I. R-84-17-NPS-09, 10CFR21 Requirements Incorrectly Linked to NUC PR QA Requirements

Conclusion

Reporting of defects and liability requirements imposed upon vendors by 10CFR21 were incorrectly linked in the OQAM to NUC PR quality levels in that if 10CFR21 was determined not applicable then manufacturing quality and receipt inspection requirements were automatically reduced. In addition, the OQAM, Part III, Section 2.1, Appendix F, attachment 1, form for determining Part 21 applicability was incorrect in that if an item was determined to be commercial grade then its affect upon or use within a Critical System Structure or Component (CSSC) could incorrectly be ignored. NUC PR agreed with NSRS that the form should be corrected. (See section V.G.)

Recommendation

The OQAM and NUC PR procedures should be revised to remove influences of 10CFR21 applicability upon the determination of required quality levels for items and services, and training in the requirements and limitations of 10CFR21 should be provided to all personnel in the procurement cycle. It is further recommended that the OQAM, Part III, Section 2.1, Appendix F, attachment 1, be corrected as soon as possible and separated from the general OQAM revision so that all questions on the form are answered whether or not 10CFR21 is applicable to the item or service.

J. R-84-17-NPS-10, Commercial Grade Items with QA Level I and II Designations

Conclusion

Commercial grade items were being purchased with little or no QA requirements or from vendors or manufacturers without TVA-approved QA programs and classified as QA level I or II. That practice was contradictory to the purpose of having QA level I and II items with considerable QC documentation attesting to its suitability for fulfilling an intended function. (See section V.G.)

Recommendation

Items purchased with no QA requirement or requirements for material certifications (COC, CMTR, etc.) and/or from vendors or manufacturers without TVA-approved QA programs should not be purchased with a QA level I or II designation.

K. R-84-17-NPS-11, <u>Quality Verification for Commercial Grade Items</u>

<u>Conclusion</u>

The use of commercial grade items as basic components places the responsibility for assuring that the item will function as intended under all conditions solely upon TVA. The QA program within TVA, at the time of this review, was not capable of providing that assurance because it did not include a receipt inspection program which included testing of the item or comparable mechanisms such as an audit of the vendor's QA program for commercial grade items. (See sections V.E and V.G.)

<u>Recommendation</u>

NUC PR should establish a receipt inspection program which includes testing or comparable mechanisms, such as audit of vendor's QA program, verification of certificate of conformance, etc., for replacement commercial grade items that will be dedicated as basic components or parts thereof, that would provide documented assurance that the item will function as intended when necessary including accident conditions.

L. R-84-17-NPS-12, <u>Receipt Inspection of QA Level I and II Items by FQE</u>

<u>Conclusion</u>

Considering the changes recommended by NSRS in this report with regard to the procurement of quality level I and II material and commercial grade items to be dedicated as basic components, the division of receipt inspections between FQE and Power Stores, in effect during this review, will be inadequate. (See sections V.B.5 and V.G.)

<u>Recommendation</u>

All items procured as QA level I and II and commercial grade items to be dedicated as basic components should be receipt inspected by FQE or others qualified to ANSI N45.2.6.

V. DETAILS

The procurement process was evaluated by review of pertinent NRC regulations, consensus standards TVA was committed to, TVA policy documents, and various levels of procedures. As part of this evaluation the procedural flow of selected procurements was followed from the originator through PURCH. NSRS attempted to identify all points of origination for procurements for operating nuclear plants and included the site, OE, NCO, vendor-supplied items with services, and internal TVA transfers between sites and organizations. More than 100 procurement requisitions selected at random from BFN, SQN, OE, and the NCO were reviewed. Of those reviewed, 45 were selected for further study as being representative of basic types of procurements in the electrical, mechanical, and structural areas. Those procurements included items, services, and internal transfers procured as either direct charge, Indefinite Quality Term (IQT), or Material Management System (MAMS) stock reorders. Of those 45 representative procurements, 21 were followed through the entire review and approval cycle to PURCH. Of the 21 procurement actions, 12 were classified as emergencies with the remaining 9 being normal procurements.

During the course of selecting and following the procurement actions over 90 people at all organizational levels were interviewed with regard to their function in the procurement process and problems associated with their function. At PURCH, in addition to their function within the TVA procurement system, discussions were held on U.S. Government procurement regulations and their impact upon TVA.

A. <u>Upper-Tier Documents</u>

Throughout this review an evaluation was made which compared the regulatory requirements contained within the Code of Federal Regulations and Regulatory Guides committed to in the TVA Topical Report against TVA implementing procedures which included the Operational Quality Assurance Manual (OQAM), Division of Nuclear Power Area Program Manuals (DPMs), TVA Procurement Manual, Office of Engineering Engineering Procedures (EPs), and applicable plant procedures. A detailed listing of the procedures reviewed is contained in section VII, "Documents Reviewed." Except as noted elsewhere in this report TVA's procurement programs in the areas reviewed were in compliance with regulatory requirements and were implemented in accordance with program procedures.

B. <u>Plants</u>

Activities at the plants associated with the procurement and ultimate receipt and storage of items and services were reviewed. Unless otherwise specified the findings are applicable to both SQN and BFN.

1. <u>Preparation and Review Cycle for Procurements</u>

At the sites procurement activities were confined primarily to five groups or functional areas of responsibility. Each is discussed as follows:

a. <u>Originator</u>

Once it was determined that an item or service was required for operation of the nuclear plants, some individual had to initiate the procurement action and that individual was identified as the originator. As identified in the OQAM and found in practice, the originator could be any "cognizant engineer, supervisor, or responsible designee." The originator was responsible for preparing the purchase request and specifying thereon all technical and quality requirements associated with the procurement. Specifically, as assigned in the OQAM, the originator should:

- be familiar with the functions of the system the procurement is associated with,
- be familiar with the system's importance to safety, and
- be familiar with the compliance, technical, and quality requirements of the system.

With regard to the above requirements, and in procurements evaluated during this review, all originators occupied positions where the qualifications to fill those positions satisfy the requirements to procure items and services specified above. In addition, the originator was required by the OQAM to specify completely and accurately on the purchase request as applicable the following:

- technical description of the procurement
- component or system of use
- applicable regulatory code
- QA level
- design basis
- other manufacturing requirements
- identify required tests, inspections, and examinations
- list documentation requirements
- specify special handling, packaging, or storage requirements
- determine the original EN DES procurement QA requirements
- evaluate 10CFR21 applicability
- identify special receipt inspection requirements
- specify the date the procurement is wanted

If the originator prepared the purchase request completely and accurately as required, no additional review of the document would be necessary. In practice, contrary to established procedures, the originator was not expected to complete the purchase request accurately and completely for all items above. For example, the manufacturer was expected to provide information on special handling, packaging and storage requirements. The final QA requirements and Part 21 applicability were specified by the plant FQE staff and NCO QA Group, and the final technical requirements were specified by the plant specifications engineer and NCO QE Group.

NSRS expected to find a training program for originators in place and functioning. None was found nor required. What NSRS found instead was a description by plant supervision of self training. Originators were given a copy of the plant procurement procedure(s) and expected to learn on their own. As a result NSRS found that most routine purchase requests prepared by the originator were changed at the site by FQE and Materials personnel. Those changes ranged from significant (wrong QA level or technical specification identified) to editorial.

While the originator was required by the OQAM and plant procedures to specify everything required in all procurements, they were not given the training necessary to accomplish this.

b. <u>Specifications Engineer</u>

Once the originator completed the purchase request, it was sent to the specifications engineer for review of the technical specifications and coordination with FQE, other maintenance and engineering staffs, administrative staff, Power Stores, and Plant Manager for their input and/or approval. Basically, the specifications engineer was to assure the purchase request was complete and accurate. Both BFN and SQN handled this function somewhat differently.

At BFN there were positions of specifications engineer for both Operations and Field Services that were staffed with engineers. For the Field Services Group, the specifications engineer assumed the function of the originator and filled out the purchase request. For the Operations Group the specifications engineer reviewed the purchase request as completed by the originator.

At SQN the specifications engineer's function was fulfilled by a materials officer from the Materials Unit, who did not have an engineering background. An attempt to review technical specifications was described, but the function primarily fulfilled by the materials officer was one of expediting procurements.

Materials Units at both SQN and BFN were the principal points of contact for technical and quality assurance changes made in the NCO. The NCO Quality Engineering Branch (QE) prepared a form letter to the file with the name of the originator and FQE persons concurring by telephone with the NCO changes. It reportedly was the materials officer's responsibiltiy to assure that input by the originator or FQE was obtained before the changes were approved. On procurements reviewed by NSRS, a variety of names were listed for the originator concurrence on the QE form letters and most of the time the individual was other than the originator of the purchase request. Some approvals were by technical personnel and others were by the materials officer. In all cases the plant FQE engineer approving the purchase requisition concurred in the NCO changes. The materials officers are not technically qualified to approve either technical or QA changes on their own. Contrary to obtaining the originator's approval for changes, a materials officer concurred in the NCO proposed changes for the originator on four specific instances (PRs 942988, 951133, 951028, 951134). With regard to PR 951134, correspondence was found in the procurement file which showed the originator was aware and agreed with the change before the materials officer approval was given; however, in the other three cases no similar correspondence was found. With regard to PR 951028, the NCO added a technical requirement in which the materials officer concurred and to which the vendor took exception. The plant wanted zinc-coated sheetmetal, not oiled. The NCO added not chemically treated. The vendor quoted chemically treated no oil, and the site materials officer approved the exception. The site materials officer should not be concurring in technical changes.

c. <u>Field Quality Engineering</u>

The FQE was also required to review quality level I and II purchase requests for completeness and accuracy and approve them. At both SQN and BFN one individual in each FQE group was assigned that responsibility. NSRS found that in addition to the procurements of quality level I and II materials and services, which this review centered on, that engineer also reviewed all QA level III and IV procurements as well as non-QA procurements. Virtually everything procured by the sites was approved and/or reviewed to assure the proper quality level and requirements had been placed upon the item being procured. To put perspective on the magnitude of that effort, BFN Power Stores provided a compilation of procurements for May and June 1984 showing 1051 procurements, but did not show how many were quality level I or II. That number of procurements would result in an average of about 26 per day requiring FQE approval and/or review.

The FQE review of purchase requests was described in the OQAM as including both technical and QA requirements. Depending upon the item or service being procured, FQE described their review as including a comparison of the technical and QA requirements with plant drawings and previous procurements of the same item. Although NSRS did not physically observe this type of FQE review in process, the mechanics involved in performing it could be time consuming. Considering the number of purchase requests reviewed, the completeness of each review is of concern. FQE described the number of procurements found with QA levels lower than required as very few. The routine review of non-QA procurements by FQE is, therefore, considered too time consuming by NSRS for the benefit received, and the time expended could be more effectively utilized on QA procurements. A periodic review of a sampling of non-QA purchases should be sufficient to detect program deficiencies.

d. Plant Superintendent

Upon completion of the review and approval cycle of the purchase request, the purchase request was sent to the plant superintendent for authorization.

e. Power Stores

The purchase request with all approvals and authorization was sent to Power Stores for determination of the appropriate method of obtaining the requested item(s) and preparation of the associated documentation. Methods available to Power Stores included direct charge procurement using a purchase requisition, request for delivery under an existing IQT contract, field purchase order to purchase items of less than $300 from local suppliers, or a transfer requisition (TR) used to transfer items from one TVA site to another. Once the method was selected, Power Stores would transcribe the approved purchase request writeup verbatim on the appropriate form and add on all the purchase request attachments which could include QA and technical specification requirements. Procurement forms prepared by Power Stores were defined as QA documents in OQAM, Part III, Section 4.1, whereas purchase requests were viewed as worksheets and not QA documents. The official QA document requires the signature of FQE and the plant superintendent. Consequently both FQE and the plant superintendent were signing the same procurement action twice.

The purchase request as described to NSRS was not considered a QA document because it was not always prepared in indelible ink and could fade with time. The OQAM, Part III, Section 4.1, required QA records to be prepared in ink or typed. In conflict with that philosophy, NSRS observed attachments to purchase requests (e.g., 10CFR21 applicability form) that were prepared partially in pencil that were classified as QA documents.

In addition to signing the procurement form for record purposes, FQE was required to review for accuracy the documents prepared and attachments included by Power Stores. As FQE was the last to see the purchase request prior to transcription by Power Stores, their review of the finished product was editorial in nature. FQE, therefore, was required by the OQAM to duplicate its own work in reviewing and approving all QA level I and II purchases twice.

Like FQE, the Plant Manager was required to duplicate his work in authorizing both the purchase request and purchase requisition.

With all required signatures obtained, Power Stores then transmitted the procurement package to Chattanooga for additional review and approval prior to going to Purchasing.

2. Functioning of Plant Procurement System

Overall, the procurement system used at the plants contained redundancy and was predicated on the concept that additional review will promote a better product. As a general rule, a procurement from the identification of need through transmittal of the completed procurement package to Chattanooga contained 10 signatures or initials signifying review and approval of the procurement. Generally that preparation process was not considered excessive--taking 4 days for normal and emergency direct charges and 1 day for an emergency RD under an IQT contract. More complicated procurements were seen that required 1 to 1-1/2 months to prepare. Of the 10 signatures or initials in the approval process, only 2--the originator and FQE--were identified as having any substantive technical or quality contribution regarding the specifications or requirements of the procurement.

Personnel interviewed were generally aware of their function in the TVA procurement process but generally unaware of the function and responsibility of other sections in that process. With the possible exception of Power Stores, knowledge of Federal procurement regulations was lacking among those in the procurement process. For example, no one at the plants or elsewhere within TVA knew how long it normally took to procure something. They knew it took too long and seldom arrived when needed. The originators would allow 90 days, in establishing a date wanted, from the time a purchase request was initiated for routine nonemergency purchases of common items (nuts, bolts, steel, etc.), until those items were expected onsite. That date was virtually ignored throughout the procurement process. As a result, the purchase requisition rarely arrived at Purchasing with sufficient time remaining, until the date wanted was passed, to advertise for quotations, let alone time to review the quotations, award the contract, manufacture, and deliver the item. Of the requisitions reviewed by NSRS, it typically took 6 months to 1 year to receive material onsite and the sites were only allowing 90 days. With sufficient training in and knowledge of the procurement process, personnel within the procurement cycle could establish more realistic timeframes in order to receive needed materials.

Probably the most frequent complaint about the procurement process expressed by the sites was the material was not there when needed. That complaint results in large part from the unrealistic expectation placed by the sites upon the procurement system. The site routinely wants rapid results, 90 days or less, and the system can't handle it.

3. Planning

Planning of work for maintenance and outage modifications was not a formal part of the review; however, the obtaining of needed materials to perform work was reviewed. As identified in section V.B.2 above, ordered material often arrived at the site after it was needed. There was no one factor producing that condition but several factors beginning with the originator and including all steps through receipt inspection of the material onsite. This review found, however, no evidence onsite that material availability was factored into the work planning process. For further information on planning see NSRS Report R-84-27-SQN/BFN (GNS 841220 052).

For example, in ECN modification work, site personnel explained that a complete ECN package was not received from EN DES. Portions of the ECN package would arrive in stages over some time period. When the sites had what they believed to be a sufficient amount of the ECN package, work would be scheduled and materials ordered. Engineers at the site in charge of the modification work and ordering material openly stated that the material ordered would probably not arrive before the ECN work started. Considering that only 90 days was allowed for procurements that sometimes took 6 months to 1 year to get, that expressed concern was well founded. No effort was found, however, to include a more realistic timeframe in the site planning process.

What resulted, when the material did not arrive, was an exercise in resourcefulness by the site engineers, which they appeared to be very good at. The engineers had to find the material they needed through borrowing it from another engineer onsite, finding it at another site and having it transferred, or initiating an emergency purchase. Effective as the engineers may be, that effort in resourcefulness is time consuming and wasteful. With more effective planning a significant portion of the time wasted on obtaining materials could be eliminated.

4. Special Methods of Obtaining Material and Services

Much of the emphasis within this report is generic in nature and applicable to all types of procurements. The sites have numerous methods available for obtaining material and services with direct charge contract being the most common. This review examined not only direct charge contracts but other methods as well, and this section will focus on the less common methods and their associated strengths and weaknesses.

a. Service Contracts

Often the services of consultants or workers with specialized expertise is required. Like materials being received at a site requires a receipt inspection, the receipt of a service at the site also requires an evaluation and acceptance. Acceptance of a service is identified in the OQAM, and three acceptance methods are listed in Part III, Section 2.1, paragraph 10.0.

On two separate occasions, SQN obtained the service of Furmanite, Inc., to stop leaks which could cause a shutdown of the plant. Those services were requested by purchase requisitions 959104 and 955163 which specified the vendor shall comply with the technical requirements of IQT contract 82P38-925403. On one occasion a Gulf and Western Service representative was requested, under purchase requisition 940060, to perform work at SQN. In all three requisitions it was specified that work was to be performed and documented under TVA procedures and QA program. On four separate occasions SQN mechanical maintenance and compliance personnel were asked for the documentation contained in the work packages or elsewhere, for those three contracts, which satisfied the acceptance of service requirement of the OQAM specified above. NSRS did not receive any such documentation or an explanation of how the OQAM was satisfied and must therefore conclude that it does not exist.

b. Indefinite Quantity Term (IQT) Contracts

An IQT contract can be a powerful tool when procuring the same item or service on a routine, repetitive basis. When such an item or service is identified, an IQT contract can be prepared following the same preparation, review, and approval procedures as if it were a direct charge contract. IQTs are advertised, sent out for bids, bids reviewed, and contract awarded no differently than a direct charge. The difference is, or is supposed to be, that when items or services are required under the IQT, a request for delivery (RD) is prepared and sent to the vendor bypassing the review and approval process. That procedure was described as being followed by EN DES, but not by NUC PR. In each of the NUC PR RDs reviewed by NSRS, the RDs went through the same review process as the original IQT, therefore eliminating any savings of manpower or time gained by having the IQT. Arguments were presented that the IQT was not an actual contract, the RD was, and therefore, had to go through the review and approval process to satisfy QA documentation requirements. It was also argued that some times not everything purchased on an RD was covered by the original IQT.

With regard to the first argument, the IQT contract was retained as a QA record as were the RDs. The RDs specified what was wanted and that the terms and conditions of the specified IQT were applicable. Each RD was reviewed onsite by FQE and an authorizing official. In NSRS's opinion that should be sufficient to satisfy QA requirements and the RD should be sent directly to the manufacturer.

With regard to the second argument, NSRS views that as a completely separate issue. If an item or service is to be procured that was not initially contracted for and a change of contract was required, then it should go through the review and approval process as a new procurement.

The additional review of all RDs by the central office only resulted in additional verbiage added to the RD which was already contained in the IQT. This was considered redundant, unnecessary, and resulting in needless time delays of 20 days or more. The elimination of the central office review by NUC PR should eliminate the problem provided that in transferring the central office positions to the sites the problem was not transferred as well. That transfer was not evaluated as a part of this review.

