training plan or ENSL C24 into AI-10.1 as an attachment.

f. A formalized chemical engineer training program is needed.

Interviews conducted with WBN chemical engineers identified weaknesses similar to those identified at SQN (V.A.3). NSRS suggested to plant management that a formalized engineer training program be developed and implemented to demonstrate that the WBN chemical engineers are capable of performing their technical specialities.

5. Power Operations Training Center (POTC)

The Nuclear Training Branch stationed at the POTC implements the responsibilities delegated to it by paragraph 17.2.1.1.6 of the TVA Topical Report and Division of Nuclear Power Training plans, as they relate to chemical personnel and activity training, through its established standard practices. The standard practices, in turn, are further implemented by the Laboratory and Training Unit (LTU) through LTU Instruction Letters.

Both sets of documents were reviewed by NSRS to determine if appropriate controls had been established for:

- Instructor certification
- Conduct of the Radiochemical Laboratory Analyst (RLA) Training Program
- Conduct of Training/Retraining LTU RLAs
- Conduct of Training LTU personnel involved in Germanium Detector Calibration

NSRS review of the training center's facilities and activities in training its chemical instructors, RLAs, and radiochemical counting equipment calibration personnel, as well as training new and previously certified RLA personnel resulted in the following findings:

a. The radiochemical laboratory and count room facilities at the POTC were considered well equipped to provide RLA candidates needed hands-on experience with radiochemical equipment through practical application exercises of operation and use. Each trainee is also required to demonstrate acquired knowledge and skills through practical ability demonstrations to determine their degree of proficiency in applying procedures and techniques to operations required by an assigned task.

b. RLA training program instructor lesson plans and audiovisual materials were found appropriate for the content and objectives of the lesson. NSRS review of the RLA training course material and knowledge of RLA difficulties at TVA's nuclear stations identified a need for the RLA training program to be expanded to cover the following topics:

   (1) Preparation and use of QA records.

   (2) Sampling considerations--such as adequate flushing of sample lines, the effect of changing sample flow on suspended solids and radioactive crud, proper identification of samples, etc.

   (3) Infrequent operations--such as placing the steam generators or feed train into wet layup, the addition of bulk chemicals to a system (e.g., component cooling water system), system flushing and cleanliness operations, etc.

   (4) Post-accident sampling, post-fire analysis, and chemical decontamination principles--such as methods of analysis, sample preparation, record keeping, etc.

   (5) Expanded emphasis on proper laboratory techniques--such as the preparation of standards, principles of cross contamination controls, proper use of pipets, etc.

   (6) Characteristics of the hazardous chemicals that are used in the laboratories and systems at the nuclear facilities.

   These elements should be incorporated into the RLA training program whenever time, schedule, and manpower constraints can make it possible.

c. RLA trainee text materials were found appropriate for their intended use but were not found to be compatible with the instructor's lesson plans. RLA text material to be covered in a day may be found in another day's instructor lesson plans; however, all material could be located. POTC is aware of and intends to correct this discrepancy.

d. The POTC instructor certification program as defined in POTC standard practice TCT 16, "Instructor Certification Program," is considered adequate in providing criteria and procedures for provisionaly certifying instructors for the Nuclear Training Branch. NSRS found the certification program as presently written involves mostly teaching technique and inspectors should not be fully certified until they themselves have attended or have experience with that portion of the course they will instruct. This practice would assure that the instructor has the necessary familiarity with the audiovisual materials, lesson plans, text materials, and types of student questions to be expected before an attempt is made to instruct the course.

e. POTC should develop NUC PR chemical training programs for those areas where deficiencies have been identified. The Division of Nuclear Power Training Committee, which is composed of the Manager of Technical Support, Chief of the Nuclear Training Branch, Chief of the Technical Services Branch, and the Division Personnel Officer, has not developed and issued division training plans for: (1) retraining of qualified plant RLAs, (2) training/retraining of plant chemical engineers and supervisors, and (3) replacement personnel(see paragraph V.A.1.a of this report). The Nuclear Training Branch is still obligated through TVA Topical Report 17.2.1.1.6 to develop the division training programs and the training plans if needed to satisfy regulatory requirements and/or TVA commitments.

   NSRS indicated to POTC the need to develop, implement, and administer these programs on an expedited basis. POTC was also alerted for the need to develop training/retraining programs for its own LTU RLAs and radioanalytical equipment calibration personnel.

6. <u>Central Laboratories Services (CLS)</u>

Since no POWER quality assurance indoctrination and training program guidance was provided for CLS to develop their M&TE and chemistry personnel training programs as required by paragraph 17.2.2 of the TVA Topical Report, NSRS reviewed the CLS procedural controls and selected records for implementation of this activity. The review resulted in the following conclusions:

a. Central Laboratories Calibration Procedure 102, R1, "Calibration Personnel Qualification," is considered adequate in delineating the requirements for the qualification of persons who perform calibrations of nuclear chemical test instruments.

b. A documented chemical laboratory personnel qualification program should be prepared and implemented. CLS chemical laboratory personnel provide a nuclear support role to TVA's nuclear facilities involving diesel fuel oil analyses, leachable chloride analyses on wipe cloths, suitability of chemical material checks for use in safety-related systems, and other unique sample analyses which could affect the operation of CSSC items. CLS chemical personnel involved in these analysis activities are required by Criterion II of 10CFR50 Appendix B to be trained sufficiently to be able to demonstrate adequate capability and proficiency before accomplishing their quality affecting assignments.

CLS should develop, maintain, and document a QA training program involving CLS safety-related activities.

B. CSSC Water Chemistry Specifications and Surveillance/Actions Requirements

10CFR50, paragraph 50.34, "Contents of Applications; Technical Information," provides that for each application for a construction permit or operating license a safety analysis report (SAR) is also to be submitted. As part of this SAR the applicant is to include information that identifies and justifies the selection of those variables, conditions, or other items which were determined as a result of the safety analysis and to provide an evaluation of technical specification subjects which may significantly influence the final design and operation of the facility. Specific technical specification requirements are found in 10CFR50, paragraph 50.34.

10CFR50, paragraph 50.71, "Maintenance of Records, Making of Reports," section 50.71(e) states that each utility licensed to operate a nuclear power reactor pursuant to the provisions of paragraphs 50.21 or 50.22 shall update periodically the final safety analysis report (FSAR) originally submitted as part of the application for an operating license as described above. This provision was instituted to assure the information included in the FSAR contains the latest material developed. The updated FSAR is to include the effects of: all changes made in the facility or procedures as described in the original FSAR or latest updated FSAR; all safety evaluations performed either in support of requested license amendments or in support of conclusions that changes (50.59) did not involve an unreviewed safety question; and all analyses of new safety issues performed by or on behalf of the licensed facility at commission request. The updated information is to be appropriately located within the FSAR. The revision is to be filed within 24 months of either July 22, 1980

(July 22, 1982) or the date of issuance of the operating license whichever is later and is to bring the FSAR up-to-date as of a maximum of six months prior to the date of filing the revision. Subsequent revisions are to be made no less frequently than annually.

Therefore, using the criteria specified in 10CFR50.34, 50.59, 50.71 and industry practices, specifications as used in this review area involve all those chemistry variables which are described in the various SAR sections, technical specifications, NSSS vendor requirements, industry guidelines, and as specified by TVA management responsible for water chemistry control as considered essential to enhance nuclear safety; economic component/system/structure reliability including maintainability advantages; and continued availability of the facility. In addition to the prescribed specification limits, specification bases including surveillance and action requirements were also evaluated to ensure that the specifications had been interpreted properly and were of sufficient control to ensure adverse conditions which could affect safety-related structures, systems, and components would be promptly identified and corrected.

1. Division of Nuclear Power Central Office (NCO)

As a means to resolve conflicts between requirements and to establish minimum water chemistry parameter and sampling frequencies during normal operations, NUC PR has issued in DPM N79E2 as Section I, an organized reference by plant of the operational limits of the most important and most frequently encountered systems. Additional analyses other than those identified were considered by the NCO as not usually warranted. However, during times of abnormal or transient chemistry conditions, additional analyses may be necessary in order to better assess the chemical problem.

NSRS review of the NCO's activities in this area involved the methodology used by the Central Office in establishing a water chemistry control parameter and how the specifications are reviewed for adequacy and conflict.

From the review conducted, NSRS concluded that:

a. The concept of formally tabulating by system and plant the water chemistry parameters which should be monitored as a minimum is a good approach for detailing to the plants the commitments made on their behalf for water chemistry control.

b. Credible chemical specifications should be provided to the station facilities. NSRS comparison checks conducted on DPM N79E2 section I, tabulations revealed conflicts existed between the tables and:

- Station operating technical specifications
- FSAR commitments
- NRC licensing correspondence
- Vendor specifications

In general, conflicts were noted between the tables and all documents used in the comparison except for the EPRI secondary water chemistry guidelines issued May 26, 1981. Some of the conflicts noted were:

Browns Ferry (Table B)

- Reactor water istopic analysis of I-131, -132, -133, and -134 required to be performed monthly by station technical specifications were not included in table B-1.

- Reactor water pH limits presented in table B-1 are not consistent with plant technical specifications.

- No specifications were provided to monitor sodium pentaborate concentrations on a monthly basis as required by plant technical specifications.

Sequoyah (Table E)

- Technical specification requirements of monitoring dose equivalent iodine-131 and gross activity concentrations during modes 4 and 5 RHR operation and modes 1 and 2 steam generator operation were not provided.

- Dissolved hydrogen concentration during reactor operation and prior to opening the reactor vessel after shutdown conflict with the specification provided in table 5.2.22 of the SQN FSAR.

- The sodium molybdate tolyltriazole chemistry treatment of the component cooling water system (table E-18) conflicts with the potassium chromate treatment presented in table 9.2-2 of the SQN FSAR.

Watts Bar (Table F)

- Same concerns identified for SQN.

- No final feedwater chemistry specifications to comply with FSAR, EPRI requirements, and inferred NRC licensing requirements.

In addition to the conflicts identified above, CEG failed to perform unreviewed safety question determinations (USQDs)for those changes made to BFN and SQN's safety analysis reports (SARs) which the facilities are now operating by. The criteria for determining whether an "unreviewed safety question" exists are defined in paragraph (a)(2) of 10CFR50.59. Essentially, the language of the guidance provides that any proposed change to a system or procedure as described in the SAR, either by text, drawing, or table, should be reviewed by the licensee to determine whether it involves an "unreviwed safety question" prior to performance of that change.

