UNITED STATES NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
DIVISION OF INSPECTION PROGRAMS

Report Nos.: 50-390/85-57 and 50-391/85-46

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Docket Nos.: 50-390 and 50-391 Licensee Nos.: CPPR-91 and CPPR-92

Facility Name: Watts Bar 1 and 2

Inspection Conducted: September 30 - October 4 and October 21 - 25, 1985

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REPORT DETAILS

1. Entrance/Exit Interviews

Entrance interviews with TVA management were held at the Watts Bar site on September 30 and October 21, 1985. Exit interviews were held on October 4 and October 24, 1985 to summarize the NRC observations. Attachments 1 and 2 list those individuals who attended the entrance and exit interviews, respectively. Other licensee employees contacted included contractor personnel and TVA managers, supervisors, engineers, and Quality Control (QC) staff.

2. Inspection Scope

This inspection was conducted as part of a continuing series of inspections at the Watts Bar facility regarding the activities of the Employee Response Team Program. The first inspection (Inspection Report Nos. 50-390/85-49, 50-391/85-40) was conducted July 15-18, 1985. The purposes of the inspection described herein were to review the changes in procedures and personnel since the initial inspection in July, to perform a detailed review of the implementation of the Employee Response Team (ERT) Program, and to determine, through a review of some specific concerns, whether there had been previous indications of problems identified to TVA management similar to those concerns now being raised. Employee concern files including the associated background documentation were reviewed; and, for a selected sample of concerns, the existing plant conditions were verified and discussions were held with cognizant personnel.

The Employee Response Team Program had progressed to the point that most employee interviews had been completed (approximately 4900 as of October 18, 1985). The interviews remaining are primarily followup interviews. As of this inspection period, 3807 employee concerns had been obtained through the interview, phone-in, and walk-in process. Of these 3807 concerns, 1330 had been preliminarily determined to be safety-related. Most of the safety-related concerns (approximately 1100) had been forwarded to the TVA Nuclear Safety Review Staff (NSRS) for review and assignment of the party responsible (NSRS or Quality Technology Corporation) for the investigation of the concern. Preliminary investigations of 91 concerns had been completed and forwarded to TVA line organizations for their response and determination of any corrective actions required. Few concerns had progressed to the point of TVA line review and none to the point of completion of corrective actions.

3. Employee Response Team Program Procedures

The following TVA procedures concerning the ERT Program and related activities were reviewed:

- o Procedure No. 0207, " Handling of Employee Concerns," Rev. 1, June 25, 1985.
- o Procedure No. 0303, "Conduct of Investigations," Rev. 0, September 15, 1980.
- o Procedure No. 0307, "Employee Response Team Program," Rev. 2, September 16, 1985.
- o Procedure No. 0308, "Employee Response Team Program Administration," Rev. 2, September 16, 1985.
- o Procedure No. 0310, "Assessing Potential Impact of Unvalidated Employee Concerns on the Watts Bar Nuclear Plant (WBN) Startup Schedule," Rev. 0, June 8, 1985 and Rev. 1, October 21, 1985.

These procedures were determined to be generally adequate. Those procedures revised since the initial inspection were not substantially changed in technical content.

4. Management Interviews

Interviews were held with personnel from TVA and Quality Technology Corporation (QTC) involved in the ERT Program, including TVA managers responsible for any corrective actions. The interviews included managers from: Office of Construction, Office of Engineering, Site Director's Office, Watts Bar Project Manager's Office, Manager of Power and Engineering (Nuclear) Office, as well as NSRS and QTC. The purpose of the interviews were: to examine the interview, investigation, and review process performed by QTC, NSRS, and the Milestone Review Committee; to determine the degree of commitment and support for the ERT Program; to examine the relationship between QTC and TVA to determine QTC's investigative freedom; to examine the handling (including tracking and trending) of the concerns and their resolution; and to determine TVA management's understanding of the significance of issues being raised by the ERT Program.

During these interviews, NRC observations and comments were made. In response to the NRC comments, changes are now being made in TVA's system for the overall management of the ERT Program issues. The following are observations and comments based on the interviews held during the first week onsite and at TVA's Knoxville offices, September 30 - October 4, 1985.

a. The managers were knowledgeable about those concerns which they were responsible for responding to and were tracking the status of their responses. The corrective actions contained in the responses were not being formally tracked to ensure completion unless they were in existing TVA systems such as the Nonconforming Condition Report (NCR) or Construction Deficiency Report (CDR) process. However, some corrective actions may not be in a deficiency reporting system (NCR/CDR). For

example, a corrective action may be a change to a procedure for clarification which may not be an NCR situation. It was not evident to the NRC how completion of the corrective actions would be tracked and monitored. However, NSRS was tasked programmatically with the followup on the completion of corrective actions contained in responses.

b. It was not apparent that each organization was aware of the issues which were the responsibilities of other groups. There was not a structured mechanism for the general handling of concerns or collaboration on responses to concerns. There seemed to be a lack of coordination within the TVA line organizations. Within each TVA organization, personnel were identified who were required to respond to the employee concerns. There was some evidence of collaboration on issues such as instrument line slope, but in this case, it was not clear who in TVA was responsible for resolution of the issue. There were three separate efforts, two for certain Unit 1 systems and one for Unit 2 but without a defined lead organization. In addition, the problems with instrument tube compression fittings, clamps, and tube bending were not coordinated with the slope issue. See paragraphs 9 and 10 of this report for further details on the instrument line issues.

c. It was not apparent that a system existed which would inform the Manager of Power and Engineering (Nuclear) of which issues resulting from the ERT Program were significant.

d. TVA line managers were not advised of issues until the concern had been investigated and the investigation report issued. This caused responses to the concern issues to be done on a case-by-case basis rather than a complete and comprehensive resolution. Some concerns may be more effectively investigated and responded to when similar concerns are grouped together such as concerns in the areas of welding, instrument lines, and expansion anchor bolts.

e. TVA line managers were more receptive to and understanding of the roles of QTC and NSRS in identifying and investigating concerns than at the start of the ERT Program. Some positive aspects were seen at the employee level, i.e., employees being more willing to express themselves to their management and to identify safety issues.

f. In interviews with QTC management, QTC expressed no perception of pressure from TVA to limit their investigations.

g. TVA's management has recognized the need to develop their managers at all levels and instill proper management attitudes.

