

APPENDIX B

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

NRC Inspection Report: 50-482/87-24

Operating License: NPF-42

Docket: 50-482

Licensee: Wolf Creek Nuclear Operating Corporation (WCNOC)
P.O. Box 411
Burlington, Kansas 66839

Facility Name: Wolf Creek Generating Station (WCGS)

Inspection At: Burlington, Kansas

Inspection Conducted: October 19-23 (onsite) to November 20, 1987
(NRC Region IV Office)

Inspector:

A. R. Johnson
A. R. Johnson, Reactor Inspector, Team Leader
Division of Reactor Safety

4/5/88
Date

Also participating in the inspection and contributing to the report were:

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4/5/88
Date

Inspection Summary

Inspection Conducted October 19-23, 1987 (onsite) to December 18, 1987
(NRC Region IV Office) (Report 50-482/87-24)

Areas Inspected: Special, announced inspection to review the licensee's implementation of a program for establishing and maintaining the qualification of electric equipment within the scope of 10 CFR 50.49. In preparation for this inspection, the NRC team included a review of WCNO's implementation of EQ corrective action commitments, identified in SER, NUREG 0881, April 1982, and Supplements 4 and 5 (December 1983 and March 1985). These documents provide the NRC staff acceptance with regard to equipment for which justification for interim operation (JIOs) were provided prior to the November 30, 1985, deadline.

The NRC inspection team reviewed a sample of 38 EQ work packages in the documentation files out of a total of 67, and walked down 47 components/equipment.

Results: The inspection determined that the licensee has implemented a program to meet the requirements of 10 CFR 50.49, however, four violations of NRC requirements and three unresolved items about which more information is required, were identified. The licensee's letter No. WM 87-0309 to NRC Region IV, dated November 20, 1987, provided additional information subsequent to the onsite inspection and addressed the inspection findings presented in the exit interview by the NRC on October 23, 1987. The licensee's information and proposed methods of resolution to the inspection findings have been reviewed and were considered in preparation and issuance of this report.

The deficiencies identified by the NRC inspection team represent documentation files which could not establish that this equipment was qualified. These components were identified during the onsite review of the EQ documentation files and a corresponding plant walkdown inspection. The licensee was urged to resolve these concerns and place the necessary justifications for continued operation (JCOs) in place as soon as possible in accordance with the NRC Generic Letter 86-15.

DETAILS1. Persons ContactedWCNOC

B. Withers, President
 F. T. Rhodes, Vice President, Nuclear Operations
 J. A. Bailey, Vice President, Engineering and Technical Services
 M. L. Johnson, Nuclear Coordinator
 A. A. Freitag, Manager, Nuclear Power Engineering (NPE)
 C. M. Estes, Supervisor of Operations
 K. Peterson, Supervisor, Licensing
 E. Peterson, Supervisor, Qualification Evaluations
 R. E. Gimple, Technical Staff Engineer, Materials Quality
 A. L. Payne, Supervisor, Quality Plant Support
 C. E. Parry, Superintendent, Quality Engineering
 J. C. Goode, Licensing
 V. D. Luckert, Engineer, NPE
 J. F. McMahon, Supervisor, Technical Training
 D. R. Richard, EQ Engineer
 C. J. Hoch, QA Tech
 W. J. Rudolph II, Manager, QA
 J. M. Pippin, Manager, NPE
 J. Stokes, Material Services Manager
 O. L. Maynard, Manager, Licensing
 C. A. Snyder, Manager, Purchasing and material Services
 D. Rich, Superintendent of Maintenance
 G. Boyer, Plant Manager
 S. C. Hopkins, Senior Engineering Specialist
 B. McKinney, Superintendent, Technical Support
 *M. G. Williams, Superintendent, Regulatory, Quality, and Administrative Services
 *L. L. Cook, Supplier Quality
 *K. Harvey, QC Services Supervisor
 *T. M. Damashek, Quality Engineer
 R. D. Flannigan, Supervisor, Compliance Engineer
 *M. R. Bove, Senior Engineer
 *J. L. Houghton, Operations Coordinator, Operations
 *S. Austin, Operations Coordinator
 W. C. Wiseman, Maintenance

Others

B. J. Metro, Engineer, Westinghouse
 M. H. Fletcher, Consultant, CPA, Inc.
 J. G. Utt, Senior Engineer, Bechtel
 D. N. Lorfing, Licensing Engineer, GSU
 W. E. Kahl, UE-Callaway

NRC

B. L. Bartlett, Resident Inspector
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*Denotes those not present at the exit interview.