Therefore, the changes made with the chemical treatment of the SQN component cooling water system (FSAR table 9.2-2), SQN silica concentration limits involving condensate demineralizer effluents (FSAR table 10.4-1), SQN maximum dissolved hydrogen concentration limits for the reactor during startup and subsequent power operation (FSAR table 5.2-22/9.3-5), BFN maximum chloride limit for the condensate storage tanks (FSAR figure 8.2-2), among others should all have had an "unreviewed safety question" determination performed prior to the issuance of the DPM and performance of the change. The stations all felt this responsibility had been accomplished by the Central Office.

NSRS discussed with the Central Office the need to provide credible specifications to the plant which meets all licensing, regulatory, industry, and TVA requirements.

2. Browns Ferry Nuclear Plant (BFN)

Browns Ferry has implemented the plant parameter specification requirements defined in its station's technical specifications, and provided in General Electric Fuel Warranty Operating Instructions-contract No. 79P66-143178, through Section Instruction Letter (SIL) 16, section 300, "Water Quality Limits." Division specifications provided in DPM N79E2 Section I were not being implemented due to the inadequacies discovered upon BFN review of the issued document.

NSRS review of this area involved evaluation of the criteria specified in V.B above. The evaluation concluded that:

a. Procedures had been written to cover all chemistry specified technical specifications including action statements. However, several conflicts were noted as discussed in b. and c. below.

b. Station documents should be reviewed for technical content and to resolve specification conflicts. Several conflicts and inaccuracies were found in station documents which could result in an out-of-compliance condition or exceeding of a safety analysis value. Examples of this condition include:

(1) Table 300.1 of BF RLM 300 for steaming conditions 100,000 lb/hr does not provide parameter specifications or action level requirements covering dissolved oxygen, silicon, dose equivalent I-131 concentrations or gross reactor coolant activity.

(2) A number of BFN system operating instructions call out parameter specification requirements which are contrary to FSAR specifications. These include SOI-2, -3, -70, -74, and -78.

(3) Surveillance Instruction 4.6 requires a minimum flush time of two minutes prior to taking a representative sample for analysis. RLM 700, appendix B, specifies flush times up to ten minutes. The bases for the RLM 700 flush times could not be supported readily. BFN should reevaluate the flush times for their sample points.

(4) There is no definition provided in SI-4.6 as to what constitutes an equilibrium power operation in order to determine activity concentrations in the reactor coolant. A premature determination could result in erronous nonconservative iodine values being tabulated in which corrective action would not be taken.

(5) There was no accumulated time provisions in reactor coolant surveillance instructions to track when conductivity, chlorides, and dose equivalent iodine concentrations had exceeded their maximum allowable technical specification operational limit (see technical specifications 3.6.B.3 and 3.6.B.6).

In addition to the conflicts identified above, BFN failed to perform USQDs for those changes made to the BFN SAR.

NSRS discussed the need with BFN station management to perform a technical review to resolve specification conflicts and to document required 10CFR50.59 safety evaluations.

c. An evaluation of technical specification surveillance requirements for reactor coolant iodine activity and action levels should be performed.

BFN Technical Specification 3.6.B.6 provides iodine activity limits both for equilibrium and transient conditions low enough to:

- ensure that the 2-hour thyroid and whole body dose resulting from a main steam line failure outside the containment during steady state operations will not exceed small fractions of the dose guidelines provided in 10CFR100 and to

- accommodate possible iodine spiking phenomenon which may occur following changes made in core thermal power.

The BFN technical specification states that whenever the reactor is critical, the limits on activity concentration in the reactor coolant shall not exceed the equilibrium value of 3.2 uc/gm of dose equivalent I-131. This limit may be exceeded following power transients up to 26 uc/gm for a maximum period of 48 hours. Levels greater than 26 uc/gm will require an immediate shutdown of the reactor and closure of the main steam isolation valves (MSIV) to prevent the release of activity to the environs should a steam line rupture occur outside containment.

Surveillance requirements are established to detect excessive specific activity levels that may exist in the reactor coolant which would thereby provide station operations personnel sufficient time to take appropriate corrective action. Surveillance measures involve performing an iodine check during equilibrium power operation conditions once a month. In recognition of the fact that when the reactor core contains fuel elements with small defects the activity concentration in the coolant will increase during and following a transient, technical specifications contain special surveillance requirements to assure that higher levels of activity do not persist for lengthy time periods above the acceptable equilibrium activity. BFN Technical Specification 4.6.B.6 contains four conditions requiring additional sampling at four-hour intervals. However, because of the wording in the technical specification, provision for additional sampling at the time of transients has been nonexistant.

BFN performs one analysis per month on dose equivalent I-131 to satisfy the technical specification which pertains to equilibrium operation. If the resultant value is less than .032 uc/gm no additional samples will be analyzed for dose equivalent I-131 until the following month even if one of the four transient conditions identified in the technical specification occurs. A BFN engineering section representative stated that the basis for this is that operating at less than the .032 uc/gm level assures that station dose equivalent iodine levels will not exceed 3.2 uc/gm following a transient condition. For those monthly dose equivalent I-131 levels determined to be greater than .032 uc/gm, the surveillance is placed on the action list to perform the four-hour analysis should one of the four transient conditions occur. The BFN bases for this is because the equilibrium value of dose equivalent I-131 is such that the 3.2 uc/gm limit may be exceeded and the four-hour analysis would assure that if 26 uc/gm limit is exceeded the reactor will be shutdown and the MSIVs closed quickly.

NSRS believes that the technical specification, section 4.6.B.6 is deficient in that it does not require special surveillance sampling following transients when the equilibrium concentration is less than 0.032 uc/gm. This technical specification as presently written does not provide the assurances indicated in the "Bases" for the technical specification and the "Bases" do not provide a technical bases for assuring that following one or more transients the activity level will not exceed 3.2 uc/gm. Although the BFN plant personnel appear to be following the technical specification provisions, NSRS considers the technical specifications to be deficient and believes they should be rewritten or proper justification for the existing specifications provided.

3. Sequoyah Nuclear Plant (SQN)

SQN has implemented the plant parameter specification requirements defined in its station's technical specifications and DPM N79E2 through Technical Instruction TI-27, "Chemistry Specifications, Units 1 and 2." NSRS review of this area involved evaluation of the criteria specified in V.B above and concluded that:

a. Surveillance procedures had been written to cover all chemistry specified technical specifications including action statements. However, several conflicts were noted as will be discussed in b. below.

b. Specification criteria conflicts between TI-27 and the FSAR, NSSS vendor, SOIs, and NRC licensing correspondence should be resolved. NSRS review of TI-27 which sets forth water chemistry specifications applicable for all plant testing and operational modes as it relates to commitments made in the FSAR, NSSS vendor documents, station operating instructions, and NRC licensing correspondence identified several conflicts which will require station resolution. Examples of these conflicts include:

- TI-27 specification conflicts with FSAR commitments

TI-27 (Table 1 - Reactor Coolant)	(FSAR Table 2-2/9.3-5)
Hydrogen: 25-50 cc/kg	25-35 cc/kg
Conductivity: .50-20 umho/cm	1-40 umho/cm

TI-27 (Table 41-Component Cooling Water	FSAR (Table 9.22)
Corrosion Inhibitor: Sodium Molybdate	Corrosion Inhibitor: Potassium Chromate
Tolyltriazole	
Flouride: <0.15 ppm	0.1 ppm

- Hydrazine values provided in TI-27, Tables 38 and 39, exceed the limits specified by TVA to NRC in letter from L. M. Mills to A. Schwencer (NRC:NRR) dated August 13, 1980.

TI-27 (Tables 38, 39)	TVA to NRC Letter
N_4H_4: .02 - .1 ppm	<0.015
Sample Performance: Weekly	1/72 hrs

- TI-27 conflicts with NSSS vendor requirements

TI-27 (Table 12 - Primary Water Storage Tank)	Westinghouse
CI: 0.15 ppm	<0.1
F: 0.15 ppm	<0.1

- TI-27, Table 42, conflicts with Station Operation Instruction SOI-012.01 on Auxiliary Boiler Specification Maintenance.

It should be pointed out that TI-27 complies exactly with the specifications identified in DPM N79E2, section I, which may have led to the conflicts addressed above. Station management was under the impression that the central office had resolved these conflicts prior to their issuance of the DPM which was not the case. Though the central office may appear to be at fault in this matter, the station manager is still required by N-OQAM, part I, section 2.1, to verify that objective and performance defined during the design and construction phase are not degraded during subsequent phases of plant operation. Therefore, these conflicts along with others identified were given to station management for resolution through technical correspondence and 10CFR50.59 safety evaluations.

4. Watts Bar Nuclear Plant (WBN)

Watts Bar has implemented the plant parameter specification requirements defined in its station's draft technical specifications, FSAR, and NSSS vendor requirements through TI-27, Part I, "Water Chemistry Specifications." Similar to BFN, WBN had not implemented the division specifications provided in DPM N79E2, section I, due to the inadequacies identified upon WBN review of the issued document.

NSRS review of this area involved evaluating the criteria specified in V.B above as it related to WBN's program. The evaluation concluded that:

a. WBN had written surveillance procedures to cover all chemistry specified technical specifications as proposed, including action statements.

b. Specification criteria conflicts between TI-27 and the FSAR, NSSS vendor, SOIs, and NRC licensing correspondence should be resolved. NSRS comparison of TI-27 to commitments made in the FSAR, NSSS vendor documents, station Operating Instructions, and SQN to NRC licensing correspondence for indirect WBN commitments showed all specifications were identified within the body of TI-27 but final resolution of conflicts had not yet been accomplished. NSRS identified the conflicts noted between these documents and TI-27 including those conflicts identified with DPM N79E2, section I, to station management to aid in the resolution process. NSRS also noted to station management the need to alert the central office when DPMs they (NCO) issue conflict with criteria established by the plant or for the plant and are possibly not known by the NCO.

C. Chemical and Radiochemical Laboratory Analytical and Sampling Procedures

Criterion V, "Instructions, Procedures, and Drawings" of Appendix B to 10CFR50 requires that activities affecting quality at nuclear power plants be prescribed by written procedures of a type appropriate to the circumstances and accomplished in accordance with these instructions and procedures. Instructions, procedures, or drawings are to include appropriate quantitative or qualitative acceptance criteria for determining that important activities have been satisfactorily accomplished.

TVA has satisfied this requirement by presenting a brief description of its written program for assuring quality activities are prescribed by documented procedures, instructions, and drawings in subsection 17.2.5 of TVA Topical Report TVA-TR75-1A, R5. The POWER Quality Assurance Program to document the implementing controls for this activity are detailed in OP-QAP-5.2, R0, Instructions, Procedures, and Drawings."