The negative aspects of the above observations may have become somewhat lessened due to TVA's recent formation of a new task group made up of personnel from the Offices of Engineering, Construction, and Nuclear Power. Although this task group had not yet been finalized by the issuance of a

controlling procedure, preliminary discussions indicated that this group will be the central focal point for TVA line responsibilities regarding the ERT Program. It is anticipated that as part of the responsibilities of this task group, they will: coordinate and maintain cognizance of the overall line organization actions on concerns, including corrective actions if required; provide assessment and evaluation capabilities to ensure complete and comprehensive responses to concern issues; provide an overall management perspective on the full scope of concerns (K Forms) and their associated investigations; and provide TVA management with the overall results of the ERT Program (i.e., hardware changes, NCRs, and 50.55(e) reports).

5. Quality Technology Corporation and NSRS - Interviews and Investigations

The employee interviews are the sole responsibility of Quality Technology Corporation. Subsequent investigations are performed by QTC and/or NSRS personnel.

The resumes of the QTC personnel assigned to the ERT Program were reviewed, with particular attention given to those personnel added since the initial inspection. The majority of the added personnel are assigned to investigate Intimidation and Harrassment (I&H) concerns. The backgrounds of the personnel as described in their resumes appear generally adequate for their assignments.

The resumes of the NSRS personnel assigned to the employee concerns program were reviewed. More than one half of these personnel were assigned to NSRS on or about September 16, 1985. The backgrounds of the personnel as described in their resumes appear generally adequate for their assignments.

A sample of 12 QTC and NSRS personnel were interviewed concerning the ERT Program and their specific activities. These personnel were responsible for interviews (QTC) or investigations (QTC/NSRS) and appeared to be generally knowledgeable of the overall program and their specific responsibilities.

QTC did not and currently does not provide or require formal training for interviewers or investigators. The initial QTC interviewers at Watts Bar were generally QTC employees with previous experience in one or more programs similar to the ERT Program. Training for new QTC employees was through a combination of observation (working with experienced employees), oral management direction (daily meetings) and on-the-job training.

The NRC inspectors reviewed most of the preliminary investigation reports (91) issued as of this inspection period, and 46 of these 91 employee concerns were reviewed in detail (see Attachment 3). These were reviewed for clarity of the concern statement, adequacy of the investigation to substan-

tiate the concern, appropriate personnel contacted during investigation, technical adequacy of the investigation, and validity of the investigation conclusions. Of these 46 investigations, 27 were performed by QTC, 17 by NSRS and 2 by NSRS and QTC jointly. In addition, the review of 12 of these concerns included: using copies of the QTC files (with references to individuals relating the concern deleted) to ascertain whether the employee concern as stated on the "K Form" and the investigative reports matched that of the complete QTC interview/investigation file; discussions with QTC interviewers and QTC/NSRS investigators; review of hardware in the field related to the concern; discussions with TVA personnel involved in the area of the concern; and discussions with those personnel responsible for corrective actions.

Although "substantiated" is not specifically defined in procedures governing the ERT program, based on the NRC review of ERT investigation reports, a working definition of "substantiated" is generally that the physically identifiable statements in a concern are true, although opinions or conclusions may not be true. As the working definition implies, a "substantiated" concern is not necessarily a new safety question in that the concern may be found after investigation to be a nonsafety-related issue or may have been previously identified and resolved.

QTC issues "External Investigation Reports" to NSRS in which confidential or conflict of interest (related to NSRS) information has been deleted. A comparison of the "external" and "internal" reports showed no indication of a loss of necessary information to facilitate the proper understanding of the concern or the investigation. In most cases, the difference in reports was merely the deletion of the names and titles of the personnnel contacted. NSRS and TVA line organizations, through NSRS, can request additional information from QTC if there are questions concerning the investigation report.

Details of the NRC review of selected concerns in the areas of instrument lines, concrete expansion anchor bolts, hanger drawing notes, and valve classification are provided in paragraphs 9 and 10 of this report. A summary of general NRC observations follows and is based on the relatively small sample of investigation reports and investigative files reviewed thus far.

a. The investigation reports and "K Forms" were generally found to properly reflect the stated employee concern.

b. In some instances the assignment of investigation responsibility to QTC or NSRS has not been consistent in assigning the same organization to review similar concerns. This was noted for concrete anchor bolts for which investigations have been assigned to QTC, NSRS, and jointly QTC/NSRS. The NRC review generally found a lack of coordination of investigation efforts for those concerns in related areas.

As the full scope of employee concerns is now being seen, TVA management personnel indicated that a single broad and encompassing investigation may be considered in the welding area. As this method of grouping similar issues together for joint resolution has the potential to effect a more efficient and comprehensive investigation process and corrective action program, other areas may also be considered, e.g., instrumentation tubing.

c. The investigations seem to be done in a detailed and conservative manner and with generally adequate depth of review. Followup interviews were held as necessary. An incident, occurring during an investigation by QTC of a concern, was properly handled by the issuance of an NCR. The incident involved the disassembly of a QC accepted support on a Unit 1 system without an appropriate work plan. An NCR was subsequently issued to document this situation. However, the incident is a further example of the lack of overall management of the ERT Program in not assuring proper precautions and procedures were in place to prevent the unauthorized modification to components which had been QC accepted. This issue was referred to the NRC Senior Resident Inspector as an Inspector Followup Item (390/85-57-01).

d. Investigation information was generally detailed and comprehensive and logical conclusions, sometimes overly conservative, were generally made. Some exceptions were found and are discussed in paragraphs 9 and 10 of this report. No cases were found in which a safety issue was not brought out.

e. As few significant corrective actions had been finalized, it was not possible to determine whether corrective actions have properly addressed the full scope of the concerns including generic implications of any program weaknesses. It was noted that several early responses to the concern investigations and corrective action proposals by TVA line organizations were found to be inadequate by NSRS review and additional response was required. The addition of experienced personnel in NSRS and the formation of a new task group for the line organization responsibilities were steps taken by TVA to alleviate this problem.

There did not appear to be any formal evaluation of substantiated concerns for generic implications and root causes unless the concerns resulted in a significant NCR, which is evaluated under the procedures governing NCRs. In addition, even though an NCR may be issued, its significance sometimes may not be properly assessed. For example, several similar NCRs identified slope problems with instrument sensing lines. These NCRs had been generated prior to the ERT Program and evaluated by TVA as not being a significant deficiency. However, the investigation of an employee concern resulted in an NCR which was eventually evaluated by TVA as a significant condition adverse to quality, was generic, and required corrective action.