2. Purpose

The purpose of this inspection was to review the licensee's implementation of the requirements of 10 CFR 50.49.

3. Background

NUREG-0588 was issued in December 1979 to promote an orderly and systematic implementation of EQ programs by industry and to provide guidance to the NRC for its use in ongoing licensing reviews. The positions contained in NUREG-0588 provided guidance on (a) how to establish environmental service conditions, (b) how to select methods that are considered appropriate for qualifying equipment in areas of nuclear plants, and (c) other areas such as margin, aging, and documentation.

A final rule on environmental qualification of electrical equipment important to safety for nuclear power plants became effective on February 22, 1983. This rule, Section 50.49 of 10 CFR Part 50, specified the requirements to be met for demonstrating the environmental qualification of electrical equipment important to safety located in a harsh environment. In conformance with 10 CFR 50.49, electrical equipment for the Standardized Nuclear Unit Power Plant System (SNUPPS) plants are qualified according to the criteria specified in Category I of NUREG-0588.

In order to document the degree to which the environmental qualification program complies with the NRC's environmental qualification requirements and criteria, the licensee provided equipment qualification information since the November 30, 1985, deadline, by letters dated November 29, 1985, January 17, April 4, May 14, July 28, August 1, August 7, August 29, 1986, June 5 and November 20, 1987, to supplement the information contained in Section 3.11 and Appendices 3.11(N) and 3.11(B) of the FSAR.

The Wolf Creek SER, NUREG-0881, April 1982, requested the licensee to submit his environmental qualification program for safety-related information as outlined in NUREG-0588, Appendix E, and update Section 3.11 of the FSAR, prior to the NRC job site audit of the licensee's files as outlined in the NRC Standard Review Plan.

SER, NUREG-0881, Supplement No. 4, was issued in December 1983, which evaluated the adequacy of the SNUPPS EQ program and provided the NRC position relating to open items and unresolved issues. These outstanding items were either resolved prior to the issuance of the operating license or JIOs in accordance with 10 CFR 50.49 were provided. Such outstanding items included (a) information which demonstrated qualification of all

electrical equipment required by the Three Mile Island (TMI) action plan, and installed in accordance with Regulatory Guide 1.97; and (b) the surveillance/maintenance program to implement the program before fuel loading and a program to detect age-related degradation of electrical cables inside containment that includes a periodic inspection of selected cables.

SER, NUREG-0881, Supplement No. 5, was issued in March 1985. The NRC concluded that, for safety-related items not having complete qualification documentation, the licensee had provided commitments for corrective action and schedules for completion. For items identified that did not have full qualification before an operating license was issued, an analyses had been performed in accordance with 10 CFR 50.49(i) to ensure that the plant could be operated safely pending completion of environmental qualification. These analyses reviewed by the NRC and JIOs concluded that reasonable assurance had been provided that the SNUPPS plants could be operated safely pending completion of environmental qualification. The NRC concluded that a license condition would be incorporated into the SNUPPS plants licenses requiring all electrical equipment within the scope of 10 CFR 50.49 to be qualified by November 30, 1985.

By letter dated February 4, 1985, WCNOG in response to Generic Letter 84-24, certified compliance with 10 CFR 50.49 in that all equipment was either fully qualified or a JIO had been submitted pending full qualification.

By letter dated January 17, 1986, WCNOG provided to the NRC, Revision 3, "Report of Independent Review of Environmental Qualification Programs to NUREG-0588" which reflected the completion of the EQ review by WCNOG and closure of outstanding JIOs.

By letter dated April 4, 1986, WCNOG provided to the NRC a report entitled, "Evaluation of Environmental Qualification of Equipment Considering Superheat Effects of High Energy Line Breaks for Callaway Plant and Wolf Creek Generating Station." The report concluded that the equipment which must function to mitigate a postulated high energy line break (HELB) with superheat effects, to bring the SNUPPS plants to a safe shutdown condition, would perform their safety functions following such a postulated event.

The documents above identified were reviewed by the NRC inspection team members and used in preparation for this inspection. The inspection involved an onsite and subsequent NRC Region IV in-office inspection of records subsequently furnished by the licensee.