This area was reviewed to verify that the established program provides necessary controls to ensure analytical and sampling procedures are:

- written to implement station technical specifications and other licensing and TVA commitments;

- of proper content, clarity, applicability, accuracy, and comprehensiveness;

- are being utilized at the work station for nonroutine activities or were available for use if needed for routine activities.

1. Division of Nuclear Power Central Office (NCO)

N-OQAM, part III, section 1.1, paragraph 4.0, describes the NUC PR Quality Assurance Program to implement the POWER QA Program described above. This paragraph requires that activities which affect nuclear safety shall be prescribed in documented procedures and instructions. The requirements of such procedures and instructions are mandatory and shall be complied with by responsible organizations and individuals. Changes to these procedures must be made in a controlled fashion before they can be implemented into the work activities.

In order to ensure as much uniformity in the control of nuclear plant water quality as practical, the Central Office prescribed in DPM N79E2, Section II, to the extent possible, analytical procedures to be used to satisfy licensing, regulatory, code, and TVA requirements. The procedures were developed from industry standards, e.g., ASTM or standard method procedures. NSSS vendor or chemical vendor procedures were referenced only when no industry standard procedures were available. The procedures were identified to be explicit enough that they could be used as written or the plant may incorporate the procedures into any site instruction necessary to implement its use at the plant provided the technical content was not altered.

The activities evaluated for the Central Office in the area of chemical and radiochemical laboratory analytical and sampling procedures involved the methodology used by which proposed procedures are prepared, qualified, and issued.

From the review conducted, NSRS concluded that:

a. The concept of standardized analytical procedures is a good approach to ensure consistency between the plants.

b. Procedures presently addressed in DPM N79E2, Section II, cover only conventional water chemistry. The need to expand these procedures to cover radioanalytical practices was discussed with the Central Office.

c. There were no procedural controls established for Central Office preparations, qualification, and issuance of analytical procedures.

d. There is no documented qualification of analytical procedures prior to issuance from NCO for plant use. ANSI N18.7-1976, paragraph 5.2.15 requires those organizations which are reviewing documents for implementation or change to have access to pertinent background information upon which to base its approval and to have an adequate understanding of requirements and intent of the original document.

NSRS review of the Section II of DPM N79E2 analytical procedures found inconsistencies existed between what the procedures specified and what was denoted in NSSS vendor and ASTM procedures, including simple stoichiometry. These inconsistencies involved missing critical variable maintenance precautions, technically incorrect chemical equation balancing, inadequate analysis technique, and missing interference accountability. No formal record documents had been prepared to establish the fact that the procedures had been tested and qualified prior to their issuance for implementation. Had this been accomplished, the inaccuracies could have been prevented.

NSRS discussed with the Central Office the need to test and to document analytical procedure qualifications prior to issue for use.

2. <u>Browns Ferry Nuclear Plant (BFN)</u>

Browns Ferry implements the requirements of N-OQAM, part III, section 1.1, for prescribing activities which affect nuclear safety involving water quality through Standard Practices BF 2.3, "Review, Approval, and Use of Instructions," and BF 17.12, "Water Quality Program." These documents are further implemented by Technical Instruction TI-38 and the Radiochemistry Laboratory Manual (RLM) Engineering Section Instruction letter (SIL) 16. TI-38 was issued to provide a convenient mechanism for obtaining PORC review of all radiochemical laboratory manual procedures referenced by surveillance instructions without reviewing the entire or portions of the RLM. The RLM itself is established and administered by the engineering section supervisor.

NSRS review of this area involved performing an evaluation of the criteria addressed in V.C above as they related to:

- Sample frequency schedule
- Sampling procedures
- Conventional analytical methods
- Radiochemical analytical methods
- Counting room procedures
- Preparation of standards and carrier solutions
- Operation of the Atomic Absorption Unit

The evaluation concluded that:

a. Chemical and radiochemical laboratory analytical and sampling procedures have been written to cover all activities prescribed by station technical specifications, licensing commitments, and system operating instructions. In addition, some existing procedures were found technically deficient. Examples are as follows:

(1) Procedures had not been prepared for the calibration and operation of equipment needed to verify technical specifications requirements.

BFN technical specifications provide water chemistry and effluent discharge limits to prevent damage to the reactor materials in contact with the coolant medium and to prevent offsite releases which could cause the dose guidelines of 10CFR100 to be exceeded. The surveillance requirements established provide adequate assurance that concentrations in excess of prescribed limits will be detected in sufficient time to take necessary corrective action. To support the technical specifications, equipment necessary for accurate determinations of parameters, including isotopic analysis, need to be calibrated and operated in accordance with approved and controlled procedures.

(2) Procedures were found technically deficient.

NSRS review of Chemistry Section cognizant procedures found many technically deficient or containing conflicting criteria. Examples include:

- The chloride calibration curves generated for the Hach 2100A turbidimeters did not cover the full range of operation required by technical specifications--that of 500 ppb, (technical specification 3.6.B.3.b). The curves covered a range up to 350 ppb.
- Technical inadequacies as described in V.B.2.b

b. Inadequacies exist in the managment control over procedures used in the chemical and radiochemical analytical program. Specific examples of inadequacies include:

(1) Procedures are being used to perform CSSC-related activities without adequate review by PORC contrary to the requirements of BFN Technical Specifications 6.3.A and 6.3.B.

TI-38 was established to provide a convenient mechanism whereby PORC could review all radiochemical laboratory manual procedures referenced by PORC-reviewed, plant superintendent-approved surveillance instructions.

NSRS review of other PORC-reviewed, plant superintendent-approved documents, such as system operating instructions (SOIs), revealed parameter analysis requirements not supported by TI-38 but included in the RLM, e.g., RLM 903 is needed to support a boron analysis requirement specified in SOI-2. In addition, alternative procedures to be used when the primary method is unavailable are not detailed in TI-38 but are specified in the RLM, e.g., procedure for sampling residual heat removal (RHR) water when reactor water cleanup system is isolated and on RHR cooling (RLM 728) is not detailed in TI-38. Other examples exist involving nonidentified TI-38 RLM procedures, such as RLM 718, 718A, 724A, 737, 742, 752, 918, 936A, 936B, 954, 1140, 1304, among others.

(2) NSRS review of counting room procedures used to satisfy the regulatory guide commitment on effluent monitoring (RG 4.15) identified that equipment addressed in procedures for control was no longer in the count room and had been retired. The new multichannel analyzer systems being utilized were not identified in the program, nor were they being calibrated by approved procedures. Laboratory personnel were found using out-of-date procedures and recording data on out-of-date worksheets provided for equipment no longer in use. Similar problems were also discovered on the conventional water chemistry side whereby new spectronic equipment was not identified for use or control in RLM 1800.

Procedures for the calibration, use, and quality control for radiochemical laboratory equipment should be prepared, PORC reviewed, and approved.

(3) Procedures were found not being followed.

The following examples were observed:

- Performance of a turidimetric chloride analysis with locally prepared calibration curves and corresponding data tables of a vintage later than those approved for use by TI-38 and RLM 907.

- DPM N79E2, section II, analytical procedures had not been implemented into the RLM as required by DPM N71A1, "Division Procedures Manual (Nuclear)." The June 9, 1982 edition of this document requires the user organization to implement division directives (DPMs) within 30 days of receipt or to take exception. Neither vehicle of action had been taken by the BFN Chemistry Unit and the RLM conflicted with DPM N79E2 requirements on analytical procedures to be used, action levels for out-of-specification chemistry conditions, parameters to be monitored, and parameter specification ranges.

- Radioanalytical count room equipment was being operated and maintained by outdated instructions.

Benefits could be derived by placing all chemistry cognizant procedures (except surveillance instructions) into a comprehensive QA program document with direct controls versus the apparently uncontrolled RLM.

3. Sequoyah Nuclear Plant (SQN)

Sequoyah implements the requirements of N-OQAM, part III, section 1.1, paragraph 5.0, for establishment of water quality control procedures through AI-4, "Plant Instructions -Document Control." This document is further implemented by technical instructions and lower-tiered section instruction letters.

NSRS review of this area involved the same topics as previously discussed in C and C.2. The following findings were identified:

a. Chemical and radiochemical laboratory analytical and sampling procedures had been written to cover all activities prescribed by station technical specifications, licensing commitments, system operating instructions, and by division directive (DPM N79E2).

b. A majority of the Chemistry Section procedural deficiencies identified by NSRS in NSRS reports R-81-01-SQN and R-81-24-SQN had been resolved.

c. Inadequacies exist in the SQN chemical analytical procedures. Problems identified in the division directive DPM N79E2, section II, were carried, in most cases, into the plant's analytical method procedures TI-11. TI-11 itself also included technical inaccuracies, cases of vagueness, and limited degrees of implementation. Examples include:

   - Mercuric thiocyanate color method procedure TI-11, B.9, used for chloride determinations does not ensure the temperature of the calibration standards are maintained at normal laboratory ambient conditions (25°C) during calibration and that thermally hot samples (if greater than room temperature) be cooled to the same temperature as the solutions prepared for calibration. If not accomplished as stated, inaccurate determinations of chloride concentrations could result (see also ASTM D512-1975, page 322).

- Boron monmitol titration method procedure TI-11, B.5, used to determine boron in aqueous boric acid solutions does not determine the ppm boron masked by alkali added to the primary coolant for pH control (in the case of SQN-lithium hydroxide). Alkalie's tend to neutralize the boric acid in solution and the amount of neutralization must be determined and added to the apparent boron to acquire the corrected ppm boron concentration. This item had been previously pointed out to the SQN plant chemistry staff in January 1981 (NSRS report No. R-81-01-SQN) with no apparent corrective action taken on the matter. Similarly, Westinghouse has stated in WCAP-7333, R1, that the effect of coolant pH control alkali is small at beginning of cycle with high boron concentrations (1100 ppb boron) but is significant near end of cycle due to the much lower boron concentrations (50 ppm boron).

- Turbidimetric method procedure TI-11, B.10 used for chloride indication prepares a silver nitrate standard solution with a normality of one normal (1N) is mathematically incorrect. A crushed, dry weight of silver nitrate crystals used was 11.587 grams versus an industry standardized weight of 16.989 grams. Preparation of the lesser concentrated silver nitrate solution could have resulted in nonconservative values of chloride concentrations being identified.

NSRS believes that SQN plant chemistry staff should review their TI-11 analytical procedures and evaluate DPM N79E2, section II, prior to implementing them directly into their program.

4. Watts Bar Nuclear Plant

Watts Bar implements the requirements of N-OQAM, part III, section 1.1, paragraph 5.0, for establishment of water quality procedures through standard practices WB 3.0, "Plant Instructions," and WB 6.1.10, "Water Quality Manual." These documents are further implemented by technical instructions and lower-tiered section instruction letters.