6. Employee Concerns Tracking and Trending

The methods used to track and trend the employee concerns identified in the ERT Program were reviewed. Each concern is identified by a unique alpha-numeric file number at the time the concern is identified by QTC. Both QTC and NSRS track the concerns as they enter, are processed through, and exit their respective organizations.

Each Watts Bar line organization (Construction, Engineering, Nuclear Power, Employee Relations and the Project Manager) responsible for action on a concern maintained their own individual tracking system for status information purposes. At the time of this inspection, there was no tracking system which integrated the individual systems and provided a single reference for the Watts Bar Project for an overall status. No one TVA group was tracking those substantiated safety-related concerns which required corrective action and which resulted in NCRs. In addition, no TVA group was tracking concerns which were evaluated to be reportable under 10 CFR 50.55(e) and 10 CFR Part 21.

Also, neither QTC nor NSRS was "trending" data on the concerns in the sense of measuring changes with time or providing an assessment or evaluation of the concerns as they were identified or investigated. It was not evident to the NRC that there was a mechanism to reflect the priority of a concern issue after it had been investigated. For example, an Office of Construction (OC) tracking sheet for concerns which had already been substantiated, gave the same priority as was established by the Milestone Review Committee prior to the investigation. The instrument line slope concern was listed as a 5% power item even though the corrective action required work inside containment.

Both QTC and NSRS issued periodic "status" reports, generated from computer data bases, that presented data on the concerns only at a specific point in time. It was noted that QTC and NSRS were able to sort the individual concerns by category, such as general area or priority. The tracking and status systems in use by QTC and NSRS did not identify duplicate (essentially identical) concerns, although duplicate concerns are generally identified in the ERT Investigation Reports.

The various tracking and status reports generated by QTC, NSRS, OC and other TVA organizations were not in agreement. At least part of the variation appeared due to reports being generated at different times from data which were updated at different times.

7. Milestone Review Committee

The purpose of the Milestone Review Committee is, as stated in their charter, to assess and prioritize the employee concerns developed in the Employee Response Team Program prior to the investigation of the concerns. The

methodology for assigning priorities to the investigations is described in Procedure Number 0310. The priority of the concerns is related to the major milestones of the facility, i.e., fuel loading, initial criticality, 5% power, power ascension testing, 100% power, and a category of less significant concerns. Procedure Number 0310 was reviewed and discussions were held with cognizant personnel. The following observations were made:

a. The Milestone Review Committee assigns priorities based solely on the unvalidated concerns described in two or three sentences of the "Employee Concern Assignment Request" form (K Form). This assignment of priority is sufficient to establish the priority to conduct investigations, but by itself would not be adequate to determine whether actual plant milestones (i.e., fuel load, initial criticality, etc.) could be reached before completion of investigations for those concerns assigned a later priority.

b. A change to the assigned priority is allowed by Revision 0 of Procedure Number 0310 based on detection of a trend on a plant system basis; however, this change in priority has not been performed in some cases. For example, instrument line slope concerns are actively being corrected in the plant; however, the current milestone priority is "5% power" and welder certification concerns are also a "5% power" priority. These two examples are currently receiving significant attention which is not reflected in the assigned "5% power" priority. Based on the information available, the NRC believes that "fuel loading" would be a more appropriate priority.

   Revision 1 of this procedure allows a more flexible approach for changing the milestone priority based on any perceived trend. Since Revision 1 was only recently issued, there has not been sufficient time to determine the effectiveness of the change.

8. Reportability Review

QTC reviews each concern assigned to them for investigation and makes a preliminary evaluation, documented on a "Request for Reportability Evaluation" form, of whether the concern is reportable in accordance with the criteria of 10 CFR 50.55(e). These forms are transmitted to NSRS as part of the final report package.

All substantiated safety-related concerns transmitted by NSRS to the TVA line organizations are reviewed for reportability in accordance with existing TVA procedures.

Because there was no mechanism in place to correlate the concerns with corresponding nonconforming or reportable condition reports, it could not be determined whether substantiated concerns are being properly reviewed for reportability.

9. Past Identification and Corrective Actions

Selected concern issues which were identified through the ERT Program were reviewed by the NRC to determine whether there had been previous indications of these deficiencies. For previously identified deficiencies, the review was performed to determine what corrective actions had been prescribed and whether these corrective actions were appropriate and effective. The issues reviewed related to employee concerns in the areas of instrument lines (misinstalled compression fittings, loose or misinstalled clamps, unapproved tube bending procedures or equipment, and incorrect instrument line slope) and improperly installed concrete expansion anchor bolts and encompassed the following ERT Investigation Reports.

IN-85-795-001/002	Instrument tube compression fittings
IN-85-016-003	Instrumentation line clamps
PH-85-001-002	Instrumentation line slope
IN-85-021-001	Instrumentation tube bending
IN-85-037-001	Concrete anchor bolts
IN-85-020-001	Concrete anchor bolts
IN-85-103-001	Concrete anchor bolts

Various TVA corrective action systems were examined as part of this review, e.g., Quality Assurance (QA) audits, OC NCRs, trend analyses, and 50.55(e) or Part 21 reports. Also reviewed were selected NRC inspection reports and Systematic Assessment of Licensee Performance (SALP) reports (1979-1985) for Watts Bar. Included were interviews of TVA personnel who had involvement in the general area of the concern in order to obtain pertinent background information.

a. In the area of instrument lines, the following documents related to the above concerns were reviewed in whole or in part:

Construction Quality Assurance Audit Reports

- o WB-I-80-02 "Instrumentation Sensing Lines" dated March 6, 1980.
- o WB-I-81-01 "Inspection and Documentation of Sensing Lines and Their Seismic Supports" dated January 19, 1981.
- o WB-M-81-08 "Inspection and Documentation of Pipe Bending and Pipe Threading" dated December 1, 1981.
- o WB-I-82-02 "Installation of Instrument Lines and Supports" dated June 24, 1982.
- o WB-I-82-04 "Installation of Instrument Sense Lines" dated January 7, 1983.