In the process of evaluating procurement at the sites, a number of direct charge procurements for steel were observed at each site. It would appear that an IQT contract would be beneficial for those.

A problem with IQTs developed and was apparently solved during this review. It was determined by OGC that RDs for greater than $10,000 would require advertising in the Commerce Business Daily as if it were a new purchase. OGC later determined according to NUC PR personnel that a periodic generic advertisement would be sufficient to satisfy Federal procurement regulations.

c. Transfers

Although the transfer of material within TVA is not a procurement in a true sense of the word, transfers do provide another commonly used mechanism of introducing new materials to a site. As such, transfers were reviewed as if they were procurements from outside vendors.

Many items have become available for transfer due to the cancelled units and are shipped to all nuclear sites from HTN. Other transfers occur when one operating plant or construction site has unused material which can meet an emergency need at another site.

> NOTE: Transfer of electrical cable was not pursued by the review team at this time. Both BFN and SQN personnel identified documentation problems occuring with cable which resulted in a large number of nonconformances being written. Basic problems as told to NSRS stemmed from lack of coordination between the Office of Engineering (Electrical Engineering Branch) and the site and erroneous documentation accompanying cable transferred from HTN. Most participants were already aware of the problem and appeared to be working on a solution. The implementation of the solution will be subject to review in Phase II of the NSRS procurement review.

Form TVA 4139, "Request for Shipment of Material," is used as the means to transfer items between divisions (NUC PR and CONST). The form includes descriptive information of the item, Part 21 applicability, FQE signoff, and other miscellaneous signatures. ID-QAP 4.3, "Transfer of Items," states that the following steps are to occur in an interdivisional transfer:

(1) Requesting organization establishes a source of available items.

(2) Requesting organization prepares request for transfer.

(3) Requesting organization reviews original contract for technical and QA requirements.

(4) Copies of all appropriate records are transferred on the requested item.

(5) Source organization transfers materials to requesting organization.

No objective evidence of a technical review occurring utilizing the original contract could be identified. In actuality, the original contract (or copy) was not even requested of the source organization. Site procedures and transfer requisitions were not specific enough in stating what documentation was to be sent. The statement generally found on all transfer requisitions was, "all applicable documentation" to be included. The employee performing the receipt inspection cannot discern if all appropriate documentation has been received if it is not known what the contract required. The decision as to what was applicable documentation was the responsibility of Power Stores personnel transferring and receiving the material. Quality level material with COCs and CMTRs were among the items Power Stores was allowed but not trained to receipt inspect.

Another concern identified by NSRS involved the significant number of nonconformances written against material shipped from cancelled units, usually due to the absence of the original receipt inspection report or a disagreement between the material shipped and the original receipt inspection report. In some cases materials have been transferred that are similar to items requested but technically not the same and useless to the requesting organizations. Site employees expressed concern in utilizing HTN as a source of material. Basically, they had no assurance that the material received on a transfer would be what was originally requested. Although the HTN shipping process wasn't reviewed, NSRS identified enough nonconformed material to substantiate the concern. Controlling of the HTN warehouse will be transferred from Construction to Power Stores in the future and Power Stores will establish it as a distribution center, similar to the present Power Stores distribution center located in Chattanooga. The documentation problem on transferred materials was not limited to HTN. Inadequate documentation similar to that found from HTN occurred from other plant sites transferring materials.

d. TVA Fabricated Equipment

Another mechanism to introduce quality equipment into the plants was for TVA to manufacture the part from stock material. This review had planned to include work performed by the Power Service Shop for the nuclear plants as if the shop were another vendor. This was eliminated from the scope of the review after the BFN review segment because of time constraints.

Before the TVA-fabricated equipment was removed from the review, operator console cables and control festoons for the BFN refueling platform and jib crane were identified to NSRS as being fabricated by BFN electrical maintenance personnel. Completed control cables and festoons were classified as QA level I items and stocked within the Power Stores warehouse. Documentation was obtained on the manufacturing process and materials used to fabricate those items. It was determined that each cable and festoon was manufactured from QA level II parts and nothing could be found that showed how the assembling of QA Level II parts produced a QA level I finished product. When identified to BFN management, they assured NSRS the matter would be corrected.

5. Receipt Inspection Program

The NSRS review of the receipt inspection program was limited to a review of receipt inspection reports and associated documentation. Actual receipt inspections being performed were not observed. The review effort consisted of selecting requisitions at random from the Power Stores files and verifying that all documents requested in the contract had been received. The proper group performing receipt inspection as required by the QA level assigned to the item was noted, i.e., Power Stores personnel only or Power Stores assisted by FQE inspectors. Selected personnel from Power Stores and FQE were interviewed to verify their understanding of receipt inspection procedures. Those interviewed appeared knowledgeable of the NUC PR requirements and site procedures.

The receipt inspection program at the nuclear plant sites was directly linked to the quality level assigned to the material being received. As such, material with higher quality levels was inspected by FQE inspectors and material with lower or no quality level was inspected by Power Stores clerks. The types of inspection performed in those groups had varying degrees of difficulty associated with them, and therefore, the inspector training was significantly different between FQE and Power Stores personnel.

FQE inspectors according to the OQAM perform receipt inspection of all QA level I, level II substituted items (items substituted by the vendor as being equivalent to those asked for), level II and ECN items to which 10CFR21 applies and which are shipped from the vendor directly to NUC PR. The FQE inspectors receive formal training and certification through the Power Training Center that meets requirements established in Regulatory Guide (RG) 1.58 (which endorses ANSI 45.2.6).

Certified Power Stores clerks according to the OQAM perform inspections of QA level II non-10CFR21 items, QA level III, QA level IV, and ECN material transferred to NUC PR from CONST regardless of the QA level. The Power Stores receiving clerks must be certified by the plant QA supervisors. To become certified, 550 hours of on-the-job training must be completed and an examination passed with a score of 70 percent or better. Recertification was required at intervals not to exceed 18 months. Power Stores personnel were also delegated (by the Topical Report) the responsibility of inspecting commercial grade items.

The separation of FQE versus Power Stores performing receipt inspection occurred at QA Level II and was determined by the applicability of 10CFR21, "Reporting of Defects and Noncompliances," to the item procured.

The documentation associated with the QA level II items can vary from certificate of conformance (COC) and certified material test reports (CMTR) to packing slips. During the course of the review, no consistency could be established for documentation required of QA level II items. For example, QA level II items with Part 21 applicability could require certificates of conformance provided by the manufacturer and/or certified materials test reports. Contracts for QA level II, Part 21 not applicable, could also have the previous same requirements and/or a packing slip.

If a packing slip is the only documentation requested on a requisition, the inspection is essentially a number check and the "on-the-job" Power Stores training is acceptable to perform the inspection. However, the appropriateness of Power Stores personnel performing document reviews (such as COCs and CMTRs) that they have not been trained to perform against material received is questionable and of concern to NSRS. Examples of Power Stores receipt inspecting CMTRs on QA level II (Part 21 N/A) material were identified at BFN. Material requested was to be either ASTM A336 or A479, type 316 stainless steel. The CMTR received with the material specified results for ASTM A276, type 316 stainless steel. The items weren't nonconformed. The difference in material was being evaluated by BFN PQA Staff at the conclusion of the review.

Two examples of materials being received without having all associated documentation were identified at SQN. Those items had been received on a transfer from HTN. They did not have the original CONST receiving reports and had not been nonconformed by SQN (reference V.B.4.c). The CONST reports were later obtained by Power Stores personnel.

A basis for 10CFR21 nonapplicability, in the NUC PR structure, was the determination of an item to be "commercial grade." A commercial grade item is considered to be an industry manufactured standard product with sufficient use history in non-nuclear applications to justify its use in a nuclear application. When Part 21 was determined not applicable, Power Stores receipt inspected the item.

ANSI 45.2.6, "Qualifications of Inspection, Examination, and Testing Personnel for Nuclear Power Plants," defines inspection as:

> A phase of quality control which by means of examination, observation, or measurement determines the conformance of materials, supplies, parts, components, appurtenances, systems, processes or structures to predetermined quality requirements.

The personnel who perform those inspections are required to also meet the established standards of inspectors as specified in ANSI 45.2.6.

If an item has no predetermined quality, then an inspection as defined above wouldn't apply, and the Power Stores clerks performing receipt inspection wouldn't have to be trained to ANSI 45.2.6 requirements.

The inspection and treatment of a commercial grade item takes on new meaning and becomes quite important if the item is subsequently used as a basic component. The Code of Federal Regulations in Part 21, "Reporting of Defects and Noncompliance," states that a commercial grade item can be designated for use as a basic component through "dedication." The dedication process is basically TVA accepting responsibility for the quality and performance of the dedicated commercial item. When TVA accepts that responsibility, there should be some documented assurance of the quality of the item.

That assurance could be established through means such as the following:

(1) audit of the supplier
(2) testing of the item
(3) verification of certificate of conformance
(4) maintaining records documenting supplier history

The previously identified concern of Power Stores personnel performing receipt inspection on materials and related documentation with minimal training becomes more important when realizing that commercial grade materials can be dedicated as basic components.

In many cases, the Power Stores clerk is the only one who has evaluated the quality of an item before use. The importance of the inspection has gone beyond the basic inventory of items received versus items ordered and should be performed by FQE inspectors who have been trained in the review of documentation related to procured items.

However, it also should be emphasized that the FQE inspector receiving the certificate of conformance is basically looking for a signature. The review team did not pursue the validity of COCs but did observe the following:

(1) No testing is routinely performed on material to verify material properties as stated by the manufacturers (FQE formal training doesn't include testing methods.)

(2) Not all vendors who provide COCs with commercial grade material have been audited by TVA. Therefore, the value of the COC would be in question.

(3) Supplier and product history has not been maintained on materials received and used onsite. Therefore, no documented bases exist to substantiate the acceptability of an item on that basis.

As a result, for true commercial grade items supplied by a vendor without an approved QA program and with no supporting QA documentation, the only assuring activity remaining for TVA is testing of the item. No program was identified that tested items upon receipt. As identified in section V.G there are no TVA controls over the manufacturing process or materials for true commercial grade items that could assure that the materials of construction and operability of an item is acceptable for its intended purpose or its environment of operation.

NUC PR personnel stated a functional test of equipment was required when repaired or replaced. That test should provide suitable evidence that the item functions properly under normal operating conditions. That test will not, however, provide any assurance or demonstrate an ability of that item's functionability with respect to time or environmental conditions present during an accident. As such that functional test is unsuitable for assuring a commercial grade item used as a basic component will function as required during accident conditions.

6. Storage and Reorder of Shelf Life Items

The complete storage program for all procured materials was not reviewed at this time due to the amount of work already performed in this area by other TVA organizations. Some inadequacies and noncompliance to DPM requirements have already been identified through audits performed by OQAB of the storage program (reference audit report BF-8400-03). BFN and SQN are currently planning and building larger storage facilities which will reduce some inadequate storage conditions. Follow-up activity related to the OQAB audit should include a review of the entire storage function on all procured materials to verify compliance to DPM N82A17, "Equipment and Materials Storage Requirements for Nuclear Power Stores."

The NSRS review team limited the storage portion of the review to an area not emphasized in previous audits, but one that presented problems in the accessibility of materials. A basic problem identified by site employees was the unavailability of routine inventory items, with limited shelf life, when needed for maintenance. Examples told to the review team at both SQN and BFN involved rubber products such as O-rings and gaskets and chemicals reaching their expiration date with no suitable replacements available in stock. A limited review in the storage area was performed to address the specific problem of shelf life items. The storage requirements reviewed include the OQAM Part III, Sections 2.1 and 2.2, DPM N82A17, DPM N77A2, BF16.4 and SQA45. Discussions were held with Power Stores representatives who have the responsibility of performing the inspection on shelf life items and the subsequent reordering of materials. Records were also reviewed for completeness and accuracy of previous inspections performed.

The N-OQAM addresses the inspection of shelf life items in both Part III, Section 2.1, "Procurement of Materials, Components, Spare Parts, and Services," and in Part III, Section 2.2, "Receipt and Inspection, Handling, and Storage of Materials, Components, and Spare Parts."

Part III, Section 2.1, paragraph 3.2.3.4, "Limited (or Shelf) Life Material," states that "For additional guidance in NUC PR's policies with regard to limited shelf life or natural aging life refer to DPM No. N77A2, 'Storage and Shelf Life Considerations for Materials with Natural Aging Life.' This document covers requirements for procurement, receipt inspection, periodic inspection, and disposition."

While DPM N77A2 previously contained shelf life requirements its revision log under the entry of March 21, 1983, stated that the "Revision removes requirements for periodic inspection of materials with limited shelf life." It did, however, contain a requirement to reorder shelf life material at least three months prior to their expiration date. As stated in section V.B.2, three months may be an inadequate lead time.

Part III, Section 2.2, paragraph 4.3, "Inspections," stated that "Inspections shall be performed and documented on a periodic basis to ensure the integrity of the item and its container is being maintained . . . specific inspection requirements for equipment and material are delineated in DPM N82A17." That DPM, which did not cover all items with a shelf life, was revised on September 7, 1984 removing the inspection criteria.

Consequently, whatever inspection process was intended by the OQAM reference to lower tier document requirements was lost with the revision of both DPMs.

The Power Stores personnel at SQN and BFN had different procedures for inspecting and reordering material with a shelf life. Materials were being inspected at SQN near the expiration date and then reordered. BFN was performing an inspection when material reached about one-half its specified shelf life but assigned a low priority to the reordering of those materials.

SQN Power Stores personnel did state that a shelf life item inspection program would be initiated in the near future, but no specified date was identified. The program described would provide an inspection at six months prior to the expiration date.

The BFN site procedure BF16.4, "Materials, Components, and Spare Parts Receipt, Handling, Storage, Issuing, Return to Store Room, and Transfer," was reviewed. BF16.4 referenced incorrectly DPM N77A2 for the storage and inspection requirements of shelf life items. BF16.4, section 4.8, was consistent with DPM N77A2 and required the reorder of shelf life material at least three months before the expiration date.

In order to verify compliance with the BF16.4 inspection requirement, three months of computer printouts (May 1984 through July 1984) were reviewed that listed all shelf life stock items due to expire during the month. A checkmark (✓) had been placed by each item by Power Stores personnel verifying that an inspection had been performed. That type of documentation did not meet the requirement of OQAM Part III, Section 2.2, paragraph 4.3, which stated that a form similar to attachment 4 of that OQAM section should be used for inspections.

At BFN five items were selected from the June 1984 computer listing to evaluate the shelf life inspection process. Of those, two items were judged by BFN to be in acceptable condition and their shelf life did not expire for another year. Therefore, no reorder was required. In contrast, three of the items were due to expire within three months and had not been ordered, i.e., a purchase request had not been written.

It was emphasized by Power Stores that those small quantity items were not being reordered until a larger quantity order could be made. Certain constraints regarding the minimum dollar value of orders were imposed by PURCH and manufacturers. While the size of an order may be relevant, materials should also be ordered in a timely manner. The consolidation of orders to make "quantity orders" was the responsibility of MMSS. (See V.C.1 for details.)

When material exceeded its specified shelf life, which appeared to be a common occurrence, specific approval by PORC was required at each site to use the outdated item. More recent industry philosophy regarding materials with shelf life is contained within ANSI/ASME NQA-1-1979, Supplement 8S-1. That standard requires that shelf life items be identified and controlled to preclude the use of items exceeding their shelf life. As such it appears inappropriate for TVA to remove requirements regarding shelf life inspections, and to continue the practice of reordering material as the shelf life expires or without sufficient lead time to assure a supply of fresh material.

C. Power Stores

1. BFN and SQN Power Stores

The initial review time in Power Stores was spent gaining an understanding of the basic mechanics of site procurements (forms used, terminology, coordination required, time delays, etc.) and reviewing procurement files. Power Stores maintains a file on each procurement, which includes all available information relating to the specific procurement (request, requisition, receipt inspection report, etc.). Those files became a main source of information for the review team and, with a few minor exceptions, were essentially complete records. Various personnel were interviewed to ascertain their understanding of the total procurement system and to identify their specific responsibilities and problems within the procurement system. Those interviewed appeared conscientious in the performance of their understood responsibilities and demonstrated a willingness to assist the review team in locating documents relating to specific procurements. Areas reviewed included the automated reordering of stock items, the utilization of the MAMS database, the shelf life item inspection program, the Power Stores receipt inspection program, associated training, and handling of records. (The receipt inspection program and storage of shelf life items were previously discussed in sections V.B.5 and V.B.6 respectively.)

Power Stores personnel were responsible for typing requisitions and coordinating all the required signatures. They also helped locate needed materials within TVA by utilizing available information on the MAMS system and assisted in coordinating transfers of materials between divisions and other storerooms. Reorders of stock items were also initiated by Power Stores.

The utilization of the MAMS database onsite was controlled by Power Stores. Basic information on stock items was available through that system which functioned on a Reorder Point/Reorder Quantity (ROP/ROQ) concept. In principle a maximum (MAX) inventory level was established for each item to support plant needs without excessive inventory. A minimum level or ROP was also established which allowed sufficient time to order and receive replacements without exhausting the inventory. When the stock level reached the ROP (MIN) amount, an order could be placed for the ROQ to bring the inventory back to the MAX level. The MAMS system also contained data as to the date and amount of an item withdrawn at that time, i.e., a usage history.

The development, maintenance, and changes to the MAMS system with inputs from Power Stores and NUC PR are the responsibility of the Materials Management Services Staff (MMSS). The MAX-MIN levels have been evaluated by the MMSS in an attempt to better utilize stock inventories, either increasing or decreasing as necessary. A basic problem faced by site personnel was caused when MMSS reduced stock levels based on incomplete information. Procurements through emergency and field purchases on a specific item were not included in the MAMS usage history and therefore were not included in the evaluation. Both users of MAMS and MMSS personnel offered explanations of why and how stock shortages of certain items occurred. NSRS decided that ascertaining the validity of the explanations would not be fruitful, as Power Stores and MMSS were well aware of the problem and appeared to be cooperating in establishing meaningful usage histories to base stock reductions and increases on. Unfortunately, the originators at SQN and BFN felt they were being hampered in their work by not having basic materials available when needed. They considered MMSS the problem because MAX levels weren't high enough. A problem, resulting from the shortage of materials in stock and the MAX level being too low, was identified at both BFN and SQN and involved the hoarding of materials.

In an attempt to ensure adequate supplies when needed, user organizations would "buy out" certain items as they arrived in the stockroom, thus forcing the reorder of that item. Power Stores personnel stated that on some specific items, no matter what the MAX level was, they could never keep material in stock. Those items varied from mops and cleaning supplies to plastic bottles and electrical equipment.

Power Stores is responsible for issuing material when requested and not for questioning the usage of material.

The hoarding of materials demonstrated the frustration level experienced by maintenance and modification personnel and their lack of confidence in the procurement system. The hoarding problem was discussed with Power Stores personnel at the central office. Plans were described for better utilization of the Power Stores Distribution Center in Chattanooga as a source of heavy use stock items. Plans also included the establishment of the HTN warehouse as a Power Stores Distribution Center.