NSRS review of this area involved the same topics discussed in paragraph V.C and V.C.2 above. The following findings were identified:

a. Chemical and radiochemical laboratory analytical and sampling procedures have been written or are being prepared to support all activities prescribed by proposed station technical specifications, licensing process correspondence, NSSS vendor requirements, and system operating instructions. Since conflicts still exist between potential licensing, EPRI, and NSSS vendor requirements, procedures have not been finalized.

b. NSRS determined that DPM N79E2, section II, analytical procedures have not been implemented into the WBN Water Quality Program. The basis for this noncompliance with the requirements of DPM N71A1 involved a WBN discovery of several significant stoichiometric errors in the dilution factors provided by the DPM and the station management attitude expressed in WB 6.1.10 that the DPMs will be implemented as deemed pertinent and necessary into plant documents.

5. Power Operations Training Center (POTC)

POTC procedures for operation of the radiochemical laboratory are provided by the POTC Radiochemical Laboratory Manual (RLM). NSRS review of POTC activities involved performing an evaluation of the controls identified in V.C as they relate to POTC chemical and radiochemical support to the nuclear plants.

NSRS review of this area determined:

a. The procedures for the RLM are prepared at the POTC by the chemical staff but receive no upper-management review and approval. In addition, there are no requirements for periodic review and controls for use and revision of the procedures. As POTC performs safety related support activities for the licensed nuclear plants, procedures used to control these functions should be provided with formal controls.

6. Central Laboratories Services (CLS)

CLS implements the requirements of OP-QAP-5.2 and MCS-QP-1.0 by its laboratory test procedure manuals or through use of manufacturer's instruction books. NSRS review of CLS activities involved performing an evaluation of the controls identified in V.C as they related to chemistry support activities: specifically diesel fuel oil analytical methods.

NSRS review of this area determined that:

a. Diesel fuel oil analyses were being conducted to the latest revision of table 1 to ASTM D975 and logged as required by BFN and SQN operating license technical specifications.

b. Though the central laboratory utilizes the latest version of ASTM D975, the stations have been providing the central laboratories diesel fuel oil samples with biocide additives included. The biocide is being added as a matter of station policy at WBN and SQN; however, no biocide is added at BFN. The effects of the biocide as an interference to diesel fuel oil results are not known nor have they been evaluated.

In addition, SQN has requested CLS to perform an additional analysis of the diesel fuel oil samples it transmits to the lab for analysis, that of, an oxidation test to determine the total organic carbon in the homogeneous oil sample. In this case, a sample analysis method is provided for in the ASTM as ASTM D-2274, part 24.

NSRS discussed the reed for the CLS Chemical Laboratory Section to prepare a procedure to document their activities as they relate to:

- The use of ASTM procedures directly.
- Performance of qualification tests to provide necessary assurance that the analytical methods prescribed in ASTM procedures are still accurate even in the presence of additives or other interferences.
- A listing of ASTM procedures including specific methods approved for lab use to prevent unsanctioned use of alternate methods.

NSRS recognizes that the CLS Chemical Laboratory Section is required to perform on request a variety of unique analyses on all types of materials, some of which are safety related, which require technical expertise and judgment. Formal controls to the extent practical should be provided for these safety-related activities and the methods used should be fully documented in the reports to the requesting organization.

D. <u>Laboratory Quality Control</u>

Section 6.2.8.1 of the BFN Unit 1 Technical Specifications indicates that the performance of applicable activities will meet the criteria of NRC RG 4.15, "Quality Assurance for Radiological Monitoring Programs (Normal Operations) -Effluent Streams and the Environment," December 1977. Section 6.8.1.h of the SQN Unit 1 Technical Specifications requires that written procedures be established, implemented, and maintained delineating a quality assurance program for effluent monitoring using the guidance contained in RG 4.15, December 1977. These are licensee commitments to the NRC and were used for the basis of the review of this area by NSRS.

Regulatory Guide 4.15 states in part that quality assurance comprises all those planned and systematic actions that are necessary to provide adequate confidence in the results of a monitoring program and quality control comprises those quality assurance actions that provide a means to control and measure the characteristics of measurement equfpment and processes to establish requirements: therefore, quality assurance includes quality control. For the purposes of this review quality control functions pertaining to the radiochemical laboratory equipment and practices were evaluated and were not extended into the area of process radiation monitoring. The scope of RG 4.15 is limited to the elements of a documented quality control program acceptable to the NRC to ensure the quality of results of measurements of radioactive materials in the effluents and the environment during normal operations. However, the same type of requirements should be considered in developing a quality control program for other laboratory activities and equipment used in evaluating safety-related functions, such as the following:

- Generating information used as a bases to adjust the reactivity of the reactor core through soluble posion shim control or emergency shtudown systems.

- Generating information that will be used in evaluating the structural integrity of critical systems.

- Monitoring safety-related parameters to prevent deterioration of conditions that can affect both the longevity of the plant and/or the radiation doses to operational personnel and the general public.

Regulatory Guide 4.15 states in part that a quality assurance program (including a laboratory quality control program) is needed for the following reasons:

- To identify deficiencies in the sampling and measurement process to those responsible for those operations so that corrective action can be taken.

- To provide a means of relating the results of a particular monitoring program to the National Bureau of Standards and thereby to provide a common basis for comparing the results of various programs.

- To obtain some measure of confidence in the results of the monitoring programs in order to assure the regulatory agencies and the public that the results are valid.

It should be noted that incorrect results or results of poor quality are usually worse than no results at all as actions taken and the conditions achieved are sometimes irreversible.

be included with the program at the first opportunity. The program as delineated in the DPM is comprehensive and, if properly implemented, should ensure the validity and reliability of the data generated by the NUC PR radiochemical laboratories.

b. The NCO is meeting some but not all of the goals and objectives established in section III of DPM N79E2. Some examples are noted as follows:

- Paragraph 2.0 of section III of DPM N79E2 states "The NCO Chemistry Section will originate the chemical and radiochemical analytical procedures required to implement NPDES requirements, technical specifications, and additional requirements necessitated by Regulatory Guide 4.15." This is a good concept and would have eliminated a lot of duplication of effort, ensured uniformity, promoted efficiency and allowed the plant chemical units to devote more time to defining and correcting plant operational problems. However, it would have required close cooperation between plant staffs and NCO personnel and significant effort by the NCO Chemistry Section to meet the commitments in the specified timeframe.

  In reality each plant's chemical staff has individually prepared the procedures addressed in paragraph 2.0 of section III of DPM N79E2 in order to meet specific plant scheduling and operational commitments. The plants have in the past been reluctant to implement procedures issued by the NCO in a timely manner as they naturally felt that their procedures were developed to suit their needs and the procedures issued by NCO had not been timely and free from errors. The results of individual plant efforts are procedures that are not uniform from plant to plant and inefficiency as each plant has to reinvent the wheel. Some of this was unavoidable as BFN procedures were developed several years before the NCO was staffed to provide this function.

- Paragraph 2.0 further states, "The quality control data from the RCLs will be sent to the Supervisor, NCO Chemistry Section, at designated intervals for inclusion in the summary reports to be prepared by the NCO Chemistry Section." Contrary to this requirement, this data is not being sent to the supervisor Chemistry Section on a routine basis.

c. CEG is not active in assuring implementation of the requirements of the program specified in section III of DPM N79E2.

Paragraphs VII and VIII of DPM N71A1 specify that when a DPM or revision to a DPM is received by a user organization, it will be reviewed for applicability, returned for correction if needed, a waiver requested, or an implementation schedule submitted. These activities are required to be completed within 30 days of receipt of the DPM or revision to DPM.

Section III of DPM N79E2 was issued originally in October 1981 and revised in June 1982. None of the nuclear plants had returned the DPM for correction, requested a waiver, submitted an implementation schedule, or fully implemented the requirements of the DPM. The NCO personnel were generally unaware of the status of the implementation of the requirements of the DPM at the plants.

In summary, BFN and SQN are required by their respective technical specifications to meet the requirement of RG 4.15. In addition, there is a definite need at the facilities for the type of program delineated by section III of DPM N79E2. Lack of aggressive NCO actions to meet their commitments in a timely manner and to enforce the requirements of the DPM to provide this program for the plants in a timely manner has weakended its credibility. The DPM system will not function well unless an effort is made by the NCO to follow up in the implementation and use of feedback from the plants to correct and improve the programs.

NSRS recommends that the NCO enforce the requirements of section III of DPM N79E2. Failure to enforce the implementation of the requirements of DPM N79E2, section III and RG 4.15 could result in a condition where the ability of the Chemical Units to perform quality analyses could be impaired.

2. <u>Browns Ferry Nuclear Plant (BFN)</u>

The radiochemical laboratory quality control program at BFN is delineated in the following Radiochemical Laboratory Manual Sections:

- Section 500, "Radiocheamical Laboratory Instrument Quality Control"
- Section 1200, "Operation of Counting Room Equipment"
- Section 1800, "Chemical Laboratory Instrument Quality Control"

The stated purpose of section 500 was to describe the test procedures, acceptance criteria, and testing frequency necessary to ensure the quality of analytical results produced by the laboratory instrumentation. Section 1200 contains operating instructions and information for the laboratory counting room equipment. Section 1800 provides procedures and methods used to ensure that conventional analytical equipment is operating within tolerance when compared to known standards and that calibration checks are performed as scheduled for the respective equipment.

The evaluation conducted at BFN involved a review of those plant documents described above to determine if they implement the requirements of RG 4.15 and section III of DPM N79E2.

The review at BFN concluded the following:

a. BFN management has assigned one chemist the primary responsibility for implementing the radiochemical laboratory quality control program, developing and modifying radiochemical procedures, and training laboratory and chemical section personnel in counting techniques. However, NSRS review of these activities revealed that the job as intended was not getting done. Examples of inadequacies are as follows:

   - Applicable procedures were found out-of-date, nonexistant, or not being used.

   - During a review of section 500 worksheets for Ge(Li) detector resolutions for "Select Code I" and "Select Code III" detectors, it was noted that the detector resolutions had exceeded the limits specified in section 1200 of the RLM by a significant amount in May 1982. A technical evaluation of the poor detector resolution was not made and safety-related analyses were performed with the instruments in a possibly defective (nonconforming) condition. These instruments should have been promptly removed from service, a technical evaluation performed and documented to determine their actual conditions, and all of the analyses performed during the questionable period evaluated to ensure the quality and validity of the results. These actions were not taken for approximately two months and the instruments remained in service for use.