TVA Quality Control Instructions (QCI's) and Procedures (QCPs)

- QC-1.02-1 "Inspection Rejection Notice," Rev. 8, March 8, 1985.
- QCI-1.58 "Trend Analysis," Rev. 2, October 29, 1984.
- QCP-3.11 "Inspection and Documentation of Instrument Line Bending and Supports," Rev. 14, January 2, 1985.
- QCP-3.11-1 "Inspection and Documentation of Instrumentation Supports," Rev. 6, August 27, 1985.
- QCP-3.11-2 "Inspection and Documentation of Instrument Lines," Rev. 6, October 25, 1985.

NRC Inspection Report 50-438/82-32, 50-439/82-32, Construction Appraisal Team (CAT) Inspection performed in 1982 at Bellefonte Nuclear Plant.

The instrument line concerns have been placed into four categories: slope, compression fittings, bending, and clamps.

(1) Instrument Sensing Line Slope

The instrument sensing lines at Watts Bar are required to have a minimum slope of 1/8 inch per foot in accordance with Drawing 47W600-0-4. Lines not meeting this design requirement must be reworked or specifically evaluated by the Office of Engineering (OE). The Watts Bar SALP reports and Construction Deficiency Reports (CDRs) reviewed by the NRC inspectors did not mention instrument line slope deficiencies.

The Bellefonte Construction Appraisal Team (CAT) Inspection report noted a previous TVA audit (BN-I-80-04) had identified among others the following deficiencies:

- Inspection criteria for tubing slope were not clearly defined.
- Instrument used for measuring slope was not calibrated.
- As a result of the TVA audit, corrective actions at Bellefonte were to suspend inspection activities and revise the inspection procedures.

The Watts Bar Nuclear Plant (WBNP) Quality Trend Analysis Report for June 1984 (WBN '840730 003) stated:

> "There were 154 inspections of instrument line bending and supports with 79 rejections (QCP-3.11). The major cause of rejection was minimum slope violation."

The report for January 1985 (C24 '850301 002) listed 16 slope deficiencies and the report for August 1985 (C24 '850930 010) listed 5 slope deficiencies.

In the Spring of 1984, Office of Construction (OC) personnel identified about 400 WBNP Unit 1 instrument sensing lines that had not been inspected and accepted by QC, many of which did not meet minimum slope criteria. OC then identified about 100 instrument sensing lines which might be acceptable despite not meeting the minimum slope requirements, and requested that these lines be evaluated by OE. An OE field evaluation team was sent to the WBNP site in the Summer of 1984 to evaluate the instrument sensing lines identified by OC. Those which the team evaluated as "use as is" were documented on NCRs and formally reviewed and accepted. The other lines were reworked to meet the minimum slope requirement. All the NCRs resulting from this effort were evaluated as not being significant conditions adverse to quality (CAQs) and thus were not evaluated for root cause or generic implications.

The NRC inspectors requested that WBNP personnel provide documentary evidence of any corrective actions (i.e., revised installation criteria, retraining of craftsmen or inspectors, etc.) resulting from the high rejection rates identified in the Quality Trend Analysis Report or the requirement to bring in the field evaluation team. No such documents were provided prior to completion of the inspection.

The NRC inspectors noted that about 400 WBNP Unit 1 sensing lines had not been inspected or accepted by QC in the Spring of 1984. Hot functional testing had been performed in 1983 and again in the Fall of 1984. The NRC inspectors questioned the status of these 400 sensing lines during hot functional tests done in 1983. This issue was referred to the NRC Senior Resident Inspector as an Inspector Followup Item (390/85-57-02).

Concern PH-85-001-002 (K Form dated May 17, 1985) identified slope problems with instrument lines in System 68 (Reactor Coolant System). Investigation of the concern by QTC confirmed that some instrument sensing lines in System 68 did not meet minimum slope requirements. Subsequent inspection of these System 68 sensing lines by OC personnel identified additional deficiencies and resulted in NCR 6172 Rev. 0, dated July 9, 1985. This NCR was evaluated as a significant CAQ. The "Apparent Cause" was implied to be damage due to construction activity subsequent to QC inspection and acceptance of the lines.

Subsequent to Rev. 0 of NCR 6172, an informal inspection by TVA personnel of about 180 randomly selected instrument sensing lines in Units 1 and 2 identified slope discrepancies in 60% to 70% of

the lines. Although about 170 of these informal inspections were performed by Instrumentation QC inspectors, the details of the inspections and specific discrepancies identified were not formally documented. This issue was referred to the NRC Senior Resident Inspector as an Inspector Followup Item (390/85-57-03, 391/85-46-01).

The data from these informal inspections resulted in Revision 1 to NCR 6172 (applicable to Unit 1), dated September 12, 1985, which listed 21 NCRs generated in the summer of 1984, and stated that "...slope discrepancies have been previously identified by nonconformances which indicates a trend of this type problem requiring investigation for generic implication." This NCR also states the root cause to be that "QC failed to identify slope discrepancies during initial slope inspections."

The review by TVA personnel of NCR 6172 Rev. 1 apparently resulted in NCR 6359 Rev. 0, dated October 1, 1985, which applies to Unit 2. NCR 6359 Rev. 0 resulted in memorandum C24 '852009 004 from G. Wadewitz, dated October 9, 1985, giving new guidance on slope requirements for installation of instrument sensing lines for Unit 2.

The "Correction Methods" stated in these NCRs, the directions in the memorandum and the corrective actions to be prescribed in a procedure being written, as described by QC, QE, and other personnel were not consistent. As an example, QE was to define several hundred "critical" lines requiring a slope of 1 inch per foot, while QC was reinspecting Unit 2 lines to one quarter inch per foot. In addition, System 68 sensing lines were being cut out and rerouted in Unit 1, based on Work Plan No. 5320, prior to development of the new sensing line slope procedure, completion of the retraining on compression fittings, or any efforts to integrate the resolution of these problems with those of tube clamps and bending. The effect of these changes to the System 68 sensing lines on completed hot functional and preoperational tests on Unit 1 was referred to the NRC Senior Resident Inspector as an Inspector Followup Item (390/85-57-04).

Discussions by the NRC inspectors with QC personnel, including Instrumentation QC inspectors, indicated the following:

- Construction personnel generally attempted to install instrument sensing lines at 1/8 inch per foot slope, rather than using this as a minimum as intended by QE.

- Problems with meeting the 1/8 inch per foot slope were generally identified prior to acceptance of the sensing lines by QC and resolved by Inspection Rejection Notices (IRNs).