Contained within the MAMS system was the capability of MMSS in Chattanooga to monitor stock levels at all Power Stores locations and to automatically reorder material as the reorder point was reached. MAMS also had the capability of combining orders of like material, but MMSS personnel stated they were prohibited from using that feature by OGC. The reasoning behind that prohibition was not pursued.

While the MAMS system has an automatic reorder feature, it was not being utilized because the plant FQE was required by the OQAM to review and approve all procurements (both QA and non-QA). Consequently, all inventory reorders were prepared by hand and the combination of like orders by MMSS was performed by hand. Rationale for not using the automatic reorder system was that the MAMS system was not a QA system and changes to the information within MAMS (material specifications, QA level, etc.) could be made without QA knowledge or approval. Information was provided NSRS which explained efforts underway to develop a procedure acceptable to QA which would protect the MAMS system from unauthorized QA changes. NSRS highly endorses that effort. Upon completion of that feature the MAMS system should be usable to a larger extent, thus eliminating the considerable manpower requirements currently required to manually reorder inventoried material.

2. <u>Power Stores Distribution Center</u>

The review of the distribution center in Chattanooga and the Investment Recovery Program (IRP) warehouse at HTN was limited to discussions with Power Stores personnel.

Power Stores currently has a distribution center warehouse in Chattanooga. At the time of this review over 100 items were being stocked there. The basic concept of that center was to provide a warehouse of inventoried items that the plants stockrooms could draw from. Described plans included maintaining a 6-month supply of items, thereby allowing the plants to reduce their inventory and associated storage requirements. In concept that idea appears functionally sound but will require the cooperation of all concerned to work within the system. During this review, Power Stores was having difficulty maintaining a stock of mops, for whenever a delivery was made to BFN to replenish their inventory, plant personnel would "buy out" the mops and hoard them. That process created a real shortage within the Power Stores system based upon a perceived shortage by the users.

The distribution center did not have a QA program, but Power Stores personnel stated that one was being developed. At the time of this review the only QA material stored at the center consisted of welding rod and dye penetrant. As Power Stores personnel were not ANSI N45.2.6 trained receipt inspectors, any quality material received at the center required an FQE inspector to go from SQN to the center to perform the receipt inspection.

The IRP associated with TVA's canceled nuclear plants provided a vast supply of materials to the remaining nuclear plants. Power Stores was in the process of taking control of the HTN IRP warehouse operation. It was described as containing material with an acquisition cost of approximately 100 million dollars including approximately 33,000 valves. Approximately 40 percent of that material had QA documentation sufficient to support use in a QA system and the remaining 60 percent was suitable for non-QA systems or fossil plants. Like the Chattanooga distribution center, Power Stores described plans to keep the HTN facility as a distribution center for large items. The HTN facility was also having QA and preventive maintenance procedures prepared.

D. Central Office

The central office portion of the procurement review primarily involved the following groups: Nuclear Central Office Quality Assurance Branch (NCO QEB), NCO Materials Management Section (MMS), Central Power Stores, and the Materials Management Services Staff of Operations Support.

The OQAM (Part III, Section 2.1) was the reference used to define the responsibilities that each of the above groups had in the procurement cycle. Flowcharts which correspond to the OQAM-defined responsibilities were found in DPM N72A14. Requisitions for QA level I and II (Part 21 applicable) materials and services were reviewed by various groups in the NCO. Power Stores and MMSS basically reviewed requisitions for inventory items. Implementation of these documents was evaluated with only a few exceptions to compliance identified.

It should be noted that many of the NCO procurement responsibilities and associated personnel had been transferred to the plant sites on October 1, 1984, and the organization reviewed by NSRS was the one in place prior to October 1, 1984. As the functions and responsibilities no longer exist at the NCO, an individual breakdown of each organization and associated problems will not be presented but an overall summary is provided.

Procurements of QA level I and II 10CFR Part 21 applicable materials and services were circulated for review and approval throughout the NCO groups identified above. The only group with any visable impact upon a procurement package was the NCO QEB. Other groups provided signatures of approval or acknowledgement or were within the distribution cycle due to the mandates of organizational communications. The value added to the procurement documents by QEB on the 21 procurements followed from the sites through the NCO was minimal. For the most part QEB changes were editorial rather than substantive (e.g., changing the verbiage specifying 10CFR Part 21 was applicable). Technical review of procurements were also being performed by QEB. Both the OQAM and DPM N72A14 specified it was to be performed by the NCO technical branches when required. NSRS found that the technical branches who were previously performing most of the technical reviews were no longer doing so and it was being performed by an SC-2 mechanical engineer in QEB.

The responsibilities of the MMS were essentially clerical. They were to "coordinate central office NUC PR procurement communications among the nuclear plants, Power Stores, and the NCO." (OQAM Part III, Section 2.1, 2.2.1) They also performed a review of requisitions for "administrative correctness and completeness." (OQAM, PART III, Section 2.1, paragraph 3.1.2.10) The review was similar to others performed by the site and not considered necessary by NSRS. The MMS served as a paper coordinator that moved QA levels I and II requisitions between Power Stores, NCO QEB, and the technical branches. Files had also been maintained on specific requisitions, but these files were not evaluated for completeness because they were being transferred to the plant sites. The MMS also interfaced with other procurement groups on IQT contracts. The IQT tracking of available funds and administration of IQT contracts were functions still performed by the MMS after the October 1984 reorganization.

Findings regarding length of time to prepare, review, and approve procurements within NUC PR can be summarized as follows:

1. Normal direct charge procurements took 4 days to prepare and approve at the sites and 2 months to review and approve in the NCO.

2. Emergency direct charge procurements took 4 days to prepare and approve at the sites and 7 days to 1 month (15 days average) for the NCO to review and approve.

3. Emergency Requests for Delivery took 1 day to prepare and approve onsite and 8 to 14 days for the NCO to review and approve.

4. More complicated nonroutine procurement took 1.5 months for the site to prepare and approve and 7 months for the NCO to review and approve.

Even though NSRS found that the NCO provided little assistance on most procurements, one procurement of services to decontaminate and repair a Westinghouse CCP motor for SQN was reviewed where considerable NCO help and input was provided; however, considering all the procurement documents reviewed, the value added by the NCO could not support the continuation of several weeks or months delay between preparation at the site and transmitting the procurement package to vendors for bids. The NCO was not providing a service the plants could not provide for themselves with proper training. NSRS supports the NUC PR decision to eliminate the NCO from the procurement review cycle provided the function was not just transferred unchanged to the site.

E. Office of Engineering

The Office of Engineering (OE, formerly Engineering Design) was reviewed from the standpoint of their involvement in the procurement process for operating plants. Their involvement primarily consisted of design work on modifications. As a general rule if a modification involved the procurement of engineered items (valves, pumps, etc.) OE would procure those items. NUC PR would procure any remaining stock type items (steel, pipe, conduit, etc.). A part of the modification package consisted of a Bill of Materials which listed all the materials needed for the modification and identified by procurement contract number those purchased by OE. A problem expressed by NUC PR, but not pursued as a part of this review, was that the Bill of Materials did not necessarily arrive onsite in time for NUC PR to know what materials to buy. As a result, modifications were sometimes started not knowing if all the required materials were available.

Inconsistencies between OE and NUC PR terminologies and procedures were identified which could present problems. One such inconsistency involved the QA level assigned procured material. Within OE material was either QA material or not and if it were QA material 10CFR Part 21 was applicable to the vendor. NUC PR, on the other hand, had four different levels of quality within the QA materials it purchased and non-QA material. Within the four QA levels two had optional 10CFR Part 21 applicability. Consequently what was designed and constructed as either a QA system or a non-QA system was being maintained and modified using six different QA classifications and no QA. This is not to imply either is more or less correct, but to point out an inconsistency within TVA of doing work that really should not be there.

Another problem was identified in that the nomenclature used to define the various design classifications for piping systems were different for each plant and no official definition for the classifications could be found. An engineer within OE provided a list he developed for his own use. Engineers at the plants have a problem knowing what a piping classification means on a modification drawing because the plant engineers don't classify their systems the same way as OE. That problem results in the plant engineer having to communicate with OE for an interpretation before material is bought so the appropriate material specification can be placed upon the item procured.

Regarding OE procurements, one good practice was identified in that Requests for Delivery on an IQT contract could be issued directly from OE without going through the laborious review and approval process employed by NUC PR. Another practice, which will be discussed further in section V.G, of questionable validity was identified. Where a large component was assembled from commercial grade parts (parts not requiring an ANSI N45.2 QA program over manufacturing) and qualified to an 1E environment, OE continues to procure replacement parts as commercial grade and assumes the component maintained its 1E classification.

No areas for improvement specific to OE were identified in the limited areas reviewed.

F. Purchasing

The review time spent in PURCH involved gaining an understanding of the laws pertaining to Federal procurements, identifying the purchasing agents' (PA) responsibilities and their specific problems within the procurement cycle, and tracking specific requisitions through the bid process and award of contract. Specific internal PURCH procedures were not reviewed or evaluated due to time constraints. The PAs appeared conscientous and professional in the performance of their responsibilities and demonstrated a willingness to help in improving the procurement system. They consistently expressed concern over the excessive use of emergency purchases and unrealistic "want" dates and how these affect TVA credibility with vendors. The PAs also stressed the need to be technically accurate on all specifications found in requisitions. In the PA's opinion, too many specification problems were being identified by vendors and not within the TVA review cycle.

One review area involved obtaining a general understanding of the legal constraints placed on Federal procurements. Many were identified including low bid and EEO and small business requirements. Many of these requirements, including their impact upon the procurement process such as time delays, were unknown to site technical and NCO personnel. A relatively new constraint, Public Law 98-72 and the associated requirement that procurements of $10,000 and over be advertised in the Commerce Business Daily prior to the bid process were known by site personnel and presented more consternation than any of the others discussed during this review. That law allows all interested vendors the equal opportunity to bid on an item and delays bid opening up to 45 days. Unfortunately, due to the great number of items required to be advertised in the Commerce Business Daily by all Federal agencies, a 3- to 30-day waiting period resulted at the Department of Commerce before the ad was placed. That presented an additional significant time delay in an already lengthy process. Although many people informed the review team of the 45-day advertising requirement, there was no awareness of the waiting period delay by the site originators. Had they been aware of the additional delay there was no reason to expect that that time delay would be factored into the ordering lead times because no other time delay had been factored in either by the originator or anyone else in the procurement process.

A consistent problem identified by the PAs was the amount of time taken in the resolution of problems identified on a requisition and exceptions taken by vendors when submitting bids. The PA did not communicate directly with the originator. In fact, the PA typically did not know who the originator was. The signature of the originator was not on the requisition. Therefore, the PA had to rely on someone else (possibly from Power Stores or the Materials Unit onsite or NCO) to coordinate resolution of problems identified with the requisition after the bids were received. The agents varied as to the method used in the coordination process although all were aware of the resultant time delay.

Another problem identified by the PAs was the time delay involved in getting bids approved by the NCO QA Staff. The "review" performed by NCO QA (when no exceptions to the contract are taken) consisted of stating which of the low bidders were on a list of vendors with a TVA-approved QA program. The process of PURCH sending the bids for review was extremely cumbersome and time consuming. PURCH sent the bid to Management Services, who sent it to Materials Management, who sent it to QA. After approval the process was reversed. If an exception was involved, QA would send the exception to the site and coordinate approval between FQE, Materials Unit, and originator as necessary.

The time delay resulting from the memorandums and paperwork generated in stating which of the lowest bidders had a TVA-approved program was considered excessive and unnecessary by NSRS. In many cases the PA had worked consistently with a particular commodity and was knowledgeable of the approved vendors. To eliminate time delays and excess written communication, it would appear prudent to establish guidelines to allow PAs the task of selecting the lowest bidder from the approved vendors list. That responsibility would be applicable for cases only in which no exception was taken by the vendor.

The PURCH portion of the review occurred a few days prior to the October 1, 1984 transfer of NCO procurement responsibility to the sites. The PAs had limited or no information concerning the changes which would affect the procurement cycle. Although some time is required in a transition stage to incorporate changes, the review team considered this symptomatic of what appeared to be limited communication occurring between NUC PR and PURCH.

G. Quality Assurance

The NRC regulations and TVA procedure recognize that basic components can have varying degrees of quality placed upon them depending upon their importance to safety. The OQAM establishes four QA levels (level I, II, III, and IV) to which items or services for CSSC may be assigned. Guidelines in assigning levels are listed in paragraph 3.2.5.2 and are identical to those listed in ANSI N45.2-1971. These are interpreted by NSRS to range from items requiring considerable QA activities to those requiring little or no QA, i.e., commercial grade items of standard design which have proven successful for many years. In reviewing the QA levels in OQAM, Part III, Section 2.1, paragraph 3.2.5.2, it is found that each apply to CSSC with QA level I basically applying to, among other things, ASME Code material and items procured to a standard unique to the nuclear industry and decreasing in safety importance to QA level IV with no safety-related function.

Reviewing the definitions contained within 10CFR21, 10CFR50, and associated appendices, regulatory guides, and the OQAM, it was clear that TVA has equated the following terms:

1. Basic component.
2. Critical systems, structures and components (CSSC).
3. Structures, systems and components important to safety.
4. Safety-related structures, systems and components.

Those definitions being equivalent are used throughout the OQAM in a variety of contexts and introduce conflict and confusion.

A contradiction is introduced in the description of QA levels III and IV. In the OQAM both levels III and IV are described as being for CSSC items, but elsewhere the OQAM specifies that levels III and IV are not for basic components.

The use of commercial grade items in association with QA levels presented confusion and contradiction. Commercial grade items were allowed to be purchased by the OQAM, Part III, Section 2.1, paragraph 3.2.5.2 with QA levels I through IV. However, OQAM, Part III, Section 2.1, paragraphs 4.3.1.7 and 4.5, excluded level II as an option for purchasing commercial grade items. In addition the OQAM, Part III, Section 2.1, Appendix F, paragraph 2.2, stated commercial grade items were not basic components.

Items procured with quality level I and II designations require considerable documented quality control unless procured as commercial grade. A commercial grade quality level I or II procurement could be from vendors with an unapproved QA program, require no documented quality assurance, and receipt inspected by Power Stores personnel. Although allowed by the OQAM most but not all procurements of QA level I and II commercial grade items seen by NSRS were required to be from vendors with N45.2 approved programs.

As the QA requirements are all essentially the same for commercial grade items, NSRS believes there is a fallacy in trying to pigeonhole purchased commercial grade items into a variety of QA levels. The origin of this fallacy appeared to stem from the application of 10CFR21 to items procured to either QA level I or II. TVA, in the OQAM, stated that the determination of Part 21 applicability applied only to QA level I and II procurements. Determination of Part 21 applicability was contained within OQAM, Part III, Section 2.1, Appendix F. In order for Part 21 to be determined not applicable, the item being purchased must have been a commercial grade item, must not have been a complete basic component, or several other criteria. Appendix F, Attachment 1, was a form, "Determination of Part 21 Applicability," which when completed became a QA document. The first question asked was "is the item 'commercial grade' (yes or no). . ." If the answer was yes, Part 21 was not applicable and any remaining questions remained unanswered, such as, could its failure cause a basic component not to perform its required safety function. NUC PR QA personnel agreed this was a problem.

Considering whether or not a commercial grade item could affect the ability of a basic component to perform its safety function was addressed by the NRC when Part 21 was developed. In its first publication of Part 21 as a proposed rule on March 3, 1975, the wording was such that Part 21 could be considered applicable to off-the-shelf or catalog items. In response to inquiries and public meetings, NRC amended Part 21 on October 19, 1978, and recognized that commercial grade items could be purchased without the Part 21 requirement to report defects and the associated liabilities for not reporting them. This recognized that commercial grade items could be purchased for use as a basic component and Part 21 would become applicable after "dedication" of the part as a basic component. Based on discussions with TVA Office of the General Counsel (OGC), this dedication means to put into use and at that time Part 21 reporting requirements becomes the responsibility of TVA. Consequently, the NRC has allowed the use of items with a variety of QA levels including commercial grade as basic components. However, the use of commercial grade items with Part 21 not applicable does not eliminate the need for some level of quality, rather it shifts the burden of assuring quality and the continued ability of that item to perform its safety function from a joint manufacturer/TVA responsibility to TVA's sole responsibility. That is, if TVA procures a commercial grade item for use as a basic component, it must either assure quality during the manufacturing or through receipt inspection, testing, or other means. For a true commercial grade item that is purchased off the shelf by part number with no documented quality, the only avenue available to TVA to assure quality is through receipt inspection and testing.

In OQAM, Part III, Section 2.1, Appendix F (2.3.1) the statement is made, "Specific components, systems, and structures listed on the CSSC list are basic components by definition unless procured as commercial grade." Therein lies the fallacy. A basic component remains a basic component whether or not it is replaced with a pedigreed item or commercial grade item.

Part 21 specifies [21.3(a)(4)] that "a commercial grade item is not a part of a basic component until after dedication." It does not state that a basic component ceases to be a basic component if supplied as a commercial grade item. A commercial grade item can be used as a basic component once dedicated, and it can be used where its failure could cause a basic component not to perform its required safety function. All the Part 21 applicability means for a commercial grade item is if TVA finds it defective at some point in time, TVA must report the defect to NRC just as the vendor or TVA would have to do if a defect were found on an item where TVA imposed Part 21 upon a manufacturer.

In determining Part 21 applicability one criterion for judging Part 21 not applicable is by identifying the item as a commercial grade item Most Part 21 not applicable determinations seen during this review were because the item was identified as being commercial grade. That determination has resulted in what NSRS concludes as a misapplication of the definition of commercial grade. One example is offered in support of that conclusion:

- Requisition number 951134 from SQN was written to procure sheetmetal for ECN 2768. The metal was to be manufactured to ASTM specifications and required the manufacturer, through Appendix E Attachment 8, to have a quality assurance program that met the requirements of ANSI N45.2-1971. The items being procured were classified as commercial grade and assigned a QA level I Part 21 not applicable.

Purchasing that material to an ASTM Standard and requiring an N45.2 QA program is certainly more restrictive and prescriptive than purchasing an item to a catalog number. It therefore should not be classified as commercial grade. Part 21 may still not be applicable, but for different reasons such as it would not adversely affect the performance of a safety function.

It appears that a situation occurred where material was being procured not for a basic component but for an application that still required QA level I attention. As the Appendix F, Part 21, applicability form first questioned whether or not it is commercial grade, it appeared that personnel completing the form were taking the easy way of determining Part 21 not applicable by calling it commercial grade thereby avoiding the evaluation of other significant qualifying factors.