   The duties formally assigned in this area are deserving of full time attention and strong management support should be exercised to ensure that these duties are executed.

b. A quality control program to meet the requirements of RG 4.15 and section III of DPM N79E2 has not been implemented at BFN. This conclusion is based upon the following indications noted by NSRS during this review:

- Section 6.2.8.1 of the BFN Technical Specifications states that applicable activities are to meet the criteria of RG 4.15. Section III of DPM N79E2 which defines the laboratory quality control program to meet this requirement for the nuclear plants was issued originally in October 1981 by NCO to give guidance to the plants in this area. Paragraphs VII and VIII of DPM N71A1 specify that when a DPM or revision to a DPM is received by a user organization, it will be reviewed for applicability, returned for correction if needed, a waiver requested, or an implementation schedule submitted. These actions are required to be completed within 30 days of receipt of DPM or revision to the DPM.

  Standard Practice BF 17.12, "Water Quality Program," requires that a comprehensive program shall be prepared and implemented to include, as a minimum all applicable water quality requirements contained in the BFN Technical Specifications and DPM N79E2. Contrary to these requirements, a laboratory quality control program has not been prepared and implemented that meets the requirements of RG 4.15 and section III of DPM N79E2. This section of the DPM was not returned for correction, a waiver requested, or an implementation schedule submitted. In addition, the NRC had identified in October 1981 conditions similar to those found by NSRS that indicated a need for program improvement.

- Laboratory nuclear counting room equipment are not being calibrated in accordance with approved procedures as calibration procedures for some of this equipment has not been written.

- Sections 500 and 1200 of the RLM were found to contain procedures for equipment that had been retired and no longer in use. It was also found that these sections did not contain procedures for equipment that is currently in use. Examples of equipment currently in use with no quality control and operating procedures are the "Select Code III" gamma ray spectormeter system and the liquid scintillation counting system. Laboratory personnel were observed by NSRS performing safety-related analyses with this instrumentation even though approved operating and quality control procedures were not available and recording quality control data on outdated worksheets that were in some cases for equipment not in use.

- Procedures are not written to implement the requirements of Table 3.1.2.A, "Laboratory Instrument

Inspection and Calibration Schedule, and Table 3.1.2.B, "Calibration Schedule for Radiochemical Laboratory Counting Equipment," of section III of DPM N79E2.

- There are no plant requirements for duplicate sampling and analysis for safety-related parameters (with the exception of NPDES system) as required by part 3.1.5 of section III of DPM N79E2.

In summary, as the conditions as detailed in a. and b. above are similar to those identified by NRC approximately one year ago and the fact that the laboratory quality control program appeared to be deteriorating further, NSRS requested that NUC PR and BFN management take prompt corrective actions to correct these conditions.

3. Sequoyah Nuclear Plant (SQN)

The radiochemical laboratory quality control program for SQN was delineated by the following documents:

- Technical Instruction (TI)-14, "Operation and Maintenance of Chemical Laboratory Analytical Instrumentation"
- Technical Instruction (TI)-15, "Operation of Radiochemical Laboratory Counting Equipment"
- Technical Instruction (TI)-20, "Chemical Laboratory Test Equipment Calibration Program"
- Technical Instruction (TI)-49, "Radiological Chemical Laboratory Test Equipment Calibration Program"

These documents provide procedures for calibration, quality control checks, use, and operational maintenance of radiochemical analytical and nuclear counting equipment.

The evaluation at SQN consisted of a review of those plant documents described above to determine if they implement the requirements of RG 4.15 and section III of DPM N79E2.

The review at SQN concluded the following:

a. At SQN a plant chemist has been assigned responsibility of maintaining the nuclear counting room, ensuring procedures were updated and implemented, and training personnel in the proper use of the equipment. These duties are the primary function of this individual. The individual was determined to be very knowledgeable of his responsibilities and in the operation and use of radiochemical laboratory equipment and procedures. This was identified by NSRS to station management as a positive aspect of the laboratory quality control program.

b. Section 6.8.1.h of the SQN Technical Specifications requires that written procedures are to be established, implemented, and maintained covering the quality assurance program for effluent monitoring, using the guidance contained in RG 4.15, December 1977. Section III of DPM N79E2 issued initially in October 1981 summarized these requirements and delineated a program to be implemented by the plants. Paragraphs VII and VIII of DPM N71A1 specify that when a DPM or revision to a DPM is received by a user organization, it will be reviewed for applicability, returned for correction if needed, a waiver requested, or an implementation schedule submitted. These activities are required to be completed within 30 days of receipt of the DPM or revision to the DPM.

Contrary to these requirements, a laboratory quality control program has not been established to include all of the requirements of RG 4.15 and section III of DPM N79E2. The DPM has not been returned for correction, a waiver requested, or an implementation schedule submitted. As a result, the following conditions were noted:

- Portable flow measuring rotometers used for sampling are not being calibrated initially or periodically as required by section C.5 of RG 4.15. This was identified as an "inspector followup item" by the NRC in July 1981 but has yet to be corrected.

- Collection efficiencies for tritium (gaseous) sampling methods have not been determined and documented as required by section C.5 of RG 4.15.

- Replicate samples and analyses are not being taken periodically to demonstrate the reproducibility of sampling and analysis as required by RG 4.15 and section III of DPM N79E2.

- Calibration and operational checks are specified in TI-20 and TI-49. However, TI-20 is out-of-date and does not contain procedures for all equipment being used to perform safety-related analyses in the radiochemical laboratory.

- TI-15 is out-of-date and does not contain procedures for all counting room equipment being used to perform safety-related analyses.

- Spiked samples are not being prepared and analyzed in the radiochemical laboratory for intralaboratory evaluations of the accuracy of analytical results as required by RG 4.15 and section III of DPM N79E2.

- The operational check used to ensure operability of the Ge(Li) counting systems is being performed on a frequency of once per day. If the counting system degrades between operational checks, the degraded instrument could be used to analyze an effluent sample. The effluent could be released based upon erroneous data. The degraded condition may not be discovered for a period of approximately 24 hours. This is a nonconservative condition and could lead to exceeding 10CFR20 limits in the event of significant amount of radioactivity in plant effluents. This operational check should be used to prevent the use of a degraded or nonconforming Ge(Li) counting system to perform a safety-related analysis.

In summary, NSRS requested that SQN management take prompt action to implement all of the requirements of RG 4.15 and section III of DPM N79E2.

4. <u>Watts Bar Nuclear Plant (WBN)</u>

The radiochemical laboratory quality control program for WBN is delineated by the following documents.

- Technical Instruction (TI)-14, "Operation and Maintenance of Chemical Laboratory Analytical Instrumentation"
- Techincal Instruction (TI)-15, "Operation and Maintenance of Chemical Laboratory Counting Instrumentation"
- Technical Instruction (TI)-20, "Chemical Laboratory Counting Equipment Standardization Methods"
- Technical Instruction (TI)-53, "Laboratory Quality Control Testing" (Draft)
- Engineering section Instruction Letter (ENSL) C8 - "Analytical Balance Check Against Known Weights"
- Engineer Section Instruction Letter (ENSL) C10, "Conductivity Bridge and Cell Check"
- Engineering Section Instruction Letter (ENSL) C37, "Quality Assurance for Radiological Monitoring Program" (Draft)

These documents provide procedures for calibration, quality control checks, use and operational maintenance of radiochemical analytical and nuclear counting equipment.

The evaluation at WBN consisted of a review of those plant documents described above to determine if they inmplement the requirements of RG 4.15 and section III of DPM N79E2.

The review at WBN concluded the following:

a. At WBN a plant chemical engineer has been assigned responsibility of maintaining the nuclear counting room, ensuring respective procedures are updated and implemented, and training personnel in the proper use of the equipment. The individual was determined to be very knowledgeable of his, responsibilities and in the operation and use of radiochemical laboratory equipment and procedures.

b. Paragraphs VII and VIII of DPM N71A1 specify that when a DPM or a revision to a DPM is received by a user organization, it will be reviewed for applicability, returned for correction if needed, a waiver requested, or an implementation schedule submitted. These actions are required to be completed within 30 days of receipt of the DPM or revision to the DPM.

   Section III of DPM N79E2 was originally issued in October 1981. Full implementation has yet to be achieved (procedures are in the approval cycle). No waiver request (attachment 4 of DPM N71A1) or schedule of implementation has been issued by the plant. The Chemical Unit personnel were also found not aware or familiar with the requirements of DPM N71A1.

NSRS review of the procedures that are now in the approval cycle concluded that the WBN program will comply with the requirement of RG 4.15 and section III of DPM N79E2 when they have been issued and fully implemented.

5. Power Operation Training Center (POTC)

The radiochemical laboratory quality control program for the POTC is delineated by Section 100, "Laboratory Quality Control" of the Radiochemical Laboratory Manual.

The evaluation at POTC involved the following:

- A review to determine if the requirements of section 100 of the RLM were being implemented.
- A review of section 100 of the RLM to determine if it met the requirements of section C.6 of RG 4.15.

The review at POTC concluded the following:

a. The requirements of section 100 of the RLM have been implemented and the program is functioning well. However, section 100 of the RLM does not meet the requirement of section 6 of RG 4.15. Meeting these requirements is necessary as the POTC Standard Practice TCS 10 states the following:

"The radiochemical laboratory at the Power Operations Training Center (POTC) has equipment and facilities similar to radiochemical laboratories at nuclear power plants. The POTC lab is therefore capable of performing most of the chemical and radiochemical analyses required at the plants. In emergency situations, especially those in which the Sequoyah Nuclear Plant lab is inaccessible, the POTC lab serves as a backup facility and will support any analysis necessary for the determination of the nature and extent of the emergency, the status of the plant, and recovery from the emergency."

As the requirements of RG 4.15 are directly applicable to these functions and due to the likely critical decisions that may be made based upon the results of data generated by the POTC laboratory during emergency conditions section 100 (along with the entire Radiochemical Laboratory Manual) needs upper-tier review and approval (see also V.C.5.a). In addition, a program complying with the requirements of RG 4.15 needs to be prepared, implemented, and periodically reviewed and audited. The procedures and programs for the RLM that are currently being prepared and revised by the Chemical Unit staff at POTC receive no POTC upper management review and approval.

6. Central Laboratory Services (CLS)

The Chemical Unit of the Central Laboratory does not perform effluent analyses that would require compliance with RG 4.15 or section III of DPM N79E2. However, the Central Laboratory does routinely perform safety-related analyses (fuel oil, analyses for acceptability for DPM N79E1, and unique samples from safety-related systems). The requirements of Appendix B to 10CFR50 for a chemical laboratory quality assurance program are applicable for these safety-related analyses. A quality assurance (including quality control) program should be prepared to meet the applicable requirements of Appendix B of 10CFR50 for the safety-related functions performed by the CLS Chemical Unit.