- o A review of the complete QC NCR listing by WBNP personnel determined that only one NCR not identified in NCR 6172 Rev. 1 had been written on WBNP Unit 1 instrument sensing line slope deficiencies: NCR 5517 dated March 15, 1985. This NCR was evaluated as not being a CAQ.

- o NSRS had not previously identified or investigated problems associated with instrument line slope, compression fittings, bending or clamps.

- o Instrumentation QC inspectors apparently believe that the majority of the slope discrepancies identified after QC inspection and acceptance are due to construction damage.

- o There is no employee training at Watts Bar which deals specifically with the prevention of damage to installed and accepted equipment by subsequent construction activities. The use of instrument lines as steps or supports for ladders and scaffolding appears to be a common practice.

In summary, instrumentation sensing line slope deficiencies had been identified in trend analyses of IRNs and by QC to QE in the summer of 1984. However, these deficiencies were viewed as being case specific and were not evaluated as having generic implications. The investigation of the employee concern (PH-85-001-002) resulted in additional inspections and the revision of an existing NCR to identify a broader problem having generic implications.

Additional discussion of the NRC review in the area of instrument sensing line slope is presented in paragraph 10 of this report.

(2) Compression Fittings

Concern IN-85-795-001 (K Form dated July 18, 1985) states "Compression fittings on instrument tubing are not installed per vendor instructions." The ERT Investigation Report states that of 107 compression fitting joints disassembled and inspected to the vendor installation criteria, 60 were defective.

The NRC inspectors did not find any historical evidence of discrepancies involving compression fittings in the SALP reports, Quality Trend Analysis Reports, NCRs, or CDRs which they reviewed. They determined that there are presently no QC inspection requirements for compression fittings. A QC inspection requirement for fittings did exist in QCP-3.13 from November 24, 1980 to July 8, 1982; however, it was cancelled due to the absence of ASME and TVA upper tier requirements.

Four types of compression fittings have apparently been used at WBNP (Parker CPI, Ferulok, Swagelok, and Hi-Seal). There is no evidence that issuance of these fittings was controlled by type, or that installation training was given prior to August 1985 concerning compatibility of the various types of compression fittings.

Additional discussion of the NRC review of the issue of compression fittings is presented in paragraph 10 of this report.

(3) Instrument Tube Bending and Loose/Misinstalled Tube Clamps

The NRC inspectors did not find any historical evidence of discrepancies involving tube bending in the SALP reports, NCRs, or CDRs. Similar discrepancies in the area of loose or misinstalled tube clamps were identified in the Quality Trend Analysis Reports, but apparently were not evaluated as identifying an adverse trend which required generic corrective actions. In addition, a related concern involved bolting of Unistrut clamps on instrument lines was identified by TVA in 1983. The specific details of this concern are discussed in the Meeting Summary enclosed with R. D. Walker's letter to H. G. Parris dated July 15, 1985.

b. Employee Concerns IN-85-037-001 and IN-85-020-001 state that concrete expansion anchor bolts had been improperly installed due to hitting reinforcing steel and subsequently cutting off the anchor and in some cases welding a bolt head to the base plate. In addition, there was a statement concerning deteriorated and rusted anchor bolts.

The QTC investigation of these two concerns brought out a number of issues as described below:

IN-85-037-001:

- The lack of detailed documentation of corrective actions for Condition Adverse to Quality (CAQR-M-31).
- Inspection procedure (QCP-4.23) does not satisfy IE Bulletin 79-02 for sampling on a "systems" basis.
- Voided QC records (for QCP-4.8 inspections) were destroyed thereby deleting historical records of value in maintaining, repairing, or replacing an item or in evaluating the malfunction of an item.
- After the closure of the CAQR-M-31, NCRs have still been issued on anchor bolt deficiencies.
- Inadequate anchor bolt sampling plan in QCP 1.14, Rev. 15.

- o Visual verification of anchor bolt perpendicularity without measurement.

IN-85-020-001:

- o Concrete anchors throughout the Unit 1 annulus are in a severely rusted and corroded condition.
- o Some anchor bolts do not meet minimum thread engagement or have excessive plug depth.
- o Support members were forced into alignment with anchor bolts.
- o Reference to the investigation of Concern IN-85-037-001 for the lack of the effectiveness of previous anchor bolt inspections.

The TVA line organization responded to each of the investigation issues of Concern IN-85-037-001; however, the response was rejected by NSRS. Efforts are being made to resolve the issues. The NRC cannot comment on the technical merits of the issues until resolution by TVA occurs.

The NRC review focused on aspects of the concerns investigation related to improperly installed anchor bolts and whether the issues had been previously identified to TVA management. TVA construction QA audit reports (WB-G-78-02, -79-09, -79-23, -82-04, and -82-06) and numerous NCRs were reviewed (i.e., NCR 2803, 2873, 2789, 3311, 3409, 3742, 3624, 3842, 3289, and 2019). A number of NCRs have been issued concerning the installation and inspection of anchor bolts based on the results of QA audits and construction/inspection activities. Some NCRs date back as far as 1978, as identified in the QTC investigation report of Concerns IN-85-037-001 and IN-85-020-001. In addition, many of these NCRs were also described in TVA's response to the IE Bulletin, 79-02 in a letter from L. Mills (TVA) to J. O'Reilly (NRC) dated August 26, 1983 and revised in the letters dated June 20, 1984 and December 20, 1984. The response to Bulletin 79-02 described TVA's quality control program for anchor bolt installation since the start of construction at Watts Bar, the additional sampling inspection of anchor bolts in response to the Bulletin and a discussion of six NCRs and their resolution related to anchor bolt installations.

The sampling inspections of piping, electrical, and HVAC for the Bulletin response and/or the resolution of various NCRs demonstrated that some anchor bolt deficiencies existed (i.e., excessive plug and shell depth, cut anchors, and bolts without adequate thread engagement). Bolt thread engagement and shell depth were criteria not included in inspections for early installations. However, only a very low percentage of anchor bolts (less than 2%) would have been unable to carry the maximum design loads. TVA stated that these

results demonstrated the acceptability of anchor bolt installations and an effective testing program. The TVA line organization is evaluating the NSRS comments on the TVA line investigation report response and will provide a further response to NSRS.

The review of TVA and NRC documents indicated that the issues regarding improperly installed anchor bolts of Concern IN-85-037-001 and IN-85-020-001 were issues which had been topics of previous NCRs. Improperly installed anchor bolts have been identified in numerous NCRs and evaluated by TVA to be of a low number and of minor consequence, thus assuring that piping systems would remain operable during a seismic event. The conditions of rusted anchor bolts for duct support on the annulus floor was one issue not identified in previous NCRs.