It could be argued that it makes no difference if Part 21 is declared not applicable by either calling the item commercial grade or by deciding it is not a basic component. The argument breaks down, however, when, as stated previously, it is recognized that the manufacturing of commercial grade items requires no approved QA program or FQE receipt inspection while other non-CSSC items may require considerable QA with approved programs. An example of a determined nonbasic component purchase with conflicting Part 21 determinations is as follows:

- Requisition number 343910 from SQN was written to procure reactor coolant pump seal parts. Specific information was provided on the Westinghouse pump and the parts were required to be manufactured in accordance with the original requirements of the Westinghouse E-Specification 677355. The plant FQE staff originally classified the procurement as QA level II, Part 21 applicable, but NCO revised the procurement to be QA level II, Part 21 not applicable because they were not on the CSSC list and would not affect the safety function of a basic component. Considering that the specification used for the seals was developed by the manufacturer (Westinghouse) of the main coolant pump, it could well be a specification unique to the nuclear industry. As such, the procurement should probably have been identified as a basic component and designated Part 21 applicable. When Westinghouse supplied the parts they included the Part 21 applicability.

In other cases the use of a QA level I or II for a commercial grade item may be inappropriate and imply a level of quality that is just not present. For example:

- Requisition number 932925 from BFN was written to procure a selector switch for ECN L2115. It was ordered by the manufacturer part number, it was assigned a QA level II, and it required a packing slip for documentation.

As it was purchased from a supply house with no unique QA requirement or nuclear standards, it is considered by NSRS to truly be a commercial grade item. As such the QA level II is considered artificially high implying quality that may not be factual. That switch was to be used in a panel that was qualified, along with that model switch, by TVA to 1E requirements. It therefore clearly falls into the category of commercial grade items dedicated as a basic component.

OE has made a decision regarding commercial grade 1E equipment. Basically stated, if a component is assembled with commercial grade items (such as a motor control center) and that component is physically tested to 1E requirements and is qualified, then the qualification of that component will remain if replacement parts are the same (same stock number) or equal.

Even though commercial grade items are allowed to be used as basic components, in doing so TVA assumes added responsibilities which it is not adequately fulfilling. Recognizing, for example, that TVA had qualified, at some point in time, a commercial grade item for use as a basic component or a part of a basic component, TVA currently has no program to assure that future replacements will in fact be exactly the same as the one qualified, and therefore maintain that qualification. If a true commercial grade item is purchased by part number from a manufacturer or supplier, the manufacturer or supplier is not required to have an approved QA program, and TVA only receipt inspects the item to assure that the part number is correct. There was no testing or inspection by TVA identified that would assure that the item would perform as required or that detrimental changes to the item occurred or did not occur. NUC PR does perform a functional test of newly installed equipment which should provide some assurance that it will perform during routine operations. That test, however, will not provide any assurance that the item will perform as required under accident conditions. The manufacturers of commercial grade items are under no obligation or authority to identify changes. NSRS was informed that changes generally are accompanied by a part number change by the manufacturer. That, however, is by convention rather than by requirement. Additionally, what would constitute a change would probably differ from manufacturer to manufacturer, and a change as subtle as using a different lubricant (which could have a very detrimental effect under accident conditions) would probably not be considered a change by any manufacturer.

OE personnel interviewed stated that some manufacturers will not sell commercial grade items to a nuclear plant. OE personnel stated that if certain manufacturers received an order for a commercial grade part and knew it was to go, e.g., to SQN, they would automatically provide the QA documentation on the item, delay shipment about six months while assembling the documentation, and would charge ten times the amount they would charge for the same item if it were commercial grade. OE stated no value was added to the part, it was not manufactured any differently than the commercial grade item, and TVA already had the item so if a defect were found TVA would receive its 10CFR Part 21 notification on the previous or original orders. To avoid what OE considered exorbitant pricing, an ordering procedure was devised when ordering parts from certain manufacturers where the Power Stores Distribution Center was the recipient of the commercial grade item. Specific instructions were provided to PURCH on the Purchase Requisition not to mention 10CFR Part 21, 1E qualification, or nuclear plant. At the time the Purchase Requisition was prepared, a Transfer Requisition was prepared for the use of the Power Stores Distribution Center when the item was received. That Transfer Requisition changed the classification of the commercial grade item to a QA item and directed shipment to the appropriate nuclear plant.

That procedure had been reviewed and approved by both OGC and OQA. Discussions with Division of Quality Assurance, Procurement Evaluation Branch, personnel revealed that the manufacturer in question did, according to OQA audits, have different production runs and QA requirements for items going to nuclear plants; therefore, it appears that some value was added to the commercial grade item for the increased fee.

This entire question was not pursued any further as a part of this review. NSRS has serious reservations regarding this practice and reserves final judgement until it can be evaluated further. Until that time it would be considered prudent on the parts of OE and NUC PR PEB to evaluate this practice on their own.

With the conflicts, confusion, and fallacy described above, the situation has developed where the QA level system is being further divided within the levels I and II, through the use of Part 21 applicability, to accommodate commercial grade items. In doing so an artificial QA level is implied for a commercial grade item (i.e., commercial grade item purchased with no QA and assigned a QA level of I or II), or items appropriately purchased with a QA level and requirements are called commercial grade. It is considered more appropriate and less subject to errors if the commercial grade items are recognized for what they are, either QA level IV or non-QA, and procurement of QA level I and II commercial grade items should be prohibited. In addition, all QA level I and II items regardless of the Part 21 applicability should be receipt inspected by FQE. Further, the quality requirements associated with an item adequately performing or affecting a safety function need to be separated from the Part 21 commercial grade determination which has nothing to do with quality. Whether the quality assuring activities for an item's ability to perform a function is jointly shared by the manufacturer and TVA or solely by TVA, is irrelevant to the required quality activities.

There is a basic philosophical problem with the QA program for items purchased as basic components versus items purchased as commercial grade but dedicated as a basic component. TVA's procurement QA program for basic components is based upon adding additional TVA quality assurance activities where there is quality assurance to begin with in the manufacturing process and have no quality where there is no verifiable quality in the manufacturing process.

To fulfill its responsibility when using commercial grade items as basic components, TVA will have to develop some mechanism to qualify replacement commercial grade items such as a receipt inspection and testing program that is more stringent than what is currently in place for QA items requiring FQE receipt inspection. (For additional suggestions and information on receipt inspection see section V.B.5.)

With regard to the QA program associated with procurement, the OQAM was found cumbersome and sometimes contradictory, 10CFR21 applicability was being used incorrectly as a determinant in establishing quality levels, and the Appendix F, Attachment 1 form, for 10CFR21 applicability was inappropriate and being misused. In addition, commercial grade items were being given implied quality by assigning a quality level to them, and TVA had no mechanism to assure a commercial grade item used as a basic component would function when needed during accident condition.

H. NUC PR Procurement Problem Task Force

The review team interviewed two of the three-member NUC PR Procurement Problem Task Force to gain an understanding of the perceived problems within the procurement system. The task force report and recommendations were issued subsequently on August 10, 1984 in a report from Eric Kvaven to Jim Darling (L00 840810 294). That report was reviewed by NSRS considering all material assimilated during the procurement review. The major recommendations identified in the Management Summary of the task force report were to:

(1) Establish an adequate planning group at the plant.

(2) Implement status tracking systems.

(3) Set goals for turnaround time for each review/approval cycle step.

(4) Improve and add adequate resources for expediting efforts.

(5) Improve communication between PURCH and the site.

(6) Eliminate all unnecessary steps in the procurement cycle with the goal of placing very few, if any, steps between the requisitioner and the purchasing agent.

(7) Improve the inventory stock out problem.

(8) Better utilize the automated systems.

(9) Develop improved QA procedures and training.

(10) Redefine QA responsibilities for procurement.

The following observations were made concerning the proposed recommendations:

(a) Items 1 through 5 above have a basic emphasis of incorporating more people into the procurement cycle by adding various expeditors, trackers, and designated contacts for PURCH and OE interface. The basic premise is to eliminate the delays. It should be emphasized though that time delays at the site could not be substantiated by the review team. The only consistent time delays involved procurements which traveled through the Central Office. Those time delays stemmed from the amount of handling a requisition received traveling between the Materials Management Unit, NCO QA, Power Stores, MMSS, and PURCH. The Central Office QA review was eliminated in October with all reviews now performed at each site. Adding more resources to the cycle to perform the recommended functions will not eliminate a basic inherent problem of too many people already in the procurement cycle.

(b) Although item 6 recommends the elimination of all unnecessary steps in the procurement cycle, the steps are not readily identified in the report. It appears that the extensive tracking proposed would be established to follow a cycle similar to what presently exists. The tracking would apparently start with the procurement request and be maintained until the item is received, set aside, and finally used. Some tracking may be appropriate and effective, but the emphasis appears to be to find the people who are not performing their job properly. Instead of developing a method to track all the reviews, more emphasis is needed in simplifying the present system, i.e., identifying the reviews not needed and better utilization or elimination of resource people presently available within the system.

(c) Necessary action on item 7 was observed during the review. To alleviate the stock out problem, more emphasis was being placed on having accurate usage history available. MMSS and Power Stores were coordinating that effort. An additional Task Force report recommendation to alleviate the stock out problem was the increased usage of IQT contracts. NSRS observed, under the current NUC PR system, no benefit in using IQTs to reduce time delays due to the RD on an IQT being treated as a new contract, i.e., going through the same review cycle every time an RD is to be used. A definite benefit can be realized if NUC PR uses the IQTs as intended and prescribed in the Procurement Manual. Another improvement can be made if site Power Stores order parts as inventories become low and not save them up for a big order.

(d) Item 8 is highly supported, and establishing a uniform database with QA control could enable the use of the automated system for reordering of all inventory items both QA and non-QA. This would be an effective method to eliminate the unnecessary site review performed on an item each time it is reordered. Current emphasis by MMS, Power Stores, and NUC PR should remain on QA program development.

(e) Although items 9 and 10 appear to be directed toward QA, the report substantiates the need to train all personnel in the procurement chain and to revise and standardize all procedures. NSRS fully agrees with this recommendation.

The Task Force report identifies some real problem areas in the procurement cycle and makes many valid recommendations. Immediate emphasis should be placed on the more simplified solutions like eliminating unnecessary steps that could provide significant improvements in the present system. An NSRS suggested solution to the problems with procurement is presented in Attachment 1.

VI. PERSONNEL CONTACTED

A. Browns Ferry Nuclear Plant

R. E. Burns	Group Head, Instrument Maintenance
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T. S. Orr	Nuclear Engineer, NEB, Design Support
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F. B. Rosenzweig	Supervisor, Cable and Miscellaneous Equipment
E. R. Taylor	Mechanical Engineer, NEB, Special Support
W. C. Wylie	Electrical Engineer

F. Office of the General Counsel

W. W. LaRoche	Attorney

VII. DOCUMENTS REVIEWED

A. Requisitions (Each requisition listed includes all associated documentation.)

171173	835401	938284	943842	951129
290205	925526-2	938298	945707	951133
322026	930478	940060	946728	951134
334177	931892	940163	947434	951148
341210	931941	940185	947454	951819
343910	932925	940222	950455	955163
355456	932973	940276	950509	956101
832041	932992	942925	951019	959025
833678	935570	942962	951023	959104
834705	935718	942988	951028	959122
834706				

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Operation Quality Assurance Manual, December 31, 1983

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BF 16.3, "Quality Control of Material Components, Spare Parts, and Services," July 20, 1982

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BF 16.9, "Procurement, Shipment and Receipt of Services and Material Involving Power Service Shop," July 5, 1983

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Test Report 17503-1 from Wyle Laboratories dated January 6, 1984, "Control Equipment Consisting of Therminal Blocks, Pushbutton Operators, Selector Switches and Contact Blocks and Various Cables"

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Memorandum from G. A. Keller to Electrical Engineering Files dated August 23, 1983, "All Nuclear Plants - Development of a Comprehensive Environmental Qualification Program (CEQP)"

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Memorandum from T. E. Spink to OQAB Files dated October 19, 1983, "Meeting of Special Evaluation Team - Environmental Qualification of Safety-Related Equipment with Duke Power"

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Memorandum from H. J. Green to James P. Darling, et al, dated July 25, 1983, "Browns Ferry and Sequoyah Nuclear Safety Review Boards' Annual Report for 1982"

Memorandum from R. L. Lumpkin, Jr., to F. A. Szczespanski dated August 16, 1983, "Browns Ferry and Sequoyah Nuclear Safety Review Boards' Annual Report for 1982" (OQA 830816 700)

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Memorandum from W. F. Willis to Those listed dated October 31, 1983, "Public Law No. 98-72 - Mandatory 45-Day Waiting Period ACT - Application to Procurement and Personal Services Contracts"

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ATTACHMENT 1

SUGGESTED SOLUTION TO PROCUREMENT PROBLEM

NSRS offers an approach to solving NUC PR procurement problems starting with the basic procurement function. An attitude change should occur whereby the procurement of items is considered for what it is--a very important function. Procurement within TVA is not simple and requires a level of expertise and knowledge not inherent in any position currently at the plants. The knowledge and experience must be taught and learned. Presently, the time delays and inadequacies are associated to a large extent with individuals learning on their own how to procure things. NSRS contends that procurement of items should be elevated in stature and importance to a professional level.

To make the concept work, NUC PR should change its practice that everyone can and should be able to procure materials to one where a dedicated and trained staff provides all procurement services. People need to know how to procure things before they are faced with the task. With proper training, a significant number of learning errors could be eliminated and the quality of the procurement process, both from a materials standpoint as well as a time delay standpoint, could be improved. A training program on the entire procurement process to include TVA's procedures, quality requirements, purchasing requirements, and Federal procurement requirements should be developed and provided to personnel performing a procurement function. Satisfactory completion of that training should be a requirement before an individual is allowed to procure anything.

An extension to the training requirement could be the establishment of a group whose responsibility is the procurement of materials. In that concept, engineers requiring items or services would go to the procurement group and specify what was needed. That group staffed with the necessary expertise would, in turn, prepare the necessary procurement documents, define the material specifications, quality requirements, and provide a completed procurement package ready for the approving official, be it the Plant Manager or the Board of Directors. That staff would be responsible for assuring that the procurements were correct and require no further review or approval with the exception of the authorizing official(s) and interface directly with PURCH. Power Stores personnel and their ordering of stock items would not be included in this staff but would work closely with them on procurements of stocked quality level materials.

GNS 840705 054

TENNESSEE VALLEY AUTHORITY

NUCLEAR SAFETY REVIEW STAFF

NSRS REPORT NO. R-84-19-WBN

SUBJECT: NSRS ASSESSMENT OF THE RESULTS OF THE BLACK AND VEATCH INDEPENDENT DESIGN REVIEW OF THE WATTS BAR NUCLEAR PLANT AUXILIARY FEEDWATER SYSTEM

DATES OF REVIEW: JANUARY 10 - JUNE 15, 1984

REVIEWERS: TECHNICAL ANALYSIS AND REQUIREMENTS GROUP

APPROVED BY: James F. Murdock
JAMES F. MURDOCK

DATE

MECS, WB863 C-K

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I. PURPOSE AND SCOPE

The NSRS performed an assessment of the results of the Black and Veatch (B&V) Independent Design Review of the Watts Bar Nuclear Plant Auxiliary Feedwater System to determine if we could support the policy committee report regarding the B&V review and to document areas where NSRS considered additional action was needed. The adequacy of the immediate corrective actions and the degree of "lessons learned" to other Watts Bar plant features and to the TVA nuclear program in general were assessed.

The Black and Veatch initial and supplemental reports, the activities of the TVA program team and cognizant line organizations, the activities of the TVA management policy committee and its report, the activities of the policy committee task force and its report, discussions with the TVA line engineers and managers, and onsite verification form the scope and basis of the NSRS assessment. Since the full applicability of the Black and Veatch findings to all the TVA nuclear facilities has not been determined by TVA, NSRS will perform followup assessments where appropriate.

II. EXECUTIVE SUMMARY

From January through June 1984, the NSRS performed a review and analysis of the results of the Black and Veatch (B&V) Independent Design Review of the Watts Bar Nuclear Plant (WBN) Unit 1 Auxiliary Feedwater (AFW) System and the TVA activities in response to the B&V findings. The NSRS review covered the B&V initial and supplemental reports, the activities of the TVA program team and the cognizant line organizations, the activities of the TVA management policy committee, and the activities of the task force of the policy committee.

The impetus of the NSRS effort was to assess:

1. the quality and appropriateness of the B&V review and the selection of the AFW system as the representative system;

2. the technical adequacy and consistency of the TVA responses to the individual B&V findings;

3. the determination of causes and generic applicability of findings and categories of findings to other WBN unit 1 systems and to other TVA plants; and

4. the analyses and evaluations performed to determine the safety implications of the findings or categories of findings had the B&V activity not taken place.

The following conclusions were reached from the NSRS assessments;

1. The AFW system was a good choice for a multidiscipline representative review. The B&V review was generally complete in depth and technically competent. A weakness in the B&V review was the lack of detailed examination of the consequences of findings by onsite verification. Since the B&V review was based upon the FSAR of record in 1982 and further design changes or FSAR amendments have been and will be implemented, the degree of conformance with current regulatory positions could not be determined. This could lead to continuing direction from NRC as the plant begins operation, particularly from the I&E Office.

2. For the greater part, NSRS agrees with the resolution of specific findings. The notable exceptions are in the electrical discipline (cable tray fill and treatment of protective devices) and in the structural discipline (embediments and attendent attachments) Followup discussion with EN DES, both in Knoxville and at the site, have led to resolution of the NSRS concerns in the structural area assuming the current (post-B&V study) EN DES practices are formalized in the proper procedures. In addition to the specific technical disagreements, NSRS found the definition of the safety impacts of the findings to be inconsistent with the basic engineering and safety reasons for having the features in place. A second weakness was that the record of resolution of the findings was not uniformly and completely documented.

3. NSRS substantially agrees with the task force grouping of findings into categories by way of determination of causes and the determination of generic applicability. In some cases more than one root cause could have been assigned a finding. Thus, the judgement of the reviewer as to the more important factors could be questioned; however, these differences are considered of low consequence.

4. The identification and correction of deviations or questionable conditions is a very important result of an effort such as the B&V review. Since a perfect plant or system is not likely to be found, the determination of the effect on the plant performance had the deficiencies not been discovered is deemed the most valuable aspect of the B&V review program implemented by TVA. The NSRS assessments support the conclusions of the policy committee that there is no direct indication that any affected structure, system, or component would not have performed its safety function. The safety evaluations performed by EN DES also support the conclusion that the safety functions would be performed. However, it is the assessment of NSRS that some of the identified deficiencies could lead to indeterminant conditions or conditions adverse to quality and to safety which reduce the margin of safety. Further actions were and are required to assure the margin of safety committed in the FSAR are met.

Additional observations drawn from the results of the B&W review are:

1. Considering the degree of completion of Watts Bar unit 1, the number of deviations found by B&V which would probably not have been discovered otherwise was fairly high. This underscores the value of independent design reviews by parties outside the TVA system. The findings would have been much easier to correct or avoid had the review been conducted earlier in the design/construction process. For lessons learned value, the Bellefonte project should consider this assurance tool.

2. The nature of the deviations indicates a need to substantially upgrade the configuration management processes and personnel training programs in TVA.