7. Nuclear Safety Review Board (NSRB)

The Technical Specifications for BFN and SQN require that audits of performance activities required by the quality assurance program meet the criteria of RG 4.15. These audits are to be performed every 12 months.

The review at the NSRB consisted of discussion with NSRB SQN and BFN board members to determine if they were aware of the degree of compliance with the requirements of RG 4.15 at the two licensed plants. The review concluded that the NSRB was generally unaware of the RG 4.15 activities at BFN and SQN. NRC had reported program inadequacies at BFN in an OI&E

inspection report dated October 16, 1981. NSRB failed to recognize this for its significance and did not direct a better effort by OPQA to determine the root cause of this concern and to ascertain the appropriate and necessary corrective actions.

E. Control of Bulk and Reagent Chemicals

Appendix B of 10CFR50 specifies requirements of a quality assurance program. To comply with these requirements, TVA has formulated a Quality Assurance Program for Station Operation as described in section 17.2 of TVA Topical Report, TVA-TR75-1A, R5. The criteria in Appendix B of 10CFR50 are comprehensive and apply to all quality functions and materials for critical systems, structures, and components (CSSC). As the manner in which bulk chemicals are selected, used, and disposed of either directly or indirectly influences the integrity of CSSC and/or the health and safety of plant personnel and the general public appropriate portions of Appendix B are applicable to the chemical control program. The same is true for reagent chemicals used in safety-related analytical analyses.

Additional commitments were made to NRC as described in Table 17.2-5 of the Topical Report by reference through paragraph 17.2. These involve requirements or guidelines from the following regulatory documents:

- ANSI N18.7-1976, "Administrative Controls and Quality Assurance for the Operational Phase of Nuclear Power Plants" - Section 5.3.8 of this document states in part that procedures shall be provided for chemical control activities which will include limitations on concentrations of "agents" that could cause corrosive attack, foul heat transfer surfaces, or become sources of radiation hazards due to activation.

  NOTE: In the case of bulk chemicals NSRS considers the "agents" to be impurities in the chemical as well as its fundamental constituents.

- ANSI N45.2.13-1976, "Quality Assurance Requirements for Control of Procurement of Items and Services" - This standard describes requirements and provides guidelines for the control of activities to be exercised during procurement of items and services which affect the quality of nuclear power plants.

- ANSI N45.2.2-1972, "Packaging, Shipping, Receiving, Storage, and Handling of Items for Nuclear Power Plants" - This standard defines requirements for packaging, shipping, receiving, storage, and handling of nuclear power plant items whose satisfactory performance is required for the plant to operate reliably and to prevent accidents that cause undue risk to the health and safety of the public. The requirements deal with the protection and control necessary to assure that the requisite quality of those items are preserved from the time they are manufactured until they are used. These requirements are applicable and appropriate for bulk chemicals used in CSSC and those reagents used in safety-related analyses.

- ANSI N45.2.3, "Housekeeping During the Construction Phase of Nuclear Plants" - The requirements of this standard are intended to assure that only proper materials, equipment, processes, and procedures are utilized in the maintenance of housekeeping during the construction of power plants and that the quality of items is not degraded as a result of housekeeping practices and techniques during the construction phase.

  NOTE: Section C.3 of Regulatory Guide 1.39, September 1977, "Housekeeping for Water-Cooled Nuclear Power Plants," establishes that with the exception of subdivision 3.2.3, the requirements of ANSI N45.2.3-1973 are considered to be applicable for housekeeping activities during the operational phase of a nuclear power plant.

The Office of Power has indicated intent to implement the requirements of Appendix B to 10CFR50 through the procedures in the Office of Power Quality Assurance Manual. The ANSI standards are implemented through reference of section 17.2 of the Topical Report in the Office of Power Quality Assurance Plan.

Bulk chemicals are used at TVA's nuclear plants to accomplish the following functions:

- Control reactivity of the nuclear steam supply system.
- Prevent or minimize fouling of heat transfer surfaces.
- Prevent degradation of plant systems and equipment by providing system treatment to minimize corrosion, sludge buildup, and other undesirable conditions.
- Decontaminate materials, equipment, components, and systems.
- Enhance the "As Low As Reasonably Achievable (ALARA)" concept by minimizing activated corrosion product buildup thus reducing inhouse and offsite radiation exposures.

Laboratory reagent chemicals are essential to support approved analytical methods used to determine critical plant parameters (i.e., chloride, fluoride, iodine, boron, etc.). Therefore, proper control of these chemicals is required from the time of initial selection through subsequent disposal.

The importance of the control of chemicals is further supported by the fact that some bulk and reagent chemicals used at TVA nuclear facilities are known carcinogens, poisons, and/or of an explosive/flammable nature. Selection and control of these chemicals is essential to prevent unnecessary inhouse and offsite personnel exposure in addition to preventing explosions/ fires.

NSRS review of this area was to determine if a program had been formulated by NUC PR that contained the following key elements:

- Program for Chemical Selection, Qualification, and Change
- Procurement Controls
- Receipt Controls
- Identification Controls
- Storage Controls
- Inspections
- Nonconforming Materials Controls
- Use Controls
- Housekeeping

1. Division of Nuclear Power Central Office (NCO)

   The NUC PR Quality Assurance program to implement the Office of POWER QA program described above is delineated in the N-OQAM.

   The N-OQAM addresses these topics in a general manner but does not address the subject of chemical control specifically. Association with this subject is drawn through purchase, receipt, and issue of chemicals for use in CSSC and overall plant safety. Additional guidance for bulk and reagent chemical control has been provided by the NCO in the form of division procedures (DPMs).

   The evaluation conducted at NCO involved the following:

   - A review of the existing program as delineated in the N-OQAM and DPMs to determine if the required key elements have been addressed and to assess the degree of guidance that has been provided to the plants.

   - Discussions with NCO CEG personnel to determine their knowledge of the applicable regulatory, TVA, POWER, and NUC PR requirements.

The NSRS review of NCO's activities in this area concluded the following:

a. The N-OQAM delineates a program that generally meets the requirements of Appendix B to 10CFR50 and the applicable ANSI documents. The program is generic by necessity (covers all items used in CSSC) and addresses control of chemicals as it pertains to the processes of procurement through issue for use in CSSC. The DPMs provide more specific guidance in the areas of procurement, receipt, hazards, and spill prevention of bulk, and in some cases, reagent chemicals. Section IV of DPM N79E2 is detailed and prescribes a good program to ensure that purchased chemicals meet the procurement document requirements. It prescribes the bulk chemical and gases used in TVA nuclear power plant CSSC, which are assigned to QA level III status, specifies the purchase mechanism, the acceptance criteria, required purity of reagents, reagent stability, shelf life, and the required documentation. In addition, it prescribes the analytical methods that are to be used by the plants to determine compliance with the acceptance criteria.

b. The N-OQAM and the DPMs do not provide for a formalized program to assure adequate control over the selection, evaluation, and qualification process associated with use of bulk and reagent chemicals at the nuclear plants.

   The NCO is adequately staffed and has facilities at its disposal to perform these functions which in most cases are generic for all the plants. A qualification program should be established to promote safe use of chemicals at the nuclear facilities. Such a program should contain the following elements:

   (1) Bases of Selection

   A documented justification of the bases of selection should include a discussion of why the chemical is being used and a technical demonstration of the reactions of the chemical with the constituents of a system (in the case of bulk chemicals).

   (2) Material Compatibility Evaluation

   A documented determination of compatibility of materials and all components in a system with the chemical additive and its accepted level of impurities.

   Examples of need. The NCO prescribed the use of Molyguard B as a corrosion inhibitor for the component cooling water systems at SQN and WBN.

The chemicals were purchased and added to the system. The chloride impurity concentration of the Molyguard B was excessive causing chloride concentrations in the component cooling water systems to exceed specifications. The system at WBN was eventually drained and an analyses performed by EN DES to assess the damage to the system. This could have been avoided if an adequate evaluation had been performed at the NCO prior to authorization to procure the chemical. (See also V.B.1.b.)

(3) Dose Assessments

In an effort to comply with ALARA requirements, a documented assessment of the impact to onsite and offsite radiation doses resulting from neutron activation of constituents and impurities in the chemical and subsequent exposure or release to the environment should be performed. DPM N73E1 performs this function for onsite exposures with materials associated with maintenance that may come into contact with the primary coolant system. However, DPM N73E1 does not address chemical additives nor does it address offsite exposure.

Example of need: Boric acid purchased for use at SQN in the primary coolant system contained phosphorous as an impurity. The phosphorous was activated by the neutron flux of the reactor and was subsequently released to the environment.

(4) Fire and Explosion Hazard Evaluation

These hazards should be known and documented so that adequate precaution can be taken to minimize the probability (however remote) of an explosion and/or fire that may compromise the safety of personnel and/or the safe operation of the nuclear facility. The evaluation should include the manner in which the chemical is handled, stored, and used.

(5) Health Hazard Assessment

The health hazards of the chemical and all of its constituents must be assessed and documented prior to its authorization for purchase. The assessment should include a determination if the appropriate medical procedures and facilities are available for treatments to exposures. Presently DPM N82S1 contains a hazardous materials section but it does not include all hazardous chemicals in use or stored at the nuclear facilities. Examples:

Hydrofluoric, perchloric, red fuming nitric acids, lithium hydroxide, bromine, and sodium chromate.

(6) Shelf Life Criteria

Shelf life criteria of the chemical and its container both in storage and use should be determined and documented. DPM N77A2 addressed the "Storage and Shelf Life Considerations for Materials with Natural Aging Life" primarily for CSSC acceptability. However, it does not address chemical additives or reagent chemicals some of which could decompose into unstable compounds making them unsuitable or unsafe for use.

(7) Spill Prevention Plan and Emergency Procedures Assessment

A documented assessment should be performed to determine if plans and procedures are adequate to mitigate undesirable conditions that would result from unplanned releases. Presently DPM N75A9, which addresses spill prevention counter measures for hazardous substances, is not up-to-date.

(8) Storage Facility Assessment

An assessment should be made to ensure that adequate facilities are available for storage. The storage method should be specified in detail for each chemical at each facility. The storage facility assessment should include as a minimum hazards, environmental conditions, risk to plant and personnel in the event of a container failure, and physical separation of requirements.

(10) Periodic Inspection of Chemicals in Storage

A requirement that each plant's chemical unit periodically inspect all chemicals in storage for deteriorating and hazardous conditions should be delineated in DPM N79E2. Some chemicals are unstable, volatile, and attack or leak from their storage containers. Many of these chemicals are corrosive and hazardous. During the NSRS inspection of chemicals in storage at the nuclear facilities it was obvious that these types of inspections were not being made. Examples of deteriorating storage conditions will be discussed in the findings for each nuclear plant.