4. Findings

a. EQ Program Compliance with 10 CFR 50.49

The NRC inspectors examined the licensee's program for establishing the qualification of electric equipment within the scope of

10 CFR 50.49. The program was evaluated by examination of the licensee's qualification documentation files, review of procedures for controlling the licensee's EQ efforts, and verification of adequacy and accuracy of the licensee's program for maintaining the qualified status of electrical equipment. Based on the inspection findings, which are discussed in more detail below, the inspection team determined that the licensee has implemented a program to meet the requirements of 10 CFR 50.49 for WCGS although some deficiencies were identified (refer to Sections 4.f, 4.g, and 4.h).

b. EQ Program Procedures

The inspection team examined the implementation and adequacy of site policies and procedures for establishing and maintaining the EQ of electrical equipment in compliance with the requirements of 10 CFR 50.49. The licensee's methods for establishing and maintaining the EQ of electrical equipment were reviewed in the following documents:

<u>Type</u>	<u>Procedure No.</u>	<u>Title</u>
Directive	III.24.0, Revision 2	Equipment Qualification
EQ Procedure	EQM IC 0908, 4/11/85	EQ Qualification Requirement for S-R and I&C Cables Inside Containment
General Procedure	KGP-1131, Revision 5	Plant Modification Process
Nuclear Plant Engineering Procedures	KPN-C-309, Revision 1	Plant Modification Design Development
	KPN-D-319, Revision 1	EQ Review of Electrical Equipment to 10 CFR 50.49
	KPN-D-324, Revision 0	EQ Summary Document (Draft)
Procurement Procedure	KP-2140, Revision 1	Material and Services Procurement
Operations Procedures	ADM 01-057, Revision 12	Work Request
	ADM 08-202, Revision 9	Planning and Scheduling Preventive Maintenance Tasks

	ADM 08-211, Revision 1	Updating Procedure for Managed Maintenance Data Base
	ADM 08-813, Revision 1	I&C Group EQ Maintenance Program
Emergency Operating Procedure	EMG E-1, Revision 1	Loss of Reactor Secondary Coolant

The NRC inspection team reviewed the above licensee's procedures for meeting the requirements of 10 CFR 50.49 including (1) qualified life; (2) service conditions; (3) periodic testing; and (4) maintenance and surveillance. The licensee's EQ program was also reviewed with regard to establishment of an auditable documentation file, including such documents as EQ audit reports, maintenance and surveillance records, supporting documents which establish EQ training of personnel, and supporting documents which control plant modifications, and installation of replacement equipment to the requirements of 10 CFR 50.49.

The licensee's EQ program procedures and policies are established and are being adequately implemented to control and maintain the EQ of electrical equipment at WCGS for compliance with the requirements of 10 CFR 50.49.

The following programs were effectively in place at WCGS:

(1) EQ Maintenance Program

The WCGS EQ maintenance program consisted of Procedures ADM 08-202, ADM 08-291, and ADM 08-813 which were in place at the time of the NRC inspection.

ADM 08-202 provides instructions for planning and scheduling routine mechanical and electrical preventive maintenance (PM) tasks by means of a managed maintenance data base (MMDB) which stipulates scheduled PM activities on a computer printout. Provisions are made for an evaluation of PM activities performed after a scheduled late date. Lubrication requirements are stipulated by reference to a Master Lubrication List (MLL) which is addressed in ADM 08-208.

ADM 08-211 provides the method for documenting and making available new information for updating the MMDB. A review of change information was made by the NRC inspector.

ADM 08-813 implements an EQ maintenance program which requires procedures to be written for instrumentation and control (I&C)

components which have a qualified life less than 40 years and/or contingencies for maintaining the specified qualified life.

In addition to procedural reviews and personnel interviews, the NRC inspection team reviewed the maintenance program implementation by selecting a sample of eight components from the EQ Master List (EQML) and comparing the required PM from (a) the SNUPPS NUREG-0588 submittal to NRC including changes; and (b) maintenance requirements from the current MMDB printout. This review revealed an apparent weakness in the change system in that required maintenance was not always reflected in the MMDB. The apparent weakness was also identified in QA Audit Report TE50140-K170 in which a 100 percent review was made of all Categories A and B equipment requiring special maintenance and/or replacement prior to 40 years. In spite of the identified weaknesses, correction of deficiencies identified in the QA audit should ensure that all required maintenance is performed during each outage. Implementation of Procedure KPN-D-324, "EQ Summary Document," which is now in draft, should provide for maintenance program improvement.

The WCGS EQ program appears to be well planned and implemented. No violations, deviations, or unresolved items were identified by the NRC inspection team.