III. RECOMMENDATIONS

A. R-84-19-WBN-1 (Category 3)

All controlled documents should be clearly identified for all plants. The purposes and uses for each of the documents should be delineated. Information contained in documents designated to be controlled should be assessed for contribution to the intended purpose and use. Superfluous information should be deleted and discrepancies in documents with overlapping information should be corrected. Establishing a verified "as built," rigorously documented, should be assigned a very high priority.

B. R-84-19-WBN-2 (Category 9)

Procedure EN DES EP4.03 should be revised as has been verbally committed to reflect that visual examinations supported by field calculations are the basis for documenting acceptability of changes to or additional attachments to embedded plates in the field.

C. R-84-19-WBN-3 (Cagegory 9)

Consideration should be given to additional sampling for multiple attachments to imbedded plates made prior to February 1983 or an evaluation of the consequences of failure of 1 to 1½ percent of the supports in view of the overstressed anchor in one of the 69 plates already sampled.

D. R-84-19-WBN-4 (Category 20)

The methods and procedures for determining the proper values, physically setting, and verifying time delay relays settings should be reevaluated and indicated changes should be expeditiously made TVA-wide.

E. R-84-19-WBN-5 (Category 34)

See recommendation for Category 3.

F. R-84-19-WBN-6 (Category 35)

The instantaneous trip breakers should be verified to be set in agreement with the intent of the National Electric Code. The documentation for the design as well as for the testing and operations of the equipment should reflect the proper values. The program should be implemented TVA wide.

G. R-84-19-WBN-7 (Category 36)

Criteria should be developed for field use to control actual cable tray fill levels and to provide a basis for QC inspection. A feedback system should be included from the construction forces pulling cable to the designers routing cable to avoid the overfill problems to date. Although the problems at WBN 1 may be beyond fixing in many instances, expeditious action should be taken to upgrade the system for WBN 2 and Bellefonte.

IV. DETAILS

A. Background

From September 1982 through February 1984, an independent review of the Watts Bar Nuclear Plant (WBN) auxiliary feedwater system was performed by Black and Veatch (B&V) to determine the conformance of the system to commitments docketed in the FSAR. A TVA program team provided responses and additional information to the B&V reviewers to resolve questions and define corrective actions for confirmed deviations.

In a separate activity, a policy committee and a task force, both composed of senior TVA staff, evaluated the B&V findings for significance to other WBN unit 1 and 2 systems. The findings were evaluated for root cause and sorted into groups of similar nature. Where deemed appropriate, safety evaluations were performed to determine the consequences to the plant had the B&V review not been performed and the deviations gone undetected.

The B&V review findings were published initially in April 1983 and supplemented in February 1984. The results of the TVA task force efforts are documented in their March 1984 report to the policy committee chairman. The policy committee efforts are documented in their summary report to the EN DES Nuclear Engineering Branch.

The NSRS was involved throughout the process by being represented on the policy committee, by participating in the continuing reviews of the B&V findings and the TVA responses and by performing evaluations of the task force activities and report. The task force grouped the B&V findings into categories by determining the causes and generic applicability. The NSRS has evaluated each of these categories and basically agrees with the groupings of the findings. In the following section the NSRS evaluation of the categories is discussed. Any recommended follow-up action resulting from these evaluations is set forth in section III.

B. Discussion

1. General Observations

From an overall perspective, the B&V review showed that TVA did an acceptable design job in meeting the first order design requirements. Although there were a number of instances where the licensing commitments and licensing bases were not satisfied, further evaluations showed no cases where the ability to safely shutdown the plant was defeated. The deficiencies for the most part were failures to provide the additional margins of assurance committed in the FSAR. The basic causes for deficiencies involved lack of or poor training, failure to follow procedures, poor understanding of the commitments and lack of clear procedural definitions of commitments. In some instances the commitments were not rigorously met because they were viewed as enhancements as opposed to firm requirements.

Safety evaluations were performed by EN DES of the categories of findings where the licensing bases were not met. In all cases it was found that the ability to shutdown the plant had been maintained. The impacts of the reduced margin on overall plant safety and the effects of failure to implement the criteria for protective devices for plant equipment were not assessed.

2. Task Force Category 3

Category 3 contained 25 B&V findings where logic/control drawings did not agree with the electrical drawings. The identified cause for the category was failure to implement design review procedures as required by engineering procedure EP 4.25. The task force concluded the problems were generic to logic, control, schematic and connection diagrams throughout WBN units 1 and 2. The review was extended to three additional systems where similar problems were found. It was determined that corrective action was required for both past and future work.

The line organization has issued ECNs and FCRs to correct identified errors in hardware wiring and training was conducted in the I&C section of Sequoyah/Watts Bar Project (SWP) for EP 4.25. The drawings will be stamped to restrict the use to the intended function. No further reviews of other systems is planned to determine if other systems have the same problems, in spite of the widespread problems identified in the four systems that were reviewed. These problems included instances where as many as 13 wires shown on one drawing were installed on the wrong terminals (FCR E-3508, system EA). Finding F805 identified a crosstie between normal and emergency 125 V dc systems. Schematic 45W603-46-6R4 was different in many significant respects from logic diagram 47W611-3-4R2.

NSRS agrees with the TVA line actions to the point of correcting known wiring errors. We do not agree that their corrective action for past and future work is adequate. Since the problems have been demonstrated to be common in the four systems reviewed, it is reasonable to assume the deficiencies are institutional and all the plant systems should be reviewed and deficiencies corrected. Further to knowingly allow discrepancies to continue to exist in overlapping documents and depend upon a note to control document usage is very poor practice. Although the precise reason for the wiring errors cannot be ascertained, having conflicting information on overlapping documents cannot be helpful in precluding such errors. Further, during operations, personnel such as ROs, SROs, maintenance engineers and crafts rely upon such drawings as logic diagrams and schematics to perform their jobs. Allowing discrepant information on any controlled document places too great a burden on the administrative control systems to preclude use for a wrong purpose and further errors attendent to this practice can be expected including further wiring errors and misoperating equipment. The correct way of handling drawing errors is specified in EP 1.26 "Nonconformances Reporting and Handling by EN DES." It may be necessary to have more training in procedures at the management levels since these actions are being prescribed by management. NSRS recommends that all controlled documents should be clearly identified for all plants. The purposes and uses for each of the documents should be delineated. Information contained in the documents designated to be controlled should be assessed for contribution to the intended purpose and use. Superfluous information should be deleted and discrepancies in documents with overlapping information should be corrected. Establishing a verified "as built," rigorously documented, should be assigned a very high priority.

3. Category 4

Category 4 contained 12 B&V findings which the task force described as failure to design/maintain design records for the AFW system as specifically described in the FSAR. The task force identified cause was that TVA personnel were not aware of the FSAR statements. When the design changed, the FSAR was not uniformly amended to reflect the new designs. The problem was deemed generic to both WBN units and required corrective action for past and future work.

A special engineering procedure (SEP 83-05) was written to verify the accuracy of the WBN FSAR. Additionally, EP 2.01 was revised (revision 5) to upgrade the procedure for processing FSAR changes and EP 4.02 has been revised to require that engineering change notices (ECNs) describe FSAR changes needed as a result of the design change. NSRS reviewed the SEP to assess its completeness. Little guidance is offered to the reviewers of the FSAR as to the depth or method of review. Further the B&V review found deficiencies in the TVA response to IE Circular 81-13 and IE Bulletin 80-20. The SEP 83-05 review was restricted to FSAR sections; questions, responses to IE bulletins, NRC generic letters, etc., were not included in the review. The SEP review may not have corrected the deficiencies in the remaining commitments.

NSRS reviewed a sample of the proposed FSAR revisions and found a number of inconsistencies. The problem was discussed with OQA; a program was instituted by OQA to address the NSRS concerns.

4. Task Force Category 5

Category 5 had 10 findings where procurement forms and flow diagrams specified different requirements for various valves and qualification documentation was not tied to the design and procurement process. The task force concluded this category required corrective action for future work and for past work as appropriate.

The underlying problem for this cateogry was a breakdown in the ECN process. Although some of the problems were attributed to the inappropriate use of S1 ECNs, some breakdown in the ECN, squadchecking, and signature process occurred. Although the task force identified two EPs being changed or issued, the procedures in place at the time that these problems developed were adequate if rigorously implemented. The NSRS agrees with the TVA and task force actions for this category.

5. Task Force Cagegory 6

Category 6 contains 7 findings of discrepancies between documents (analysis results, load tables, isometric drawings, flow diagrams, etc.) used in the design of piping systems. The task force found this category required corrective action for both past and future work.

The NSRS agrees in general with the TVA and task force conclusions for this category. But even though individual areas of the design may indeed have random and unique errors, an overview of these areas indicates a generic problem of implementation of procedures, attention to detail and lack of a really independent review process.

7. Task Force Category 7

Category 7 has 17 findings of nonconforming conditions in construction of previously inspected and accepted pipe supports. This set of findings required some modification to future activities; other TVA actions in place prior to the B&V findings are expected to resolve any deficiencies in completed work.

All of these items were due to the pipe supports in the field being different from what was shown on the drawings. In many cases there were ECNs and FCRs pending when B&V did their study. This resulted in drawings being different than field conditions because CONST had not made the modifications yet. Also, the NRC Bulletin 79-14 program, "walk-down," under WBN-QCP-4.56 had not been implemented when B&V did their study. The discrepancies probably would have been been corrected by the 79-14 program. There is no safety concern after implementation of the 79-14 program, and correction of any deficiencies found, which is required prior to unit fuel loading. The pipe supports would have been inspected, and the ones with problems would have been corrected.

7. Task Force Category 9

Category 9 has 8 findings of failure to adequately control and evaluate embedded plate capacity when multiple attachments were made to the plate by construction. The task force concluded that corrective actions already identified and scheduled would have resolved the deficiencies and that some modification to planned corrective action for future work is needed.

NSRS substantially agrees with the task force and EN DES responses and actions for this category except in the area of embedded strip plates.

The initial NSRS review and discussions with cognizant EN DES designers concluded the findings relative to the strip plates would not have been corrected by actions already identified nor would the deficiencies have been corrected by the corrective action plan identified. There is no control system to identify and maintain records of as built loads on the plates. With this lack of record or system, there is no way of knowing whether plates are overloaded.

NSRS has two points in question on this subject which lead to a direct safety concern:

1. Although it was not discussed by B&V, the embedded plates have been analyzed with a "rigid" plate analysis as opposed to a "flexible" plate analysis. This can be

an unconservative analysis. Of 69 cases that were checked, an anchor on one plate was shown to be stressed beyond the allowable stress in the acceptance criteria and a stiffener was added as in documented in the corrective action NCR WBN-CEB-82-02. This is a generic issue since all plates are analyzed in the same manner. It should be recognized that NRC has not fully accepted the TVA assumptions in response to IE Bulletin 79-02.

2. Of much greater concern is the control of attachments to embedded plates. There is no bookkeeping system to keep track of the cumulative load on any individual embedded plate. Construction Specification N3C-928 was implemented in February 1983 in response to the B&V findings to restrict locations of attachments. However, there was still no system established to identify and control the cumulative load on each plate. This specification should have been more restrictive. On January 6, 1984 revision 2 of N3C928 was issued which allowed the EN DES representative onsite "by visual examination" to determine whether a detailed evaluation of the plate is required. The representative has no guidelines or acceptance criteria, but uses engineering judgement. NSRS has serious concerns with this reduction in requirements. Black & Veatch had signed off on this finding on December 30, 1983 on the basis of the February 1983 revision of N3C-928. TVA relaxed the requirements in the specification seven days later. The only way to ensure that plates do not fail is to do an analysis using the actual loads or to compare the actual loads to the loads used in the prior analysis and show that the revised loads are within the envelop of the analyzed case.

Based upon the second concern, NSRS visited WBN to review the visual examination process. The EN DES representatives were actually checking loads against the allowables, not just visually examining; however, the results were not being documented. After the NSRS visit, OQA issued deviation report C03-S-84-0089-D01 and EN DES designers have agreed verbally with NSRS and in response to OQA for the deviation to revise Appendix 4 to EN DES EP 4.03 to document the field calculations as the basis of approval. This would eliminate our concern on the cumulative loads for attachments made under N3C-928.

NSRS has a residual concern for all the multiple attachments made prior to February 1983. The sampling of 69 plates revealed one plate with an overstressed anchor requiring a stiffener. The EN DES cognizant designers should consider taking a larger sample to gain greater confidence that all the plates are adequate. If the additional sampling is not done, consideration should be given to performing a safety evaluation of the supported members with a basis of 1 to 1½ percent support failures since 1 in 69 of the embedded plates sampled had an overstress condition when compared to the allowable.

8. Task Force Category 11

Category 11 has 2 findings of inadquate documentation of operational modes data used in the analyses of piping systems. These findings were classified as deviations from the licensing commitments and bases and required corrective action for both past and future work.

A sampling program of rigorously analyzed piping was instituted to provide assurance that no design problems remained. Initially 20 problems were evaluated and none required reanalysis. The sample problems represent approximately 10 percent of the total number of rigorously analyzed problems. Another 30 percent have been updated for other reasons and the proper operational mode data were included.

NSRS agrees with the TVA actions and conclusions for this category.

9. Task Force Category 12

Category 12 had one finding of failure by EN DES and CONST to properly implement and document the alternate analysis criteria for seismically supported piping. It was concluded that although there was a deviation from a licensing commitment, actions already being taken by TVA would have corrected the problem without reliance on the B&V study.

NSRS agrees with the TVA actions defined in EN DES SEP 8218 and SWP EP 43.21 dealing with alternate analysis problems and the task force conclusions.

10. Task Force Category 13

Category 13 had one finding in which termination information on documentation was in error and was not updated to reflect the actual configuration. The task force review concluded based on a sampling of 40 additional AFW termination records with no discrepancies that this finding was an isolated case and no further action is required.

NSRS supports this conclusion.

11. Task Force Category 14

Category 14 had 22 findings where various supports on the AFW system had not been modified, redesigned, or initially designed per revised analysis of ECN 2576. The task force concluded the findings were departures from licensing commitments and licensing bases. Corrective action was designated for both past and future work. The EN DES evaluation of the overallimplications of the discrepancies revealed that the problem was substantially isolated to the one ECN. A total of 5500 supports were reviewed--5000 in ECN 2576 and about 500 in ECN 3184 to support the conclusion. Although about 8 percent of the supports covered by ECN 2576 required some construction modification, only one support covered by ECN 3184 required construction modification which very strongly supports the conclusion that ECN 2576 was an isolated occurence albeit over an extended period of time.

An evaluation of the support deficiencies showed that the reserve stress in the pipe was not exceeded such that even through a support may have failed, the piping would not be overstressed. NSRS fully agrees with the task force and EN DES conclusions and corrective actions for this category.

12. Task Force Category 18

Category 18 had one finding where a technical note on a piping support drawing was found to be invalid for some applications. It was concluded that the finding condition was a deviation from a licensing commitment but the licensing basis was met. There was corrective action for future work; no modifications to existing support bolting was required.

NSRS agrees with the task force and EN DES evaluations and corrective action for this category.

13. Task Force Category 19

Category 19 had two findings where equipment could not be determined to be environmentally qualified to NUREG0588. These findings represented deviations from the licensing commitment; TVA already had a program in place which could have reasonably been expected to correct the problems.

NSRS agrees with the TVA conclusions for this category.

14. Task Force Category 20

Category 20 had five findings where, as stated by the task force, no procedure existed for documenting preoperational testing determined time delay relay settings and the preoperational test scoping document did not identify or require documenting the settings. The task force classified the findings as deviations from the licensing commitments but the safety consequences were indeterminate. The task force documentation indicates the settings made prior to June 1983 were documented adequately by an interim memorandum (EEB 830614 439). The preoperation test scoping document and EN DES procedure SEP 83-11 have been written to require documentation of all the settings determined after June 1983.

The NSRS evaluations of this problem showed the scope to be greater than the task force addressed in this category since there appears to have been no effective control over time delay relays. Corrective actions for significant NCRs for these findings included procurement of new time delay relays to provide an adequate range. The existing relays would not allow setting the time called for on logic diagrams, hence the logic had not been properly implemented. This may be related to the lack of procedures governing logic diagrams (Category 3). The extent of the generic applicability review for this category is not clear to NSRS. The methods and procedures for determining the proper values, physically setting, and verifying time delay relay settings should be reevaluated and indicated changes should be expeditiously made TVA-wide.

15. Task Force Category 23

Category 23 has two findings related to the AFW turbine pump trip and throttle valve not being included on the active valve list and the valve schematic not including the required control room bypass and test indication nor automatic bypass of the open torque switch. It was concluded the discrepancies were deviations from both the licensing commitments and bases. Corrective action was required for past and future work. The evaluation for cause concluded the deficiency was an isolated error resulting from failure to include the valve on the active valve list. Including the valve on the active valve list, providing the automatic torque switch bypass and providing the control room indication of bypass and test of the thermal overload correct the deficiency and the licensing requirements are met. The EN DES safety evaluation concluded the nuclear safety of the plant would not have been reduced if the deficiency had not been corrected.

- NSRS agrees the corrective action taken is acceptable and the requirements are satisfied.

16. Task Force Category 25

Category 25 has one finding of flange evaluations being omitted in some analysis calculations. The task force concluded that the licensing commitment had not been met but evaluation showed the licensing basis was met. The corrective action included a 100 percent review of all completed calculations to assure flange qualification. Since the deficiency was attributed to individual errors, the corrective action for future work is to more clearly define the requirements.

NSRS agrees with the EN DES corrective actions and conclusions.

17. Task Force Category 30

Category 30 has two findings of failure to satisfy design criteria for (1) monitoring operability and (2) providing adequate electrical protective devices for the motor-driven AFW pump lube oil pump. The task force concluded the licensing commitment and the licensing basis were not met. The evaluation for causes revealed inadequate training and poor or lack of communications with NUC PR and EN DES. In reviewing other equipment, only one additional instance of failure to provide electrical protection was found. Thus the deficiency was not widespread. The EN DES safety evaluation of the two findings concluded there would be no safety concern had the defects not been corrected.

NSRS agrees with the specific corrective actions for the identified problems for this category.

18. Task Force Category 31

Category 31 has two findings of editorial discrepancies in licensing documents. The findings did not represent compromises of the licensing basis. The low number of errors found in this category support the conclusion that no action beyond correcting the identified errors is warranted, particularly in light of the extensive efforts detailed in Category 4.

NSRS agrees with the task force conclusions for this category.

19. Task Force Category 32

Category 32 has nine findings of incompatible hanger drawings and piping isometrics. The errors were deemed to be caused by checking and design verification of documentation between branches not being done as required by procedures.

The corrective action was to train designers in the procedural requirements. The errors did not result in any identified safety concerns since much of the work was not complete and system walkdowns could be expected to identify any incorrectly placed or installed supports.

NSRS has one residual concern with the EN DES corrective action. Since the root cause was inadequate training in procedure requirements, a continuing or periodic training program would appear to be needed. One time training is not felt to be totally adequate. Further, the corrective action was through SWP-AI1 R2, which appears to apply only to the Sequoyah/Watts Bar design projects not to TVA design projects in general.