(11) Disposal Technique Assessment

The harmful nature of some chemicals to personnel the environment, and to the operating plants makes it imperative that the method of disposal of all chemicals (including their containers) used at nuclear plants be uniquely defined and controlled. The discharge of all bulk chemicals in use should be addressed in the Environmental Technical Specifications, NPDES permits, and Environmental Impact Statements.

(12) Licensing Documents Assessment

An assessment should be made before prescribing any new chemical treatment to assure that the requirements of 10CFR50.59, "Changes, Tests, and Experiments," have been met. During this review it became obvious that the CEG and chemical unit personnel at the plants were not aware of the 10CFR50.59 requirements.

(13) Procedure and Instruction Assessment

An assessment should be made to ensure that all procedures to determine the applicable chemical constituents for acceptance and use have been prepared, qualified for use, issued by NCO, and implemented at the plants.

In summary, NSRS recommends that the NCO expand DPM N79E2 to include the elements described above. The program should include a requirement that these determinations will be made and documented before authorization is granted through DPM N79E2 and N76A4 to purchase and use any new chemical. The DPM should be updated to include those chemicals already in use.

2. <u>Browns Ferry Nuclear Plant (BFN)</u>

The applicable requirements of the N-OQAM and DPMs described in the previous discussion of the NCO are implemented at BFN in the station standard practices and in RLM, Section 2000, "Bulk and Laboratory Chemical Receipt and Control."

The standard practices dealing with procurement, receipt, storage, and issue are comprehensive and are applicable for chemicals as related to materials purchased for use in CSSC. The other documents are related specifically to control of chemicals.

The evaluation conducted at BFN involved the following:

- A review of plant documents delineating NUC PR requirements as defined in the N-OQAM and DPMs for procurement controls, acceptance testing, and receipt inspection documentation to determine if those requirements have been administratively implemented.

- Discussions with BFN Chemical Unit personnel to determine their knowledge of the chemical control program as defined by the BFN documents.

- An inspection tour of the storage areas where chemicals were being stored.

The NSRS review at BFN concluded the following:

a. The BFN documents reviewed implement the existing NUC PR requirements for the control of bulk and reagent chemicals. Standard Practice BF 14.36 contained some innovative administrative concepts concerning the control of hazardous chemicals from a safety standpoint. The requirements of the N-OQAM are implemented through Standard Practice 16.2-16.6. The requirements of appendix F of DPM N76A4 and section IV of DPM N79E2 are implemented through Standard Practice BF 17.13 and section 2000 of the Radiochemical Laboratory Manual. During the review it was noted that Standard Practice BF 17.13 incorrectly states that the acceptance criteria for all bulk chemicals are listed in appendix F of DPM N76A4. Appendix F specifies the purchase mechanism to procure bulk chemicals as QA Level III status. The acceptance criteria is specified in section IV of DPM N79E2.

b. BFN Chemical Unit personnel through the first-line supervisor level are knowledgeable of the chemical control programs as defined by the BFN documents.

c. During the inspection tour of the chemical storage areas, the following conditions were noted which support the need for a periodic inspection program.

   - A hazardous reagent chemical (perchloric acid), which is no longer in use at BFN, was being stored in the Power Storeroom. NSRS recommended to station management that the NCO be contacted and requested to provide an acceptable method of disposal for this reagent chemical. The chemical should then be disposed of in accordance with the prescribed method. Any current procedure utilizing this chemical should be eliminated from the Radiochemical Laboratory Manual as it is probable that the fume hoods at BFN were not designed to handle perchloric acid.

- Fumes from hydrofluoric acid in storage in the Power Storeroom were leaking and causing deterioration of storage facility shelves (rusting) and possibly exposing storeroom personnel to hazardous vapors.

- No program existed to establish and effectively control shelf lives of bulk and reagent chemicals. Section 2000 of the Radiochemical Laboratory Manual states in part that shelf life and storage precautions that are specified on vendor's labels must be observed for all reagents. However, it was apparent from a NSRS inspection that reagent chemicals in storage had not been inspected in some time.

- A drum (55 gallon) containing ammonium hydroxide was found in warehouse storage severely rusted and had two tiers of drums stacked on top. If the drum fails or leaks, the warehouse would be filled with hazardous vapors and could cause personal injury.

- QA Level III chemicals (borax and boric acid) were stored in a non-CSSC storage facility. Some of the bags containing the boric acid were breached which could cause deterioration of the quality of the chemical.

- Sodium chromate tetrahydrate, a carcinogen, was being stored in a warehouse. The chemical is no longer being used at BFN and should be disposed of as directed by NCO as it is an identified carcinogen.

d. Cation ion exchange resin purchased for use in the condensate demineralizer system at BFN was contaminated with sulfuric acid by the manufacturer. Its subsequent use caused the reactor coolant conductivity to exceed technical specification operating limitations. Sulfuric acid is used in the manufacturing process for cation resin. As sulfur induced corrosion is extremely detrimental to stainless steel, NSRS recommends tighter control over purchase and use of these resins.

3. <u>Sequoyah Nuclear Plant (SQN)</u>

The applicable requirements of the N-OQAM and DPMs as described in the previous discussion of the NCO are implemented at SQN by the following plant documents.

- SQA 45, "Quality Control of Materials, Parts, and Services"

- Administrative Instruction (AI)-11, "Receipt Inspection, Handling, and Storage of QA Materials, Substitutes, and QA Level/Description Changes"

- Technical Instruction (TI)-19, "Chemical Feed Controls"

- Results Section Instruction Letter (RSIL) C3 - "Radiochemical Laboratory Chemical Control"

Standard Practice SQA-45 and AI-11 dealing with procurement, receipt, storage, and issue are comprehensive and are applicable for chemicals as related to materials purchased for use in CSSC. The other documents are related specifically to the control of chemicals.

The evaluation conducted at SQN was similar to that conducted at BFN as discussed in V.E.2 above. The review at SQN concluded the following:

a. A program that implements the existing NUC PR requirements for the control of bulk and reagent chemicals had been implemented (with one identified exception) in the SQN documents reviewed. The requirements of the N-OQAM and appendix F to DPM N76A4 were found implemented by SQA 45 and AI-11. The requirements of section IV of DPM N79E2 were being implemented by AI-11 and RSIL C3. There are, however, some indications that the requirements of section IV of DPM N79E2 and station documents have not been implemented in detail. The following conditions were noted:

   - Not all of the analyses required for acceptance in section IV of DPM N79E2 are included in the implementing documents at SQN. For example:

      1. Attachment 3 of section IV of DPM N79E2 requires that incoming shipments of hydrazine be analyzed for turbidity. SQN implementing documents do not require a turbidity analyses on incoming shipments of hydrazine.

      2. Attachment 15 of section IV of DPM N79E2 requires that incoming shipments of sulfuric acid be analyzed for specific gravity and visual clarity. SQN implementing documents do not require either analyses.

      3. Analytical methods for determining chloride content in bulk chemicals from section IV of DPM N79E2 have not been incorporated in any of the SQN documents. This implies that any chloride analysis performed on any bulk chemical at SQN was being performed in a manner that did not comply with the methods as specified in DPM N79E2.

- RSSIL C3 instruction step C4 refers to attachment 15 of SQA-45. The correct reference should be attachment A.

These examples were identified from a superficial review of the SQN documents and are not all inclusive as to problems that may exist. NSRS recommends that the SQN Chemical Unit staff perform a thorough internal review of these documents and take corrective actions as necessary to fully implement the requirements as delineated by the NCO documents.

b. SQN Chemical Unit personnel through the first line supervisor level are knowledgeable of the chemical control program as defined by the SQN documents.

c. During the inspection tour of the chemical storage areas the following conditions were noted which support the need for a periodic inspection program:

- Storage conditions of some reagent chemicals stored in the Power Storeroom were deteriorating. Specifically:

  Zirconyl Nitrate - Container leaking
  Zirconyl Chloride - Container leaking
  Trichlorasetic Acid (poison) - Container leaking
  Bromine - In badly corroded container and rusting shelves

  NSRS recommends to station management that the NCO be contacted and requested to provide an acceptable method of disposal of these chemicals. The chemicals should then be disposed of in accordance with the prescribed method.

- A hazardous reagent chemical (perchloric acid) which should not be used at SQN was being stored in the Power Storeroom. NSRS recommended that the NCO be contacted and requested to provide an acceptable method of disposal. Any current procedures utilizing this chemical should be eliminated from SQN documents as it is probable that the fume hoods at SQN were not designed for use of this chemical.

- Ethers (ethyl anhydrous and isopropyl) have no dates of manufacture or receipt on their containers. These ethers tend to form explosive peroxides upon standing and even more rapidly after being opened.

  Instruction step A.2.c.III of RSSIL C3 does require that the containers be dated when they are opened.

However, peroxides can form in an unopened container. Ethers should not be kept or used at the plant after extended storage.

d. The existing plant requirements (SQA 45) for procurement and receipt inspections have not been fully implemented. NSRS requested all documentation for one shipment each for sodium hydroxide, sulfuric acid, and boric acid. Power Storeroom personnel selected purchase requisitions RD-860700, RD-860694, and RD-360670. During review of these documents and the respective requirements in SQA 45, the following conditions were noted:

   - Specification 12A, attachment 15 of SQN 45 requires an analyses for specific gravity, chloride, and visual clarity for all shipments of 50 percent sodium hydroxide. The Materials Receipt Inspection Report, item II.M, for the shipment of 50 percent sodium hydoroxide received on April 6, 1982 as a QA Level III material (RD-860700) indicates that a chemical evaluation by the radiochemical laboratory was not applicable. This is contrary to the requirements of SQA 45. Results of any analyses (if performed) were not attached to the receipt inspection documents and thus may not be affored the same level of document control as the other documentation.

   - Specification 17, attachment 15 of SQA 45, requires analyses for specific gravity and visual clarity for incoming shipments of sulfuric acid. The Materials Receipt Inspection Report, item II.M, for the shipment of 93 percent sulfuric acid received on April 15, 1982 as a QA Level III material (RD-860694) indicates that a chemical evaluation was performed. The results of the analyses if performed, however, were not attached to the receipt inspection documentation.

   - Specification 2 of attachment 15 of SQA 45 (issued February 22, 1982) requires that boric acid shall be shipped in polyethylene-fiber drums to prevent ingress of moisture and impurities. Approximately 31,600 pounds of boric acid was purchased by RD-860670 dated March 24, 1982 in 100-pound bags. Inspection of these bags in storage revealed that some were breached, yielding the boric acid subject to moisture and impurities.