10. Additional Review of Specific Concerns

a. Instrument Line Slope

Discussions were held with various TVA personnel concerning actions being taken to identify, document, and resolve instrument sensing line slope deficiencies. It appeared to the NRC inspectors that three separate programs had been initiated by TVA, without an overall plan to ensure consistency. These programs were for:

(1) Unit 1 Reactor Coolant System Flow Transmitter instrument sensing lines being rerouted under Work Plan 5320;

(2) The remainder of Unit 1 sensing lines; and

(3) The Unit 2 sensing lines.

The programs and procedures for items (2) and (3) above had not been approved and implemented at the time of the NRC inspection.

The NRC inspectors observed an informal inspection or walkdown (not performed by certified Instrumentation QC inspectors) of Unit 2 sensing lines for slope, number and general location of supports (tube clamps) and torque seal on clamp bolts. The walkdown was part of the program initiated by TVA Memorandum C24 '851009 004. The NRC inspectors were told that the inspections were performed in the same manner as previous instrumentation inspections. The inspection appeared adequate; one slope discrepancy was identified in the four line segments (subassemblies) inspected.

The related problems of instrument line compression fittings, qualification of tube bending personnel, procedures and tools, and tube clamps did not appear to have been reviewed in conjunction with the sensing line slope problems or with each other.

b. Compression Fittings

As a result of Concern IN-85-795-001, NCR 6278 Rev. 0 was initiated. This NCR was judged to be a significant CAQ, requiring determination of a root cause and evaluation for generic implications. Memorandum B45 '85 1008 256 from Coan to Wadewitz, dated October 8, 1985, provided an interim response to the NCR. This interim response stated that there was an apparent lack of design requirements for installation and inspection of compression fitting joints to assure adherence with the manufacturer's recommendations. These requirements are to be detailed in a construction specification. In addition, various types of compression fitting installation discrepancies are to be subjected to a testing program at TVA's Singleton Laboratory.

TVA Memorandum C24 '85 1011 005 from Wadewitz to Coan, dated October 11, 1985 states that: the compression fitting problems are generic to all Watts Bar installations and may be generic to other TVA plants; retraining to the manufacturer's installation instructions of the various brands of fittings used at Watts Bar is in progress, and an inspection program is to be initiated. The training prescribed by CTM 61-07 was reviewed by the NRC inspectors and appeared to be comprehensive and properly implemented.

The NRC inspectors determined that compression fitting installation continued after identification of the deficiencies and during Instrumentation Fitters training, with no apparent controls (i.e., inspection or surveillance) to prevent continued misinstallation. No program for reinspection of recently completed fittings had been developed as of October 25, 1985. In addition, during a walkdown in the Unit 1 Reactor Building, numerous fittings were found laying around without any indications of measures to control their use and application.

c. Instrument Tube Bending and Loose/Misinstalled Tube Clamps

Concern IN-85-021-001 (K Form dated May 23, 1985) states "Unit 2 benders (personnel) are required to be certified. The same tube benders were not required to be certified for tube bending work in Unit 1." The ERT Investigation Report identified problems with tube bender (personnel) qualification, tube benders (equipment) control, tube bending procedures, and other items. This concern is presently under review by OE. No response to the ERT Investigation Report was available at the time of the NRC inspection.

Concern IN-85-016-003 (K Form dated June 17, 1985) states "Tubing not clamped properly. This is a sitewide condition. Tube 3/8" OD S.S. instrument lines Unit 1. Clamps are bent, crooked, tight or loose. Condition was noticed about a year ago." The ERT Investigation Report identified numerous loose tube clamps in the Unit 1 Reactor Building

and Auxiliary Building. This concern is presently under review by OE. No response to the ERT Investigation Report was available at the time of the NRC inspection.

The NRC inspectors performed a limited walkdown of instrument lines in the Unit 1 Reactor Building and noted numerous instances of loose clamps and bolts with broken torque seals. An inspection of WBNP Unit 1 System 68 sensing lines and the adjacent physical areas identified numerous loose instrument line clamps and two broken electrical connector seals on relocated flow transmitters. These issues were referred to the NRC Senior Resident Inspector as an Inspector Followup Item (390/85-57-05).

On October 24, 1985, the NRC Inspectors were informed by TVA personnel that a "Project Manager" had been appointed to be in charge of identifying and resolving the instrument line problems for Units 1 and 2. Furthermore, on October 25, 1985 the Project Manager halted work on the installation, modification, and inspection of instrument sensing lines in Units 1 and 2. These actions occurred as a result of the NRC inspection findings previously discussed.

d. Support and Hanger Notes on Drawing 47A050

Several individuals have expressed concerns regarding the "050 Notes" pertaining to installation and inspection of pipe hangers. These notes are stated on Drawing Number 47A050, Mechanical Hanger Drawing General Notes (referred to by most individuals on site as the "050 Notes").

The NRC inspectors reviewed the following concerns and the associated investigation reports, where an investigation had been performed (*):

PH-85-006-001*
IN-85-010-002
IN-85-024-001*
IN-85-052-001*
IN-85-413-001*
IN-85-445-001
IN-85-532-006
IN-85-932-001

Generally the above concerns raise the same issue, questioning the proper usage of the "050 Notes" by construction and inspection personnel. The questioning stems from: the number of notes (63 pages of 8½" X 11" sheets); apparent contradictions between the notes, construction specifications, and codes; and numerous changes to the "050 Notes".

Investigation of four of the concerns have been conducted by NSRS (Concerns PH-85-006-001, IN-85-024-001, IN-85-052-001, IN-85-413-001). Concern PH-85-006-001 was found to be not substantiated. The NSRS investigations of the three other concerns generally found that the concerns were substantiated.

The NRC inspectors reviewed the investigation reports, interviewed QC inspectors and their supervisors, held discussions with the TVA engineers and NSRS reviewers involved, and reviewed pertinent personnel resumes. The following observations were made.