20. Task Force Category 33

Category 33 has two findings of inadequate cable tagging. The two cited instances were the result of an oversight in one case (correct information, wrong color tag) and information being obscured on the tag due to wear and tear from rework in the other. No corrective action for past or future work was indicated since the frequency of occurence was low and walkthroughs are already designed to find and correct errors of this type. No safety concerns were expressed.

NSRS agrees with the task force conclusions for this category.

21. Task Force Category 34

Category 34 has 11 findings where "out of function" features of drawings were not in agreement with the latest design drawings showing the detailed design of the "out of function" features. The task force concluded that the "out of function" features do not impact the technical adequacy of drawings and are not used for design, construction or operation of the plant. No corrective action was deemed necessary.

NSRS agrees with the technical impact conclusions reached by the task force; our recommendation for Category 3 is equally valid for this category.

22. Task Force Category 35

Category 35 has one finding where instantaneous trip settings for motor-operated valve breakers were not in accordance with EN DES criteria and vendor recommendations. The task force concluded the licensing commitment and the licensing basis were not met and corrective action was required for both past and future work. The EN DES safety evaluation concluded:

> While these high settings were found to violate good design practice and could lead to a motor control center failure, the high trip settings would not prevent the safe operation or the safe shutdown of the plant.

The basic cause of the deficiencies was lack of training and knowledge of changed requirements and expedient decisions not to correct deficiencies when the requirements were known not to have been met.

NSRS has substantial concerns with the EN DES and task force resolution of this finding category. First, the safety evaluation tabulates 444 breakers out of 610 having settings greater than 1300 percent of the motor full load current. Of the 444 breakers, 385 were either reset or replaced and set. The remaining 59 breakers were neither replaced nor reset and are still apparently not in compliance with the commitment to the requirements of TVA Design Standard E.9.2.1 (now superceded by a non-mandatory Design Guide E2.3.5, issued November 10, 1983) which references requirements of the National Electric Code (NEC). No justification was or has been documented for not resetting or replacing the 59 breakers. This misapplication of the NEC requirements as implemented by Design Standard 9.2.1 leaves TVA in noncompliance with the practices of industry as reflected in the NEC for motor circuit protection. This in turn places WBN in noncompliance with the FSAR commitment although the FSAR does not directly commit to the NEC, the Design Standard clearly does and the Design Standard has not been met in all cases.

A second and higher level concern is the failure of the cognizant EN DES personnel to properly consider applicable parts of the NEC. The EN DES safety evaluation very selectively quotes section 430-52 of the NEC by quoting an exception ". . . the setting of instantaneous trip circuit breakers shall in no case exceed 1300 percent of the motor full load current." Other parts of section 430-52 which are equally applicable state: "The motor branch circuit short circuit and ground fault protective device shall be capable of carrying the starting current of the motor. A protective device having a rating or setting <u>not exceeding</u> the value calculated according to the values given in Table 430-152 shall be permitted." The <u>maximum</u> allowed setting in Table 430-152 is 700 percent of the full load current of the motor. The full wording of the exception quoted in the safety evaluation is "Where the setting specified in Table 430-152 is not sufficient for the starting current of the motor, the setting of an instantaneous trip circuit breaker shall be permitted to be increased but <u>shall in no case</u> <u>exceed 1300</u> percent of the motor full load current."

The expressed EN DES electrical design practice and philosophy are not in concert with present day nuclear design logic or common industrial practice. By NSRS reading, the stated EN DES positions do some injustice to the reasons for having protective devices of any sort. Clearly protective devices should be set as closely to normal operating conditions as possible while recognizing the full range of conditions including starting loads and avoiding nuisance trips. The NEC specifies this clear philosophy by using words such as "not exceeding" and "maximum" throughout. Table 430-152 of the NEC specifies 1300 percent to be the maximum exception. The NEC does not specify that all the breakers should or can be set at 700 percent or 1300 percent or any other given value.

The EN DES safety evaluation is incomplete in that the consequences of the pervasive nature of the deficiencies was not thoroughly considered. A worst case consequence was proposed which could lead to a fire which could disable a complete motor control center. It was further stated that the scenario, while possible, is so improbable as to be considered incredible. NSRS is concerned that broad conclusions have been reached with so narrow failure analysis and consequences determination being documented. The misapplication of the breakers exposes equipment to unnecessary challenge. These challenges can cause undetected failures which would not be seen during periodic testing. At the best, the deviations would have reduced safety margins even though single failure criteria may have been met; therefore, the deviations were significant to safety.

The instantaneous trip breakers should be verified to be set in agreement with the intent of the National Electric Code. The documentation for the design as well as for the testing and operations of the equipment should reflect the proper values. The program should be implemented TVA wide.

23. Task Force Category 36

Category 36 has one finding that the cable tray fill criteria are not assured of being met because of the less than conservative nominal values used for cable cross sectional areas in the cable routing program. After evaluation by designers, it was concluded that the licensing requirements had been met and no corrective actions are required for either past or future work.

NSRS does not agree that the licensing commitment has been met; it is not clear that the licensing basis has been met. The WBN FSAR states that ". . .low-voltage power cable tray fill shall be limited to a maximum of 30 percent of the cross-sectional area of the tray, except when a single layer of cable is used. Cable tray fill for control and instrumentation cables shall be limited to a maximum fill of 60 percent of the cross-sectional area of the tray." The supporting EN DES documentation for the conclusion that the licensing requirements had been met was based upon considerations of dead weight, ampacity and heating value of combustibles in isulation and jacket materials. While NSRS agrees these are important considerations, there are others such as mechanical protection of the cables from missles or casual hazards.

The FSAR describes a fully automated computerized system to route cables and to control cable fill using the criteria stated above. There is not a variable to control for cables of the same guage but different diameter; there is no formal feedback procedure to alert the designer, when for vagaries of construction, that the tray is full physically before all the cables are installed as computer routed. Further, no acceptance criteria have been provided for either the installer or a QC inspector to use to consistently determine that a tray is physically full.

Although not a part of the findings in task force Category 36 additional conditions adverse to quality noted by NSRS during a field trip to WBN to observe the cables in cable trays were:

1. Excess cable coiled and hanging from edges of cable trays.

2. Excess cable coiled and lying on the floor where people have to walk to access areas of the plant.

3. No record of megger test results for cables.

EN DES should develop acceptance criteria to be used by construction forces as well as the QC inspectors which define fill in measurable terms to supplement the arithmetical computer methodology. The additional problems above must be resolved. Until these deficiencies are corrected, TVA can not adequately justify that the licensing requirements are satisfied in full. NSRS believes safety evaluations should be made of the conditions described prior to substantial plant operation.

24. Task Force Category 37

Category 37 has one finding where valve wiring circuits were designed such that the red and green indicating lights on the unit control board would light dimly upon malfunction of the PAuto contact of the Westinghouse W2 control switch on the unit control board. It was concluded the design did not satisfy either the licensing commitment or basis and corrective actions were taken. EN DES recognized the requirement; however, the failure was a random design error in conjunction with inadequate design verification. The circuits with W2 switches were reviewed and the deficiencies were corrected when found.

NSRS agrees with the EN DES corrective action taken.

25. Task Force Category 38

Category 38 has two findings of failure of the thermal overload bypass circuit designs to meet the requirements of RG 1.106 and IEEE 279-1971. The task force concluded the licensing basis had been met and no corrective action was required.

NSRS agrees with the EN DES and task force resolution for this category.

26. Task Force Category 39

Category 39 has one finding where the specific configuration of 6.9kV bundled cables in trays had not been tested for the effects of fire retardant coating on the ampacity of the cable. The task force concluded the licensing commitment had not been met but the basis had been satisfied. An evaluation of the condition was prepared as part of the policy committee activity and was presented to NRC for acceptance.

NSRS agrees with the conclusions and actions taken by EN DES and the task force for this category.

TVA 64 (OS-9-69)

UNITED STATES GOVERNMENT

Memorandum

TENNESSEE VALLEY AUTHORITY

GNS '841017 050

TO : W. R. Brown, Project Manager (Bellefonte), 102 ESTA-K

FROM : H. N. Culver, Director of Nuclear Safety Review Staff, 249A HBB-K

DATE : OCT 17 1984

SUBJECT: BELLEFONTE NUCLEAR PLANT - NSRS REPORT NO. R-84-22-BLN - DECAY HEAT REMOVAL SYSTEM

Attached is an NSRS report concerning the design of the decay heat removal system at Bellefonte. In general, the design of the system appears to be adequate to meet its intended safety functions. However, the report does contain two recommendations to address apparent deficiencies in the design of the low temperature reactor vessel overpressurization protection features. Please provide responses to these recommendations within 30 days of the date of this memorandum. If you have any questions, please contact Bruce Siefken at extension 6860.

H N Culver

H. N. Culver

BRS HNC

CFS:BJN

Attachment

cc (Attachment):

R. W. Cantrell, W11A9 C-K
MEDS, W5B63 C-K
H. G. Parris, 500A CST2-C
E. G. Beasley, W12B21 C-K
C. W. Crawford, 670 CST2-C

NSRS FILE

GNS '841017 051

TENNESSEE VALLEY AUTHORITY

NUCLEAR SAFETY REVIEW STAFF

REVIEW

NSRS REPORT NO. R-84-22-BLN

SUBJECT: BELLEFONTE NUCLEAR PLANT - DECAY HEAT REMOVAL SYSTEM

REVIEWER: Bruce F. Siefken
BRUCE F. SIEFKEN 10-15-84
DATE

APPROVED: James F. Murdock
JAMES F. MURDOCK 10/16/84
DATE

MEDS, W5B63 C-K

I. SCOPE

This review deals with the decay heat removal system (DHRS) at Bellefonte Nuclear Plant (BLN) and was restricted to a functional review of the system. That is, the various functions and design requirements were identified, and the design of the DHRS was then compared to the identified criteria. Both external documents (e.g. regulatory guides, standard review plan, etc.) and internal documents (e.g. FSAR, design criteria, etc.) were examined to determine the functional requirements for the DHRS. The review was limited to mechanical and fluid aspects of the design. Electrical and instrumentation requirements were not reviewed in detail. A detailed check of the adequacy of the DHRS in mitigating a loss of coolant accident (LOCA) was also not included in the review scope. A detailed review of these areas will be made and documented in a separate report.

II. BACKGROUND

The BLN decay heat removal system is typical of B&W's standard design for 205 FA plants. The decay heat removal system at BLN performs a number of safety-related functions and some nonsafety-related functions. The safety-related functions include decay and sensible heat removal, supply low pressure injection, recirculation cooling, piggy-back cooling, spent fuel cooling, auxiliary pressurizer spray, reactor vessel overpressure protection, and long-term cooling. Nonsafety-related functions include filling and draining the refueling canal and reactor coolant purification during refueling. The DHRS is the safety-related method of cooling the reactor from 305°F to cold shutdown. It is NSRS's position that cold shutdown is the most stable and safest plant condition in off-normal conditions, such as after a failure which requires maintenance. Thus, it plays an important role in plant safety. The diversity of its functions results in many design requirements being placed on the system. The DHRS was chosen since it plays an important role in safe plant operation and in accident mitigation and embodies many plant interdependent features. In this report the conceptual design of the system was examined to verify that the design meets the design bases for the system.

III. CONCLUSIONS/RECOMMENDATIONS

The conceptual design of the mechanical portions of the DHRS is generally acceptable with the following potential concerns:

A. R-84-22-BLN-01, Adequacy of Low Temperature Reactor Vessel Overpressurization Protection

FSAR Figure 5.2.2-3 indicates that at refueling temperatures, the maximum allowable reactor coolant system (RCS) pressure is approximately 450 psig. However, the overpressurization calculations indicate a maximum RCS pressure of 725 psig at the DHR discharge to the cold leg. (Refer to FSAR section 5.4.7.2.1 and 5.2.2.11).

NSRS recommends that additional low temperature reactor vessel overpressurization protection measures be instituted and documented in the design basis for BLN.

B. R-84-22-BLN-02, <u>Adequate Design Margin for DHR Isolation Valve Opening</u>

FSAR Figure 5.2.2-3 indicates that the DHR suction isolation valves must be open when the reactor coolant temperature falls below 305°F to ensure adequate low temperature reactor vessel overpressure protection. Bellefonte General Operating Instruction BLGOI-1C also requires the operator to open the DHR isolation valves at 305°F. The DHR pump equipment specification, B&W document No. 08-1130000007-07 lists the maximum liquid temperature of the pump suction as 305°F. Thus it appears that there is no margin in the design for instrument error and operator action.

NSRS recommends that additional temperature margin be incorporated into the DHRS design and be documented in the DHRS design basis.

IV. DETAILS

The functions of the DHRS are defined in several documents, but the principal functions are contained in the design criteria document for the DHRS, reference A, and in the B&W system description for DHRS, reference J. Regulatory requirements for each of these functions were compiled and the design of the DHRS was compared to the compilation. Instrumentation adequacy was assessed by reviewing the available operating instructions and the limits of system operation. No attempt to perform a human factors engineering review was made.

The review concentrated on the fluid and mechanical aspects of the DHRS. Detailed electrical aspects of the instrument, control, and power circuitry for the system were not reviewed. The sections below summarize the results of the functional review.

A. <u>Remove Decay Heat and Sensible Heat</u>

The DHRS pumps 5000 gal/min of reactor water through the decay heat removal heat exchangers. Component cooling water system transfers heat from the DHR Hx to the essential raw cooling water (ERCW) system. The ERCW system then carries the heat to the ultimate heat sink. Thus, decay and sensible heat are removed from the RCS. The decay heat removal heat exchangers are sized to remove 4.1×10^7 Btu/hr which is adequate for normal operation. A bypass line around the heat exchangers and throttling valves provides the means of controlling the RCS temperature to within limits. (There are maximum cooldown rates and an absolute minimum temperature limit.) Both trains of DHR are needed to cool the RCS from 305°F to 140°F within 14 hours as specified in the system description. The use of only one train lengthens the cooldown time considerably to about 140 hours to reach 140°F.

However, the RCS temperature can be reduced to 212°F in about 9 hours using only one train of the DHRS. These longer times do not meet the recommendations in proposed R.G. 1.139 (i.e. 36 hours to cold shutdown after a single failure), but this is a rather arbitrary limit. There is little safety significance in not meeting these times with the DHRS since the RCS can be quickly depressurized to atmospheric pressure if needed.

During refueling the DHRS cools the reactor coolant system and the refueling canal. This is accomplished in the same manner as plant cooldown. A small flow from the canal does go through the purification system and the DHR can be aligned to circulate this flow.

B. Supply Low Pressure Injection

The DHR pumps also serve as the low pressure injection (LPI) pumps following a LOCA. They are required to deliver 5000 gal/min to the reactor vessel at a pressure of 100 psig. The pumps appear adequate for this task by developing a minimum of 385 feet tdh at 5000 gal/min. This leaves an allowance of about 70 psi pressure drop in the piping from the pump to the reactor vessel. Pumps are automatically started and valves automatically opened on an engineered safety features actuation system (ESFAS) signal (triggered by low reactor pressure, high containment pressure, or low steam generator pressure). Minimum flow is provided by a recirculation line from the DHR cooler outlet to the pump suction. This flow (125 gal/min) has been properly accounted for in sizing the pumps.

The LPI function of the DHRS is required to be single failure proof. The design appears to meet this requirement with two independent, full-capacity trains. The initiating LOCA could affect the availability of some portions of the DHRS, but the LPI function can still be satisfied with a single failure. Cavitating venturies are used to limit the flow between the two LPI injection points to accommodate situations where the initiating LOCA breaks an injection line and a single failure fails one LPI train. A detailed review of the LPI function was not undertaken but will be included in a review of LOCA mitigation at BLN.

C. Recirculation Cooling Post-LOCA

The DHR/LPI function automatically switches its suction from the BWST (borated water storage tank) to the RBES (reactor building emergency sump). Thus, reactor coolant is recirculated. Low level in the BWST triggers this switch by first opening the sump isolation valves and then closing the BWST suction valves (after the RBES valves are 90 percent open). The cross connection to the makeup pumps is also automatically opened. [The makeup pumps double as the high pressure injection (HPI) pumps.] This "piggy-back" mode ensures that flow continues through the DHR pumps if the reactor pressure is high.

There is adequate net positive suction head (NPSH) available for the HPI operating mode. R.G. 1.1 was used to calculate the NPSH available with the conservative assumption that the sump fluid is at saturation. Thus, only the elevation difference of the sump and the pump suction is assumed to contribute to NPSH. The sump is the more limiting case since the BWST is subcooled considerably.

D. Piggy-Back Cooling

The discharge of the DHR pumps is automatically aligned to the suction of the HPI pumps on a low BWST level signal. This ensures adequate flow through the DHR pumps to prevent pump damage in the event that the RCS pressure is above the DHR pump shutoff head. This is needed since the minimum flow line from the DHR pumps is isolated automatically on low BWST level to preclude pumping contaminated water from the sump to the BWST. The LPI discharge valves are left open so that as the RCS pressure drops the DHR pumps can deliver flow directly to the reactor vessel. When this flow (direct to vessel) is greater than 700 gal/min, the piggy-back flow can be safely stopped. There is sufficient flow information for the determination of this flow, but several different flows must be algebraically summed to obtain the information. This procedure is adequate, however, since it is not critical to the safe shutdown of the plant.

E. Spent Fuel Cooling

The DHRS can be used to provide cooling to the spent fuel pool as a backup to the spent fuel cooling system. One train of the DHRS is adequate to cool 1-1/3 cores of fuel in the pool, the design condition for the pool cooling systems. The reactor should be defueled before placing the DHRS into the spent fuel cooling mode since manual valves need to be aligned, which results in the DHRS being unavailable for reactor cooling or low pressure injection. The spent fuel cooling system (SFCS) consists of two trains, but for the case of 1-1/3 cores in the pool, both spent fuel cooling trains are needed. The DHRS flow to the fuel pool will require throttling since the DHRS normal flow is 5000 gal/min and SFCS flow is 1650 gal/min per pump. This throttling can be accomplished by the valve in the decay heat cooler outlet. Temperature can be controlled with the cooler bypass valve. Sufficient instrumentation exists to allow the operator to accomplish these actions.

F. Provide Auxiliary Pressurizer Spray

If the reactor coolant pumps (RCP) are tripped for any reason, the normal source of pressurizer spray is lost (i.e. the RCP discharge). If the reactor is at a high pressure, the makeup pumps are used to supply high pressure spray through a length of

2-inch DHRS piping to the pressurizer spray line. At low pressure, the DHR pumps can be used to supply the spray flow. The spray connection is located at the decay heat cooler outlet which results in the head available for spray flow being the pressure drop across the DHR throttling valve and the pressure drop in the piping to the reactor vessel. The design calls for a maximum flow rate of 150 gal/min through this line. This value is verified during the preop test since the available head appears to be small and there are a number of valves in the 2-inch line. Throttling of the spray flow is done by two valves operable from the control room in a parallel flow arrangement. The throttling capability is necessary for matching the depressurization rate to the cooldown rate. The parallel flow paths also ensure that if one motor-operated valve fails to open, there still exists a flow path for auxiliary spray. The valves are powered from different trains of the class IE electrical system. Since most accidents are required to be mitigated without offsite power, these valves are needed for a timely depressurization of the primary system.