   - Attachment 15 of SQA 45, page 38, and appendix F of DPM N76A4 contain the following statement "chemical additives used in critical systems, sturctures, and components shall also meet the requirements of DPMs N73E1 (TI 35) and N79E2. Chemical additives were not addressed in DPM N73E1 or SNP TI-35.

As there were apparent problems with each document reviewed, NSRS concluded that the procurement and receipt program for QA Level III bulk chemicals at SQN were not getting the attention it requires. NSRS recommended to station management that the SQN staff do an internal review to determine the status of program implementation and take corrective actions as necessary.

4. Watts Bar Nuclear Plant (WBN)

The applicable requirements of N-OQAM and DPMs are described in the previous discussion of the NCO and are implemented at WBN by the following plant documents:

- Storage and Handling Instruction SH-C.01, "Storage and Control of Reagent Grade and Bulk Quantity Chemicals in the Power Storeroom."
- Standard Practice WB 4.1, "Material Procurement and Control"
- Standard Practice WB6.1.10, "Water Quality Manual"
- Technical Instruction (TI)-19, "Chemical Feed Controls Plant Systems"
- Engineering Section Instruction Letter C6, "Inspection of Stored Chemicals"
- Engineering Section Instruction Letter C31, "Bulk Chemical Additives Receipt and Control"

The evaluation conducted at WBN was similar to that conducted at BFN as discussed in paragraph V.E.2. The review at WBN concluded the following:

a. A program that implements the existing NUC PR requirements for the control of bulk and reagent chemicals had been implemented in the WBN documents reviewed. The requirements of the N-OQAM and appendix F of DPM N76A4 were implemented through Standard Practice WB 4.1. The requirements of section IV of DPM N79E2 were implemented by Standard Practice 6.1.10, Engineering Section Letters C6 and C31, and Storage and Handling Instruction SH-C.01.

Storage and Handling Instruction SH-C.01 administratively controlled procurement and receipt of chemicals to ensure that appropriate storage conditions were defined and inspection controls were in place before chemicals were ordered. In addition, it implemented an identification system (tags or stamp) which prevented unacceptable chemicals from being issued from the Power Storeroom.

b. WBN Chemical Unit personnel through the first line supervisor level were determined by NSRS to be knowledgeable of the chemical control program as defined by the WBN documents.

c. During the inspection tour of the chemical storage areas, discussions with plant personnel, and review of plant documents, the following conditions were noted which support the need for expanding the plant program to include periodic inspections:

- ENSL C6 and SH-C.01 did not contain adequate requirements or information to allow the expiration date of chemicals received and stored to be determined. The majority of the chemicals that arrive onsite were not marked with the date of receipt or manufacture.

- Some of the bulk chemicals were being stored without the "OK for Issue" stamp or tags which were required by Storage and Handling Instruction SH-C.01.

  NSRS recommended that the use of these tags or the stamp be fully implemented.

- Sodium tetraborate (QA Level III) bags were breached and leaking.

- A bottle (approximately 4 liters) containing what appeared to be hydrochloric acid was stored in the Power Storeroom but contained no identification label.

- There was no requirement for the periodic inspection of chemicals in storage for hazardous conditions and deteriorating storage containers.

5. Power Operations Training Center (POTC)

The requirements of the N-OQAM, appendix F of DPM N76A4, and section IV of DPM N79E2 addressing control of bulk chemicals were not applicable at POTC. However, the requirements of section IV of DPM N79E2 addressing reagent chemicals and gases are considered applicable for POTC. The evaluation conducted at POTC involved the following:

- A review of POTC documents delineating the applicable (as defined above) NUC PR requirements in section IV of DPM N79E2 to determine if the key elements have been administratively implemented.

- A review of the Radiochemical Laboratory Analysts Training Program to determine if a program exists to train the RCLAs in the hazards associated with the chemicals (bulk and reagent) that they will come in contact with or will work with during the performance of their duties.

The NSRS review at the POTC concluded the following:

a. The POTC had not prepared a document implementing the applicable requirements of section IV of DPM N79E2. They had no formal program for inspection of chemicals in storage for expiration date or deteriorating and hazardous conditions. No significant training is afforded to the RCL trainees in the hazards associated with the chemicals (bulk and reagent) that they will work with in the performance of their duties. Programs containing these requirements and training should be prepared and implemented (see also V.A.5.b).

F. Nonconformance and Corrective Action Controls

Criterion XV, "Nonconforming Materials, Parts, or Components" of Appendix B to 10CFR50 requires that measures be established to control materials, parts, or components which do not conform to installation. It further requires that nonconforming items be reviewed and accepted, rejected, or reworked in accordance with documented procedures. Criterion XVI, "Corrective Action" of Appendix B requires that conditions adverse to quality be promptly identified and corrected. In the case of significant conditions, it requires the causes to be determined and corrective action taken to preclude repetition. It further requires that the significant conditions, the causes, and corrective actions taken be documented and reported to management.

TVA has satisifed these requirements by presenting a brief description of its written program for effecting corrective action in subsections 17.2.15 and 17.2.16 of TVA Topical Report TVA-TR75-1A. The POWER Quality Assurance Program to document the implementing controls for ensuring management and NRC that nonconforming items identified during receipt inspection, fabrication, repair, modification, installation, or in use are properly identified, evaluated, corrected, and reported are detailed in OP-QAP-15.1, R1, "Nonconforming Materials, Parts, or Components," and OP-QAP-16.1, R0, "Corrective Action."

This area was reviewed to determine if the established program for water quality controls provides for the following control measures:

- Identification of problems noted from line and review organizations, QA audits, QC inspections and tests, NRC inspections and related documents, experience review groups, and vendor letters into a formal review and closeout program.

- Evaluation of the identified problems as to their safety impact on the plant (long and short term), cost effectiveness, generic implications, adverse trends.

- Authority to ensure corrective action to be taken will preclude recurrence.

- Reporting and notification criteria to NRC and appropriate levels of TVA management.

- Records maintenance of the deficiency, evaluations performed, and corrective actions taken.

- Status tracking of the item until corrective action is complete.

- Trend analysis reporting to higher management as to nonconforming item processing, rates of change, and disposition decision time.

1. <u>Division of Nuclear Power Central Office (NCO)</u>

N-OQAM, part III, sections 7.1 and 7.2 and DPM N80A25 describe the NUC PR QA program to implement the POWER QA program requirements of OP-QAP-15.1 and 16.1 discussed above. These sections delineate specific methods which should be utilized to control nonconforming materials, parts, or components or conditions adverse to quality from recurring.

The activities evaluated for the central office in this area involved review of CEG's.

- Work item tracking system and historical file.
- Evaluations of identified problems and their ability to effect corrective action.
- Evaluations of plant operations and operational data to detect adverse trends.
- Ability to resolve deficiencies cited against them.

From the review conducted, NSRS concluded that:

a. Though CEG provides quality-achieving criteria for the nuclear plants they have not been audited by OPQA&A, NRC, INPO or other review organizations. The Westinghouse-TVA steam generator task force has observed their activities but only from a performance standpoint, not as an official audit. Therefore, their action to cite deficiencies against them could not be evaluated.

b. CEG has not been monitoring OPQA&A audit reports, NRC inspection reports, or corrective action report (CAR) printouts from the plants to evaluate identified problems being cited against the plant chemical units. Analysis of this data is necessary to determine if adverse conditions exist which could or have affected the nuclear plant water quality program.

c. CEG is responsible for assuring that a proper water quality program has been developed, but it does not have sufficient authority to effect corrective action should an adverse trend or condition be identified by the group. For example, during the May 1982 SQN unit 2 outage, significant amounts of sludge (200-300 pounds) were removed from each of the steam generators during sludge lancing after only four and one-half months of operation. In addition, evidence of corrosion and annuli blockage at the first tube support plate was identified. CEG thereupon examined the chemical control data since the unit first began power operations in December 1982 and found the unit had been operated with some parameters out of DPM N79E2 limits. CEG concluded that failure of SQN to operate within the chemical limits specified in DPM N79E2 resulted in accelerated corrosion of the tube support plates (Memorandum to J. A. Coffey from J. M. Ballentine dated May 26, 1982, "Sequoyah Nuclear Plant Unit 2 - Steam Generator Condition and Chemical Control")

The plant's response (Memorandum to T. G. Campbell from C. C. Mason dated June 7, 1982, "Sequoyah Nuclear Plant - Unit 2 - Water Chemistry Control History") showed plant management dedication to timely completion of the startup program without unduly compromising steam generator integrity. The response provided rationale for those occassions in which plant management made decisions to operate in a manner that did not literally adhere to the chemistry requirements ("guidelines" as the plant noted) provided in DPM N79E2.

NSRS review of CEG's conclusions, the plant response, and DPM N79E2 identified several conflicts which should be evaluated.

(1) DPM N79E2 "Scope" does specify that the DPM provides guidelines for nuclear plant water quality control. However, "Applicability" requires each plant to incorporate the DPM into their program where applicable. The format of the DPM may be altered or other editorial modifications may be made to any of the sections to fit the philosophy of the particular plant as long as the technical intent of the specification, procedure, program, or instruction is left unchanged, which entails strict compliance.

(2) Section I, "Water Quality Specifications," specifies that in general, expected specification

ranges identified for the various parameters are to be met during all items of applicable operation. Accordingly,:

(a) the plant superintendent may authorize deviations for justifiable reasons (other than load demand) provided the deviations and justifications are documented and are discussed with the nuclear central office personnel at the first opportunity. Contrary to this requirement, on February 4, 1982 steam generator blowdown sodium concentration and cation conductivity were exceeded for approximately 10 hours because of a special request for continued operation by the DPSO load dispatcher. Central office was not notified.

(b) Action level III guidelines shall not be exceeded without the express consent of the Manager, Nuclear Productions. Contrary to this requirement during the period January 9-19, 1982, the unit was operated above the action level III limit of 7 micromhos/m for a period of approximately 30 hours. No mention was made or inference to Manager, Nuclear Production concurrence. In addition, the 30 hours operational run of 8 micromhos/m violated the action level III requirement to initiate an immediate reduction in power and to be in mode four within six hours of confirmation of conditions. Plant rationale for this action was to operate as long as possible with blowdown maximized to achieve system cleanup in the shortest time possible.

Other occurrences were noted by NSRS between the documents, however, the intent of the CEG concern of which NSRS concurs, is that the unit must operate with strict adherence to the chemical control limits to minimize the rate at which corrosion and tube denting will proceed. If these controls are not adhered to, it is conceivable that the lifetime of the steam generators will be shortened. However, NSRS review of CEG trend analysis data for SQN during July 1982 showed again parameter limits were being exceeded and, in cases, power was not reduced as required.

NSRS indicated to NCO management that upper management attention should be provided to resolve chemistry control cognizance authority.