(a) The inspector conducted interviews with 12 Hanger QC inspectors and QC inspection supervisory personnel to obtain their opinions regarding the "050 Notes". The consensus of opinion of individuals questioned was that the "050 Notes" are sometimes confusing. However, when questioned, none of the QC inspectors or QC inspection supervisors were concerned with the quality of the completed hangers, or were aware of any hangers that had not been fabricated in accordance with approved design requirments (i.e., hangers were fabricated in accordance with the details shown on drawings and "050 Notes", or in accordance with an approved Field Change Request, FCR). The QC inspectors stated that "050 Notes" were too numerous, some were confusing, and that the notes are frequently revised by FCRs. The QC inspectors also stated that they often were required to request engineering support for assistance in interpretation of the "050 Note" requirements, and that sometimes the inspectors rejected hangers during QC inspections which were later accepted by engineering because they, the inspectors, may have misunderstood an "050 Note". The individuals questioned stated that they wished the "050 Notes" would either be simplified or replaced by another system. However, none of these individuals could offer suggestions regarding alternatives to the "050 Notes".

(b) As a result of the discussions with QC personnel and review of FCRs, the NRC inspector identified the following problem. When a hanger cannot be installed in accordance with the details shown on the construction drawings because of interferences or another reason, an FCR is generated by construction or site engineering personnel. The FCR is transmitted to TVA Design Engineering for approval. Until the FCR is approved, the hanger documentation is placed in a pending FCR status. When the FCR is approved, the documentation is completed and sent to the vault. It is not necessary to reinspect the hanger. If the FCR is returned to the site "approved as noted" (i.e., FCR was revised by Design Engineering), the hanger is partially reinspected. The only portion of the hanger that is reinspected is that portion affected by the revision to the FCR. Since work is permitted to be performed

on hangers in the pending status, the completed hanger may not be constructed in accordance with the approved FCR and other design documents. Also, the FCRs may or may not have been reviewed by QC personnel Therefore, the inspector questions why the hanger is not reinspected after the FCR is approved to assure that the hanger was installed in accordance with the requirements of the approved FCR and other design documents. This problem has been referred to the Region II Office and is an Inspector Followup Item (390/85-57-06, 391/85-46-02).

(c) It appears to the NRC that the TVA line organizations have considerable technical expertise and understanding of the complex process of design, installation, and inspection of supports. It also appears to the NRC that the difficulties in achieving a resolution to the concern issues may be due to less experience of assigned NSRS personnel on this complex technical issue. The NRC noted that in another area (welding) NSRS has recognized the need for specialized expertise and, in addition, has plans to hire an outside contractor to perform these investigations.

(d) There are a large number (63 pages) of General Notes ("050 Notes") which affect the pipe hanger erection and inspection. Several of the QC personnel expressed concerns related to what they considered frequent and unnecessary changes to the "050 Notes". Although the use of the "050 Notes" is cumbersome, hanger quality does not appear to be degraded.

(e) There are numerous changes being made to the "050 Notes" by use of FCRs. The FCRs are written to resolve interferences and other problems encountered during hanger erection. The FCRs are generally found to be acceptable by engineering and are approved.

(f) Since there are more than 50,000 hangers installed on the Watts Bar project, identification of minor hanger deficiencies during reinspection programs would normally be expected.

The TVA line organizations have responded to the investigation reports and stated that the "050 Notes" will be revised to clarify those notes perceived to be ambiguous, that actions were already underway in this area in response to INPO findings to reduce inspector inconsistency, and the reinspection of 20 additional supports were performed.

The NSRS review of the line organization response found them to be unacceptable in not fully addressing the corrective actions needed and in not demonstrating that deviations to codes or specifications were justified. Efforts were still continuing as of this inspection period to achieve resolution of the concern issues. The NRC will further review the resolution of these concerns after TVA has determined that resolution has been reached.

As part of the NRC review in this area, the as-built installation of two pipe supports were reviewed in the plant. Pipe supports No. 2-68-035 and 2-68-036 (Reactor Coolant System) shown on Drawings 2-68-035, Rev. 902 and 2-68-036, Rev. 904 were reviewed by the NRC inspector for conformance to the design drawings. These supports had been previously accepted by QC and involved a complex support structure using both spring hangers and snubbers and an FCR. It was noted that several "050 Notes" were required to be used (related to dimensional tolerances) in order to accept these supports. These supports were found to be in general conformance to the design drawings.

e. Employee Concern Regarding Valve Installation

An employee expressed concern regarding the installation of a Class B check valve in a class A system. The system involved is a 2 inch auxiliary pressurizer spray line in Unit 1. This concern was investigated by QTC who verified that the concern was valid. In order to resolve this problem, the licensee initiated nonconformance number SCR WBNMEB 8521. The licensee determined that the problem was caused by an error on drawing number 47W406-9 which specified a valve with part number W-1-8377 on the bill of material for installation at this location.

Part number W-1-8377 is a Model #9911, Mark 71 valve, which is a Class B valve supplied by Kerotest, Inc. The inspector reviewed the drawing and the bill of materials. The corrective action to disposition the NCR was to obtain additional documentation from Kerotest which would validate the use of this valve in the Class A line. The inspector reviewed the documentation and noted that only minor changes to the design parameters were necessary to meet Class A requirements. The valve complied with the Class A design parameters. The licensee installed a revised nameplate supplied by Kerotest which indicates the check valve is a Class A valve. The inspector noted, during review of the NCR listed above, that the same problem had been previously identified at the Sequoyah site. However, the licensee does not have an adequate program to address problems such as this one which may be common to several TVA sites. Also, the inspector was unable to determine during this inspection whether or not this problem had been identified and corrected on Watts Bar Unit 2. The lack of an adequate program to review NCRs, LERs, and NRC violations for applicability to other TVA sites has been referred to the Region II Office as an Inspector Follow-up Item (390/85-57-07, 391/85-46-03).

11. Items from Initial Inspection Report (50-390/85-49, 50-391/85-40)

a. "The [NRC] inspectors suggested that the licensee consider soliciting interviews from former TVA employees who were terminated, particularly those formerly associated with the Watts Bar Project."

The licensee indicated that publicity for the Employee Response Team Program and the "hot line" telephone number was provided through newspapers in the area and the TVA newspaper which is sent to employees and retirees. Furthermore, the licensee noted that the Employee Response Team Program has interviewed approximately 5000 individuals which the licensee considers a sufficient sample size.

b. "The [NRC] inspectors noted that no QA audit of QTC was included in the program procedures. TVA should consider at least a QA audit of corrective actions and final disposition of concerns."