G. Low Temperature Reactor Vessel Overpressurization Protection

The decay heat removal system contains two relief valves, one in each drop line to the DHR pumps from the RCS, which provide overpressure protection from the RCS at low temperatures. Each valve is sized to provide 100 percent of the required relief flow for a variety of overpressure events. The overpressure events include energizing all pressurizer heaters, loss of all decay heat removal, and spurious start of the HPI pumps. The start of the HPI pumps was the most limiting event. The relief valves were originally placed in the design to provide overpressure protection for the DHRS. However, recent NRC concerns on the need for low temperature RCS overpressure protection has prompted the use of these same valves for RCS protection. The relief valves appear adequate for DHRS overpressure protection.

The use of these valves to protect the reactor vessel, however, has some problems. The relief valves are located downstream of the decay heat letdown isolation valves. Thus, there are two isolation valves between the RCS and the relief valves. However, since the valves provide low temperature pressure protection, there needs to be some method of isolating them from normal operating pressures. In order to prevent a possible brittle failure of the reactor vessel, overpressure protection must be provided. As the temperature of the reactor vessel decreases, the maximum allowable pressure in the vessel decreases. FSAR Figure 5.2.2-3 shows this relationship. At refueling temperatures, the maximum allowable RCS pressure is about 450 psig, while above 305°F the maximum allowable pressure is 2,500 psig. The problem with the design is that the decay heat isolation valves must be open before the low temperature pressure protection is needed, but after the RCS temperature is below the maximum DHRS suction temperature. FSAR Figure 5.2.2-3 shows that the DHRS suction lines must be open at 305°F after the reactor vessel has sustained 32 effective full power years of operation since the pressurizer safety valves no longer provide reactor vessel overpressure protection. The decay heat pump specification states that the maximum suction temperature of the pump is 305°F. Thus, the maximum temperature and the minimum temperature for opening the DHR isolation valves are both 305°F which leaves no margin for instrument errors or operator action. When instrument errors are taken into account, there exists the possibility of exceeding the maximum DHR suction temperature which may damage the pumps or exceeding the pressure-temperature limits of the reactor vessel.

The calculations done for the reactor vessel overpressure protection are the same calculations done for the DHR overpressure protection. The problem is that the worst case assumptions for the DHR case are not the worst case for the reactor vessel. A plot of the allowable RCS temperature versus pressure (FSAR Figure 5.2.2-3) shows that at refueling temperature (140°F) the allowable RCS pressure is only about 450 psig (estimated). The DHR relief valves were sized to prevent the DHR suction pressure from exceeding 500 psig (FSAR section 5.4.7.2.1). The overpressurization calculations indicate a maximum RCS pressure of 725 psig at the DHR discharge cold leg connections. Thus, it appears that these relief valves may not provide adequate reactor vessel pressure protection unless additional measures are taken.

The possibility of low temperature repressurization event closing the DHR isolation was investigated. The DHR letdown isolation valves will automatically close above a pressure of 620 psig in the RCS. If one considers the single failure criteria in mitigating an overpressure event, then the closure of some of the decay heat isolation valves could render some of the relief valves unavailable. However, there does not appear to be a single failure that would render both relief valves unavailable, and one relief valve should be adequate per the FSAR analysis. Thus the isolation valves should remain open during a repressurization event.

H. Long-Term Cooling

The DHR may be required to operate for many weeks after a LOCA. There was a concern that boron may tend to concentrate in the reactor vessel during the long period of time and could crystalize out of solution as the reactor vessel cooled. This might possibly result in some cooling channels being blocked and fuel overheating (termed the "bone-china syndrome").

The DHR establishes a positive flow through the reactor vessel by opening the dump-to-sump valves. These lines run from the hot leg to the reactor building emergency sump (RBES). The DHR draws from the RBES and discharges into the reactor vessel. These lines each have redundant isolation valves to ensure that flow from the RCS can be terminated, if necessary, with a single action failure. Furthermore, a total of four lines are used which ensures that a dump-to-sump flow can be established with an assumed single failure and the consequences of the initiating LOCA. Motive power for these isolation valves is normally removed during power operation. The operator manually initiates the dump-to-sump feature within 24 hours of a LOCA by establishing a flow path from at least one hot leg to the sump.

I. Nonsafety-Related DHRS Functions

The DHRS has two nonsafety-related functions, filling and draining of the refueling water canal and plant purification during refueling. The 5000 gal/min flow from one pump of the DHRS can be aligned to draw from the BWST and discharge into the canal. Handwheel-operated valves are used to align the discharge to the refueling canal. The DHR can also partially drain the refueling water canal. Handwheel-operated valves allow water to be drawn from the canal and discharged to the BWST. The water level can be lowered to the reactor vessel flange only. The spent fuel cooling system normally accomplishes these functions.

The DHR also can route water to the makeup and purification system during refueling. This allows water cleanup and purification for chemistry control. These functions appear to be adequately implemented.

V. DOCUMENTS REVIEWED/REFERENCES

A. Design Criteria for Decay Heat Removal System, N4-ND-D740, R0

B. Design Input Memorandum DIM-N4-ND-D740-1

C. Design Input Memorandum DIM-N4-ND-D740-2

D. Design Input Memorandum DIM-N4-ND-D740-3

E. Design Input Memorandum DIM-N4-ND-D740-4

F. BLN FSAR Section 5.4.7, "Decay Heat Removal System"

G. BLN FSAR Section 6.3, "Emergency Core Cooling System"

H. NRC Standard Review Plan, Section 5.4.7, "Residual Heat Removal System"

I. NRC Standard Review Plan, Section 6.3, "Emergency Core Cooling System"

J. B&W System Description for Decay Heat Removal System, 15-403600000-08

K. ANSI N18.21973, "Nuclear Safety Criteria for the Design of Stationary Pressurized Water Reactor Plants"

L. NRC IE Information Notice 82-17, "PWR Low Temperature Overpressure Protection"

M. NRC IE Information Notice 82-45, "PWR Low Temperature Overpressure Protection"

N. BLN FSAR, Section 5.2.2, "Overpressurization Protection"

O. B&W Report BAW10074A, R1, "Multinode Analysis of Small Breaks for B&W's 205-Fuel Assembly Nuclear Plants with Internals Vent Valves"

P. NRC Branch Technical Position ICS3B, "Isolation of Low Pressure Systems from the High Pressure Reactor Coolant System"

Q. NRC Branch Technical Position RS5B-2, "Overpressurization Protection of Pressurized Water Reactors While Operating at Low Temperatures"

R. B&W Specification 08-1130000004-07, "Decay Heat Removal Pumps"

S. B&W Contract Specification 08-1024000003-02, "Heat Exchangers for Auxiliary System Service (Decay Heat Removal System)"

T. B&W Specification 08-1125000003-06, "Decay Heat Removal Pump Drives"

U. B&W Specification 08-1137000002-05, "Lube Oil Pump Motors for Decay Heat Removal Pumps"

V. B&W Operating Specification 64-1002746-00, "Decay Heat Removal System Operation"

W. B&W Technical Document 67-1003781-01, "Plant Limits and Precautions 05-1101"

X. B&W Letter D-4303, "Decay Heat Letdown Valve Interlock Setpoints," August 25, 1982

Y. B&W Letter L-575, "Suggested Responses - NRC Questions 440.9 and 440.10," January 10, 1983

Z. TVA Letter K-7267, "Decay Heat Letdown Interlock Setpoints," January 19, 1983

AA. B&W Letter P-1891, "Low Temperature Overpressure Protection Alarm," January 24, 1983

BB. B&W Letter D-4554, "Decay Heat Letdown Interlock Set Points," April 13, 1983

CC. B&W Letter D-4600, "Low Temperature Overpressure Protection (LTOP) Requirements," May 19, 1983

DD. TVA Letter K-7729, "Low Temperature Overpressure Protection (LTOP) - Alarm Design Requirements," July 29, 1983

EE. B&W Letter P-2182, "Low Temperature Overpressure Protection," January 9, 1984

FF. B&W Letter L-576, "NRC Question 57(a) - DHR Isolation Valves," January 13, 1983

GG. Memorandum to H. J. Green and J. A. Raulston from L. M. Mills, "Bellefonte Nuclear Plant Units 1 and 2 - Instrumentation and Controls System Branch Review of BLNP FSAR," dated September 29, 1982 (A27 820929 029)

HH. Bellefonte Operating Instruction BLOI ND, Decay Heat Removal"

II. Bellefonte General Operating Instruction BLGOI-1A, "Unit Heatup from Cold Shutdown to Hot Standby and Reactor Startup"

JJ. Bellefonte General Operating Instruction BLGOI-1C, "Unit Cooldown from Hot Standby to Cold Shutdown"

TVA 64 (OS-9-69)
UNITED STATES GOVERNMENT

Memorandum

TENNESSEE VALLEY AUTHORITY

GNS '841017 052

TO : W. R. Brown, Project Manager (Bellefonte), 102 ESTA-K

FROM : H. N. Culver, Director of Nuclear Safety Review Staff, 249A HBB-K

DATE : OCT 17 1984

SUBJECT: BELLEFONTE NUCLEAR PLANT - MAIN STEAM SYSTEM DESIGN ADEQUACY FOR MITIGATION OF A STEAM LINE BREAK - NUCLEAR SAFETY REVIEW STAFF (NSRS) REPORT NO. R-84-25-BLN

Attached is an NSRS report concerning the adequacy of the design of the main steam system in mitigating steam line breaks. The report contains several recommendations for improving the design and/or improving the documentation of the design. NSRS is particularly concerned about apparent inconsistencies between the FSAR and the actual system design. Please provide responses to these recommendations within 30 days of the date of this memorandum. If you have any questions, please contact Bruce Siefken at extension 6860.

H N Culver
H. N. Culver

BJS BFS:BJN
Attachment
cc (Attachment):
E. G. Beasley, W12B21 C-K
R. W. Cantrell, W11A9 C-K
MEDS, W5B63 C-K
H. G. Parris, 500A CST2-C
C. W. Crawford, 670 CST2-C

NSRS FILE

GNS 841017 053

TENNESSEE VALLEY AUTHORITY

NUCLEAR SAFETY REVIEW STAFF

NSRS REPORT NO. R-84-25-BLN

SUBJECT: REVIEW OF BELLEFONTE NUCLEAR PLANT'S MAIN STEAM SYSTEM DESIGN ADEQUACY FOR MITIGATION OF A STEAM LINE BREAK

REVIEWER: Bruce F. Siefken 10-12-84
B. F. SIEFKEN DATE

APPROVED BY: James F. Murdock 10/12/84
J. F. MURDOCK DATE

MEDS, W5B63 C-K

I. SCOPE

This review was restricted to a review of how the main steam system design meets the functional and licensing requirements necessary to mitigate a steam line break. Tornado-induced steam line breaks were included in the review scope. TVA internal design documents were used to define and describe the main steam system. This design was compared to regulatory requirements, licensing commitments made in the FSAR, and to interface requirements placed on the design by Babcock and Wilcox (B&W), the nuclear steam supply system (NSSS) vendor. Only safety-related or important-to-safety aspects of the main steam system were reviewed.

II. EXECUTIVE SUMMARY

The NSRS assessment of the mitigation of postulated steam breaks at BLN indicates that some design changes may be necessary in the area of preventing two-steam-generator blowdowns and in tornado protection for the main steam isolation valves (MSIVs). In particular, it appears that the present design does not meet the single failure criteria for some steam line breaks and for the design basis tornado.

Of particular concern to NSRS is the conclusion that the BLN FSAR does not accurately represent the design bases for the main steam system as is required by 10CFR50.34. The TVA internal criteria exempt the MSIVs from the single failure criteria. The FSAR, however, does not reflect this philosophy but commits to single failures after some steam line breaks. Also the MSIVs in one steam valve vault are not protected from tornado missiles. This results in the plant being vulnerable to tornadoes. Finally, there are several discrepancies between licensing commitments in the FSAR and the plant design. NSRS's overall assessment is that the present design of the main steam system may be deficient and/or that the design documentation requires improvements.

III. BACKGROUND

The design of pressurized water reactors (PWRs) has traditionally contained only one MSIV per steam line while boiling water reactors (BWRs) have had two MSIVs. In the early seventies the NRC attempted to require that Combustion Engineering (CE) place two MSIVs in each steam line as a part of CE's standard plant design. CE fought this attempt and the matter was resolved in licensing hearings. The conclusion of the hearing process was that one MSIV per steam line was judged as sufficient since the turbine stop valves (TSVs) close reliably and could be used as a backup to the MSIVs. However, it was recognized that there are several branch lines between the MSIVs and the TSVs which may not automatically isolate on a turbine trip. Therefore, the NRC required that these leakage paths be identified and quantified, and that the total leakage be shown to be acceptable. These results, however, were not documented as formal licensing requirements, but it was understood by the NRC and the utilities that these matters would be pursued only in the questions to the FSAR. In the midseventies this dichotomy was brought to NRC's upper management's attention by dissenting reviewers and resulted in considerable internal discussion. The NRC published NUREG-0138, reference A, to establish a uniform basis for this issue and to document their justification of a single MSIV. The issue was resolved by allowing credit to be taken for valves downstream of MSIVs closing or remaining closed. These valves include the turbine stop valves, the moisture separator/reheater intercept valves, and the turbine bypass valves. The justification given for this position is based on an analysis of a main steam line break and whether the mitigating equipment needs to be seismically qualified. The staff concluded that the use of the nonsafety grade equipment as a backup to safety equipment was acceptable for a main steam line break at a PWR. This position was supported by a simplified analysis of a steam line break which showed that the consequences of a two-steam-generator blowdown were not as severe as those which result from a large LOCA. Therefore, less strict quality standards could be applied to the mitigation of a steam line break as allowed by Criterion I of Appendix A to 10CFR50. The position was further supported by the NRC staff's estimation that the probability of a main steam line break, an earthquake, and the failure of an MSIV to close was low; and thus the overall safety of the plant would not be strongly affected by the occurrence of the postulated scenario. The possibility of tornado-induced steam line breaks was not considered in NUREG-0138. The NRC has revised their Standard Review Plan, references B and C, to allow the use of nonsafety-grade equipment as a backup to safety-grade equipment in mitigating a main steam line break. Thus the licensing requirements have become more formalized as a result of the internal NRC dissent.

In reviewing FSAR submittals the NRC has been using the licensing position described above. As part of this review, the NRC has asked TVA to provide information concerning BLN flow paths between the MSIVs and the turbine stop valves (see FSAR question 430.67, reference D). This question requests a list of flow paths, flow rates, valves, and their method of closure in order for the NRC to evaluate how TVA complies with issue number 1 of NUREG-0138, the use of turbine stop valves as a backup to the MSIVs. The total flow rate from all the unisolated paths between the unaffected steam generator and the turbine stop valves has to be shown to be acceptable if the stop valves are to be used as a backup to the MSIVs after a steam line break. The NRC also required the Yellow Creek Nuclear Plant (YCN) to assume the failure of an MSIV as evidenced by their questions on the YCN PSAR (references E, F, and G). Pebble Springs Nuclear Plant also was required to postulate the failure of an MSIV. Thus it was NRC's pattern and practice to require that applicants postulate the failure of an MSIV.

IV. CONCLUSIONS/RECOMMENDATIONS

A. NSRS concludes that TVA has not met the requirements of 10CFR50.34 inasmuch as the design bases for the main steam system which have been implemented are not accurately described by the BLN FSAR. Specifically, TVA does not consider failure of the main steam isolation valves to be credible, as stated in the design criteria for the main steam system, since the valves have redundant closure signals. However, the BLN FSAR does consider single failures of MSIVs. Therefore, the FSAR conflicts with TVA's internal design criteria.

R-84-25-BLN-01. NSRS recommends that TVA resolve the conflict between the FSAR and the design criteria and document the resolution in the design criteria or FSAR as appropriate.

B. NSRS concludes that the present main steam system design does not meet regulatory requirements in the following area. NUREG-0138, issue 1, allows credit for the turbine stop valves in preventing a two-steam-generator blowdown after a steam line break and the failure of an MSIV. However, the design arrangement at BLN is such that in the event of a break, as postulated in NUREG-0138, the closure of the turbine stop valves will not terminate the two steam generator blowdown since the steam lines are cross-connected by a 42-inch-diameter header upstream of the stop valves. Furthermore, the NRC in FSAR question 430.67 asked TVA to provide additional information in the FSAR concerning all flow paths between the MSIVs and the TSVs. In TVA's response to this request, the 42-inch-diameter crosstie header between the main steam lines was omitted. NSRS concludes that the answer to FSAR question 430.67 is not complete.

R-84-25-BLN-02. NSRS recommends that design modifications be made to provide redundancy in the isolation of steam lines as required by NUREG-0138 or that conservative analysis of a two-steam-generator blowdown event be completed which shows that the consequences are acceptable. Additionally NSRS recommends that the response to FSAR question 430.67 be amended to more accurately reflect the design of BLN.

C. NSRS concludes that the present design of the main steam system does not comply with commitments made in the BLN FSAR in the following areas:

1. Section 3.6.2.1.2.1.5 of the FSAR states that pipe breaks outside of the main steam valve vaults do not jeopardize equipment within the main steam vaults. However, report CEB77-10 states that break SM B-94 may damage the "A" steam generator MSIVs.

   R-84-25-BLN-03. NSRS recommends that the design of BLN be modified to prevent all steam line breaks outside of the valve vault from damaging an MSIV or demonstrate that the break does not damage the MSIVs.

2. Section 3.6.2.1.2.1.5 of the BLN FSAR states that the pipe break exclusion applies only to the 32-inch-diameter main steam piping and to the 20- and 22-inch-diameter main feedwater piping. However, CEB report CEB 77-10 does not postulate any breaks in any size piping within the main steam valve vaults.

R-84-25-BLN-04. NSRS recommends that the inconsistencies in BLN design be corrected and that the commitments in FSAR section 3.6.2.1.2.1.5 and CEB 76-13 be fully met.

3. FSAR section 3.5.2 states that if tornado missles damage the main steam lines and isolation valves in the unprotected "A" steam valve vault, that the plant can be cooled down as described in FSAR section 15.1.5 with single failure capability. However, if this described scenario occurred and an MSIV in the "B" main steam valve vault were postulated to fail open, then a two-steam-generator blowdown would occur which the turbine stop valves would not be able to terminate. The BLN FSAR states in section 10.3 that the design of the main steam system prevents the uncontrolled blowdown of two steam generators after a steam line break and a postulated single failure.

R-84-25-BLN-05. NSRS recommends that the design of the main steam system or the main steam valve vaults be modified to comply with the requirements of FSAR sections 3.5.2, 10.3, and 15.1.5 or that an analysis of a two-steam-generator blowdown event be made which shows that the consequences are acceptable.

D. The maximum allowable steam flow rate from the unaffected steam generator after a steam line break needs to be documented in the design bases for the main steam system. NSRS was unable to find evidence of these considerations by the NSSS vendor in the design bases for the main steam system.

R-84-25-BLN-06. NSRS recommends that the maximum allowable steam flow rate from the unaffected steam generator after a steam line break be established by the NSSS vendor based on the analysis of such steam line breaks and that this flow and its basis be documented in the design bases for BLN and be traceable to the NSSS vendor's analysis.

V. DETAILS

A. Main Steam System Description

The BLN main steam system connects the steam generators with the turbine generator. The design includes four main steam lines, two from each steam generator, one main steam isolation valve (MSIV) per line, a 42-inch header cross-connecting the steam lines, eight turbine stop and control valves, and several connections for a variety of purposes. The conceptual design of the system is depicted on the design criteria diagram, main and reheat steam system, reference H. The steam lines run from the steam generators into the main steam valve vaults, one vault for each steam generator. The valve vaults are designated "A" and "B" and contain the steam lines from the "A" and "B" steam generators respectively. Reference I shows the steam line routing from the steam generators to the valve vaults. Inside each valve vault, there are several lines and valves in the main steam system including the following:

1. Eleven main steam safety valves.
2. One MSIV per steam line.
3. Steam supply line and isolation valves to the auxiliary feedwater turbine.
4. Modulating atmospheric dump valve and bypass.
5. MSIV bypass line and valve.
6. Line to startup and recirculation system and isolation valve.

The main feedwater lines also pass through the main steam valve vaults.

The main steam valve vaults are located on opposite sides of the containment structure on the 0° and 180° azimuths. The "A" vault is located on the 0° azimuth and the "B" vault lies on the 180° azimuth as shown in reference J. The "A" steam valve vault is physically a part of the auxiliary building. Three walks and the floor are adjacent to auxiliary building areas while the fourth wall adjoins the secondary containment structure. Only the roof of the "A" steam valve vault is an exterior surface. The "B" main steam vault has a common wall with the secondary containment structure. The other walls and the roof are exterior surfaces. The steam valve vaults are required to be designed to withstand the effects of a steam line or feedwater line break within the vault. This requirement is met by providing vent areas to relieve the resulting pressures after such a break. The "A" steam valve vault relief area consists of a large blowout area on the valve vault roof covered by a number of panels which blow out at a pressure of 0.5 psig. There is no tornado missile protection for these panels. The "B" steam valve vault has all of its walls designed for 30 psig (including the roof) and is tornado missile proof. However, one wall was designed with a safety factor of 1.5 while the rest of the structure used a value of 2.0. Thus it is felt that the weaker wall will relieve first before the remaining structure is damaged.

After exiting the valve vaults, the main steam lines are routed over the roofs of the auxiliary and control buildings enroute to the turbine building. Once inside the turbine building, the steam lines from each steam generator are joined by a common pipe and then these two pipes are cross-connected by a common 42-inch-diameter header. The four lines to the high pressure turbine originate at this common header with each line containing a turbine stop and a control valve. Various miscellaneous lines are located upstream of the turbine stop and control valves including:

1. An 8-inch line to the main feedwater turbines.
2. Two 12-inch lines to the moisture separator/reheaters.
3. A 20-inch line to the turbine overload stop and control valves.

4. A 6-inch connection to the auxiliary steam system.
5. A 30-inch line to the turbine bypass valves.

B. <u>TVA Design Criteria for the Main Steam System</u>

The design requirements which EN DES placed on the main steam system are contained in the detailed design criteria for main steam, reference K. The design criteria references a number of other documents which place requirements on the design. B&W's system description for secondary system, reference L, is the principal referenced document and establishes those interface requirements for the main steam necessary to achieve compatibility with the nuclear steam supply system (NSSS) design. The TVA design criteria document addresses the issue of a single MSIV. The design basis is that the MSIV will be considered exempt from the single failure criteria provided the valve design meets several requirements, namely:

1. The valve shall fail closed on loss of electrical power or air pressure.

2. Each MSIV shall be served by two separate sets of engineered safety features actuation system (ESFAS) digital actuation channels (i.e. "A" and "B" channels) arranged in a 1-of-2 logic to close the MSIV.

3. The design shall be capable of closing the MSIV after a single failure in an instrumentation channel or power supply.

The design criteria specify that the piping layout reserve space such that a second MSIV could be placed downstream of the existing MSIV and that these valves be shown as future on TVA design drawings in the FSAR. The design criteria also specifies that for all normally open valves downstream of the MSIVs which do not automatically close on a turbine trip, the flow shall not exceed 6 percent maximum steam flow. If this condition is not met, then the design criteria states that measures shall be taken to restrict the flow to the 6 percent limit.

The design criteria also specifies nonsafety-related arrangement requirements. These include the steam line header arrangement described in section II above and the various lines which emanate from the main steam header.

The system description for the secondary system contains some requirements which affect the system arrangement, including:

1. The steam line pressure drop from each steam generator to the turbine stop valves shall be such that the outlet pressures of the steam generators are equal within 5 psi under valve wide open (VWO) flow conditions.

2. A connection between the main steam lines from the two steam generators shall be supplied to provide a minimum cross flow from one steam line to the other of 30 percent of the total turbine VWO flow while one of the steam generators is isolated.

C. NRC Requirements

The NRC requirements which the design of the main steam system must meet are contained in a number of documents. The Standard Review Plan (SRP) serves as a guide for the review of licensing applications by the NRC and contains or references the basic regulatory requirements which various systems should meet. Section 10.3 of the SRP concerns the review of the main steam system and references NUREG-0138 for the acceptability of taking credit for valves downstream of the MSIV to limit blowdown of a second steam generator in the event of a steam line break upstream of an MSIV. NUREG-0138 was discussed in the Background section of this report. Section 15.1.5 of the SRP discusses the review of postulated steam line break accidents and requires consideration of single active failures which might result in more than one steam generator blowing down. This implements the requirements of Criterion 34 of Appendix A to 10CFR50 which requires that systems used to remove residual heat have suitable redundancy in isolation provisions to accomplish their safety functions assuming a single failure. Appendix A to 10CFR50 defines a single failure of a fluid system component as the failure of any active component which results in the loss of its capability to perform its intended safety function. Therefore NSRS concludes that the NRC requires that the failure of an MSIV to close be included in the analysis of steam line breaks.

D. BLN FSAR

The BLN FSAR discusses the design of the main steam system and steam line breaks in four locations--chapters 3, 6, 10, and 15. Section 3.6 discusses pipe break postulation and evaluation, section 6.2 discusses steam line breaks as related to the design of primary containment, section 10.3 discusses the design of the main steam system, and section 15.1 discusses the analysis of steam line breaks. The NRC has also asked several questions concerning steam line breaks at BLN.

Section 6.2.1.4 presents the analysis of steam line breaks inside containment and the predicted pressure and temperature profiles which result. Table 6.2.1-27 lists the steam line breaks which were analyzed for containment response and shows that four of the ten cases assume the failure of an MSIV.

Section 10.3.1 presents the design bases of the main steam system and delineates the major acceptance criteria for a main steam line break. This section states that for postulated steam line breaks, as described in FSAR section 3.6, with postulated single failures that uncontrolled flow from more than one steam generator and a reactivity transient beyond the postulated load in FSAR chapter 15 are prevented. Section 3.6 describes the manner in which pipe breaks are postulated and how their effects are analyzed. This section defines the main steam system as a high energy system for which circumferential breaks in the piping are postulated and gives the criteria for selecting break locations. The FSAR excludes breaks of the main steam and feedwater piping in the main steam valve vaults which is larger than 20 inches in diameter. NRC Branch Technical Position MEB 3-1 (included as part of the Standard Review Plan) allows the exclusion of breaks in piping up to the outermost containment isolation valve. The FSAR also excludes the piping downstream of the isolation valve (MSIV) that is within the valve vault. This expanded exclusion area has not been questioned by the NRC to date. The break exclusion criteria of MEB 3-1 are to be applied to the additional piping run. TVA has sent the NRC a copy of report CEB 76-13, reference U, which documents TVA's plan for implementing APCSB 3-1 and MEB 3-1. Section 10.0 of this report states that provisions have been made to accept postulated breaks in 12-inch-or-less piping inside the valve rooms. Report CEB 77-10, reference S, has been sent to the NRC to amplify TVA's pipe break evaluation. This report, however, does not contain any postulated pipe breaks inside the valve vaults, even though there are several lines which are outside of the FSAR exclusion, i.e., smaller than 20 inches in diameter. MEB 3-1 criteria may have been applied to these smaller lines however. Further, this report indicates that one analyzed break, number SM B-94, which occurs at the "A" valve vault roof may cause possible damage to the MSIVs. The report indicates that this is an acceptable interaction based on the reasoning that although structural damage occurs which may damage the MSIVs, they are not needed to safely shut down the plant. This reasoning is based on the "B" steam generator MSIVs closing which violates the NRC's criteria to assume single failures that could lead to two-steam-generator blowdowns. Since the postulated break was considered to be adequately mitigated, no corrective actions were proposed by the report.

The NRC asked FSAR question 430.67 to obtain additional information regarding compliance to NUREG-0138, issue 1, on providing redundancy to the MSIVs. This question requested information concerning all flow paths that branch off the steam lines between the MSIVs and the TSVs, and that this information be documented in the FSAR. TVA's response is contained in Table 430.67-1. However, this table does not contain the 42-inch crosstie header which connects the steam lines from the two steam generators. At present, there are no valves in this crosstie. Thus, there is no redundant backup capability to the MSIVs. The NRC requires this redundancy in the design, but they do not require that the backup for the MSIVs be designed to safety-related standards. NUREG-0138 contains the justification for allowing nonsafety-related components as redundancy for the MSIVs. It is not a justification for the lack of redundancy.

E. Design of Other B&W Plants

A brief look at other nuclear plants with B&W-supplied reactors was undertaken to determine if the lack of steam line isolation redundancy is an industrywide problem. There were 14 B&W plants which were docketed with the NRC. Six of these plants were reviewed to determine if redundancy exists for isolating steam lines. The FSAR for these plants, section 10.3, was the basis for the review, and the results are summarized below.

1. Rancho Seco and Crystal River 3 - These plants are both very early B&W designs announced in 1967 They do not meet the requirements of NUREG-0138, but they were essentially built before this NUREG was published in 1976.

2. Three Mile Island 2 - This plant was docketed in 1968 by the NRC and has redundancy in its isolation capabilities since the steam lines are crosstied downstream of the turbine stop valves.

3. Davis Bessie - This plant has unidirectional MSIVs and non-return valves in the steam lines which provide redundancy in the isolation. The plant was docketed in 1968.

4. Midland - This plant was also docketed in 1968 and has two isolation valves per steam line. Only one valve is designated the MSIV, but both valves are shown in FSAR figure 10.3-1.

5. WPPS-1 - This plant was docketed in 1973, the same year BLN was docketed. This plant does not have redundant isolation provisions.

Thus, of the six plants reviewed, two were designed before the issuance of NUREG-0138, three meet or exceed the requirements for redundancy, and one plant does not have redundant steam line isolation capability.

F. Problem Areas

After reviewing the main steam design, its design criteria, the BLN FSAR, and regulatory guidance, NSRS has the following concerns:

1. TVA has not consistently documented the design of the main steam system to the NRC in the area of MSIV failures. The internal design policy is that the MSIVs are exempt from the single failure criteria since there are redundant signals and solenoids to close the valves. However, this position has not been provided to the NRC. The BLN FSAR contains several references to the failure of an MSIV after a steam line break. The TVA response to FSAR question 430.67 is misleading in that it implies that TVA is in compliance with NUREG-0138, R1. The postulated break SM B-94 of CEB77-10 violates the NUREG position in that the break damages the

"A" steam valve vault MSIVs, and they cannot be relied upon to close. A postulated single failure of an MSIV in the "B" valve vault would then result in a two-steam-generator blowdown. Furthermore, the closing of the turbine stop valves would not, in this instance, provide backup since the 42-inch steam header cross-connects the steam generators upstream of these valves. Thus the TVA design does not meet the requirements of NUREG-0138, while it does meet the internally established criteria. 10CFR50.34 requires that the design bases for the plant be included in the license application.

2. The provisions of BLN FSAR section 3.6.2.1.2.1.5 are not met by the present BLN design. These sections require that pipe breaks outside of the break-exclusion area (i.e. not in the steam valve vault) are not allowed to affect the operability of the MSIVs. However, CEB77-10 states for break SM B-94 that these valves may be damaged.

4. The BLN FSAR states that the pipe break exclusion applies to only the 30-inch main steam piping and to the 20- and 22-inch main feedwater piping within the steam valve vaults. TVA report CEB77-10, however, does not analyze breaks of any piping in the main steam valve vaults; and report CEB 76-13 states that measures have been taken to accept postulated failures of this piping.

5. In order to take credit for the closure of the turbine stop valves as a backup to the MSIVs, one must calculate the expected flow from all unisolated flow paths from the main steam lines. This flow must then be compared to the maximum allowable flow from an isolated steam generator after a main steam line break. The maximum allowable flow rate is usually determined by the NSSS vendor and should be used as input to the accident analysis of a steam line break. Allowances for a stuck open atmospheric dump valve or safety valve are also considered in establishing the maximum allowable flow. NSRS has been unsuccessful in finding this flow rate in the NSSS vendor design documentation.

6. The roof of the "A" main steam valve vault is not protected from tornado missiles. The BLN FSAR states in section 3.5.2, reference T, that if tornado missiles damage main steam lines or MSIVs in the "A" steam valve vault, that the plant is designed to mitigate this event as described in FSAR section 15.1.5 with single failure capability. This section refers to the possibility of an MSIV failing to close. The NRC specifically questioned TVA about such tornado missile-induced breaks in question 410.11. The response to this question does not mention the possibility of a single failure. If one postulates that tornado-generated missiles disable an MSIV and break a steam line in the unprotected "A" steam valve vault, then the failure of an MSIV in the "B" steam valve vault would result in a two-steam-generator blowdown which the closure of the turbine stop valves would not terminate.

VI. REFERENCES

A. NUREG-0138, "Staff Discussion of Fifteen Technical Issues Listed in Attachment to November 3, 1976 Memorandum from Director NRR to NRR Staff," November 1976

B. NRC's Standard Review Plan, Section 10.3, "Main Steam Supply System," R3, April 1984

C. NRC's Standard Review Plan, Section 15.1.5, "Steam System Piping Failures Inside and Outside of Containment (PWR)," R2, July 1981

D. BLN FSAR Question 430.67 and TVA's response submitted in FSAR Amendment 21, July 1, 1981

E. YCN PSAR Question 022.1 and TVA's response submitted in PSAR Amendment 1, August 20, 1976

F. YCN PSAR Question 022.27 and TVA's response submitted in PSAR Amendment 2, November 1976

G. YCN PSAR Question 022.46 and TVA's response submitted in PSAR Amendment 11, March 31, 1978

H. BLN Design Criteria Diagram Main and Reheat Steam System, 3BW0600-SM, R13

I. BLN Mechanical Composite Piping Drawing 3BW0303-00

J. BLN Equipment Plans - Roof Drawing 3BW0200-00

K. TVA Detailed Design Criteria for Main Steam (Including Secondary Side of Steam Generator), N4-SM-D740

L. B&W's System Description Specification for Secondary System, 15-4044000002

M. Title 10, Code of Federal Regulations, Part 50, Appendix A

N. BLN FSAR Section 3.6, "Protection Against Dynamic Effects Associated with the Postulated Rupture of Piping"

O. BLN FSAR, Section 6.2.1.4, "Containment Analysis for Postulated Secondary Pipe Ruptures"

P. BLN FSAR, Section 10.3, "Main Steam Systems"

Q. BLN FSAR, Section 15.0.2, "Single Failure Philosophy"

R. BLN FSAR, Section 15.1.5, "Steam Line Break"

S. Civil Engineering Branch Report CEB 77-10, "Bellefonte Nuclear Plants Units 1 and 2, Evaluation of the Effects of Postulated Pipe Ruptures Outside Containment"

T. BLN FSAR, Section 3.5, "Systems to Be Protected" (from missiles)

U. Civil Engineering Branch Report CEB 76-13, "Break Exclusion Position for Complying with APCSB 3-1 and MEB 3-1, Bellefonte Nuclear Plant Units 1 and 2," July 8, 1976, Revision 2

GNS 841109 051

TENNESSEE VALLEY AUTHORITY

NUCLEAR SAFETY REVIEW STAFF

NSRS REPORT NO. I-84-31-BFN

SUBJECT: INVESTIGATION OF BROWNS FERRY NUCLEAR PLANT UNIT 3 STARTUP FROM COLD CONDITION WITH RHR IN SHUTDOWN COOLING MODE ON OCTOBER 22, 1984

DATES OF REVIEW: OCTOBER 22 - NOVEMBER 2, 1984

REVIEWER: K. W. Whitt — K. W. WHITT — 11/9/84 DATE

APPROVED BY: M. S. Kidd — M. S. KIDD — 11/9/84 DATE

MEDS, W5D63 C-K

G. Procedures and Instructions

The review of procedures and instructions was two part in nature. Part I was a review of the plant controlling documents and a comparison of these documents with higher-tier documents. Part II consisted of review of instructions and observation of the use of these instructions in the field. During this NSRS review, part I was completed and part II was begun. Part II will continue as an integral part of the NSRS review of WBN and the determination of its ability to safely load fuel. As other areas are reviewed, the procedures and instructions that apply to those areas will also be reviewed.

For part I of this review the requirements of NRC Regulatory Guide (RG) 1.33, "Quality Assurance Program Requirements," were used as a basis. RG 1.33 endorsed ANSI N18.7-1976/ANS 3.2, "Administrative Control and Quality Assurance for the Operational Phase of Nuclear Power Plants." TVA implemented these requirements in N-OQAM, Part II, Section 1.1 (dated 6/2/83), "Document Control," parts 4.4, "Plant Instructions," and 5.0, "Periodic Review of Procedures and Instructions," and Section 8.1 (9/29/82), "Preparation, Maintenance, and Implementation of the Manual." At the plant level, AI-3.1, "Plant Instructions - Control and Use," provided the details for implementing upper-level requirements.

1. Plant Controlling Documents

A review was conducted of AI-3.1, "Plant Instructions - Control and Use." Generally, the instruction implemented the requirements of the upper-tier documents, with two exceptions. One point of NSRS concern was in the matter of what constituted a required periodic review of a procedure or instruction. and the second concerned the FQE review of instructions written by FQE.

a. Two-Year Review

In the area of review, RG 1.33 states:

> The overall quality assurance program requirements for the operation phase that are included in ANSI N18.7-1976/ ANS 3.2 are acceptable to the NRC staff and provide an adequate basis for complying with the quality assurance program requirements of Appendix B to 10 CFR Part 50, subject to the following:

No exceptions were listed for the review of procedures or instructions. ANSI N18.7-1976/ANS-3.2 stated:

> Plant procedures shall be reviewed by an individual knowledgeable in the area