No QA audits of QTC have been performed. Also, no QA audits are included in the ERT program procedures. The licensee explained that contract confidentiality requirements are still a problem and have precluded the licensee from having QA audits performed. The licensee is continuing discussions with QTC on this subject. A way is being sought that will allow for a QA audit and assure QTC can legally meet its responsibility of confidentiality to individuals who expressed their concerns to QTC.

c. "The [NRC] inspectors noted that conversations could be overheard through the walls of the interview rooms. In light of stringent confidentiality measures, the inspectors suggested that the rooms be made more soundproof."

QTC acknowledged that the interview rooms were not soundproof; however, care in the interviewing process eliminated the problem of a loss of confidentiality. QTC noted that the interview rooms were inadequate to maintain efficiency in processing the large number of interviewees. The number of interviews have significantly decreased; therefore, reducing the effects of any future modifications.

d. "TVA janitors were permitted unescorted access into the room where the QTC telephones and answering devices are located."

QTC noted that the trailer in which the interviews were specifically performed were off-limits to such persons as janitors (except during a controlled time period) and was strictly limited to authorized personnel. This trailer housed the QTC answering devices and telephones for persons wanting to report a concern. The controlled time for the janitors was between 11:30 a.m. to noon daily during which QTC would not perform interviews.

e. "Individuals to be interviewed were not told of their scheduled interview until immediately prior to the interview. This does not allow an individual sufficient time to recall facts or gather documents useful in relating his or her concern."

QTC agreed that scheduling of the initial interviews was in need of improvement. However, due to the large number of interviews to be done no improvement was made. QTC notes that in spite of this situation, the number of substantiated concerns revealed by individuals were indicative that the program accomplished its objective. In addition, there is evidence in the investigative files of followup interviews being done to clarify or solicit additional information.

f. "The [NRC] inspectors noted that the QTC staff does not qualify for unescorted protected area access which might allow for more freedom during investigations."

QTC and NSRS stated that the QTC staff has yet to qualify for unescorted protected area access. About eighteen QTC staff are being processed by TVA for unescorted access. No data has been established as to when the processing will be completed. In response to the concern about the impact on QTC staff's freedom during their investigations, QTC noted that the unescorted access impedes the timeliness of completing the investigation but not the quality.

Except for item b above, the NRC had no additional questions.

ATTACHMENT 1 - ENTRANCE INTERVIEW ON SEPTEMBER 30, 1985

R. Parker, Assistant to Manager
E. Ennis, Plant Manager*
G. Wadewitz, Construction Project Manager
B. Willis, Operations and Engineering Plant Superintendant
R. Ector, Assistant to Site Director
R. Goode, Project Engineer
D. Wilson, Design Services Manager
C. Christopher, Assistant Quality Manager
T. Hayes, Nuclear Licensing Unit Supervisor*
J. McDonald, Compliance Supervisor
C. Borrelli, Compliance Engineer
M. Kidd, NSRS Chief Investigations Branch
M. Harrison, NSRS Head Investigations Group*
G. Brantley, NSRS Engineer
W. Schum, QTC Project Manager*
C. Hill, QTC Group Manager
O. Thero, QTC Group Manager
W. Byrd, Engineering Section Supervisor**
K. Hooks, NRC (IE)*
M. Shymlock, NRC (Resident Inspector)*
H. Wong, NRC (IE)*
R. Heishman, NRC (IE)
P. Van Doorn, NRC (Region II)
P. Holmes-Ray, NRC (Region II)*
W. Holland, NRC (Resident Inspector)*
C. Caldwell, NRC (Resident Inspector)**

* Also attended Entrance Interview on October 21, 1985.
** Only attended Entrance Interview on October 21, 1985.

ATTACHMENT 2 - EXIT INTERVIEW ON OCTOBER 4, 1985

H. Culver, Assistant to Manager
R. Parker, Assistant to Manager
E. Ennis, Plant Manager*
B. Willis, Operations and Engineering Superintendant*
R. Ector, Assistant to Site Director
T. Hayes, Nuclear Licensing Unit Supervisor
C. Christopher, Assistant Quality Manager
D. Wilson, Design Services Manager
H. Fischer, Construction Engineer
C. Borrelli, Compliance Engineer
K. Whitt, NSRS Director
M. Harrison, NSRS Head Investigations Group
P. Washer, NSRS Section Leader
P. Border, NSRS Section Leader
D. Stevens, NSRS Engineer
W. Schum, QTC Project Manager
O. Thero, QTC Group Manager
B. Bounds, Maintenance Supervisor**
W. Brown, Project Manager**
W. Byrd, Engineering Section Supervisor**
C. Caldwell, NRC (Resident Inspector)
E. Adensam, NRC (NRR)
M. Shymlock, NRC (Resident Inspector)*
K. Hooks, NRC (IE)*
P. Van Doorn, NRC (Region II)
S. Weise, NRC (Region II)
R. Spessard, NRC (IE)*
H. Wong, NRC (IE)*
W. Holland, NRC (Resident Inspector)
P. Holmes-Ray, NRC (Region II)**

* Also attended Exit Interview on October 24, 1985.
** Only Attended Exit Interview on October 24, 1985.

ATTACHMENT 3 - INVESTIGATION REPORTS (PRELIMINARY) REVIEWS

IN-85-221-001*
IN-85-016-003*
IN-85-795-001*
IN-85-795-002*
IN-85-514-001*
IN-85-217-001
IN-85-354-001
IN-85-025-001
IN-85-009-001
IN-84-411-001
IN-85-130-002
IN-85-088-001
IN-85-311-008
IN-85-024-001*
IN-85-020-001*
IN-85-037-001*
IN-85-088-002
IN-85-246-001
IN-85-543-004
IN-85-016-001
IN-85-415-002
IN-85-103-001
IN-85-388-006
IN-85-532-006
IN-85-460-003
IN-85-406-001
IN-85-458-007
IN-85-445-002
EX-85-003-003
IN-85-113-003
IN-85-453-007
IN-85-021-003
IN-85-216-001*
NS-85-001-001
IN-85-001-002
IN-85-052-008
IN-85-501-001
IN-85-530-001*
IN-85-012-X02**
IN-85-202-001
PH-85-012-001
IN-85-001-003**
IN-85-541-001*
IN-85-052-001
IN-85-413-001
PH-85-006-001

* Included QTC file review, discussions with QTC/NSRS/TVA personnel involved and review of hardware in field.
** Same as above (*), except without review of hardware in field.