(2) Surveillance of Safety-Related I&C Cables Inside Containment

As a result of badly deteriorated cable insulation identified at Savannah River during late 1976, WCGS committed in SSER 4, dated December 1983, to a surveillance program to identify and prevent significant age-related degradation of I&C cables inside containment. The program was presented to and determined to be acceptable to the NRC, as stated in the SSER. During this inspection, the NRC team reviewed the implementation of this program to date.

Procedure EQM IC-0908, dated April 11, 1985, "Environmental Qualification Requirement for Safety-Related I&C Cables Inside Containment," was reviewed to determine the details and frequency of this inspection requirement. The work request (WR) (currently not numbered nor dated) which will implement the WCGS inspection program to completion, was reviewed by the NRC inspection team. The WR schedules inspections to be completed each 5 years, commencing on March 25, 1990. The WR and supplements identify the inspection procedures to be followed and which components are to be inspected. The baseline inspection was reportedly performed prior to initial startup of the plant in accordance with WR 03933-85. This program is apparently being adequately implemented.

No violations, deviations, or unresolved items were identified by the NRC inspection team.

(3) Control of Plant EQ Modifications

WCGS Procedures KGP-1131, Revision 5, and KPN-C-309, Revision 1, were reviewed by the NRC inspection team to ensure proper control of equipment qualification is being maintained during plant modifications. Procedure KGP-1131, "Plant Modification Process," describes the process of initiating a Plant Modification Request (PMR), obtaining the required approvals, and closeout of the PMR. KGP-1131 also establishes departmental and personnel responsibilities with the PMR. The procedure ensures that the responsible parties review the PMR for effect on the EQ program. Procedure KPN-C-309, "Plant Modification Design Development," describes the engineering activities associated with PMRs. This procedure contains instructions and associated EQ checklist to ensure PMR reviews include evaluations with regards to the effect of changes and station modifications involving EQ equipment.

The control of the WCGS plant EQ modification program implementation, to verify that modifications involving EQ equipment have been incorporated into the PMR process, will be accomplished during a subsequent NRC inspection.

No violations, deviations, or unresolved items were identified by the NRC inspection team.

(4) Program for Independent Review of EQWPs

Procedure KPN-D-319, "EQ Review of Electrical Equipment to 10 CFR 50.49," establishes the guidelines on performing an independent review of EQ programs, including EQWP development by WCGS personnel and review of EQWPs supplied by outside organizations. The NRC inspection team reviewed EQWP documentation for evidence that a positive statement was included in each EQWP by the licensee to ensure that the equipment is qualified for its application and that the documentation has been properly reviewed and approved. The "Electrical Equipment Qualification Signature Sheet," (Form KEF-D-319-1), clearly performs this function; however, EQWPs supplied by other organizations reviewed prior to the initiation of KPN-D-319, Revision 0, did not contain the signature sheets.

No violations, deviations, or unresolved items were identified by the NRC inspection team.

c. EQ Training Program/QA Audits of EQ Activities

The NRC inspection team reviewed training records and conducted interviews with WCGS training personnel responsible for administering training programs related to EQ activities. WCGS is in the process of formalizing their EQ training program by written procedure. Verification of this program will be accomplished during a subsequent NRC inspection.

WCGS has in place an audit program which prescribes planned and periodic QA audits of EQ activities. The NRC inspection team reviewed WCNOG QA audit reports TE 50130-X045 and TE 50140-K170. The NRC inspection team concluded that these EQ audits were effectively being accomplished.

No violations, deviations, or unresolved items were identified by the NRC inspection team.

d. EQ Replacement Parts/Procurement Program

The WCGS EQ Replacement Parts Program is an integral part of the licensee's overall EQ program and is controlled by Procedures KP-2122, "Material and Services Receipt;" KP-2123, "Material Storage and Handling;" KP-2124, "Material Issue;" and KP-2125, "Stored Item Maintenance." The WCGS EQ Procurement Program is controlled by Procedure KP-2140, "Material and Services Procurement."

No violations, deviations, or unresolved items were identified by the NRC inspection team.

e. EQ Master List (EQML)

The NRC inspection team reviewed the WCGS EQML, Revision 0, and associated documents to verify its adequacy and verify the implementation of WCNOG's EQML development and maintenance procedures.

The WCGS EQML is presented as Table 3.11(B)-3 of the WCGS Updated Safety Analysis Report (USAR). The WCGS EQML was based on a review of technical specifications, emergency operating procedures (EOPs), off-normal operating procedures (ONOPs), piping and instrumentation diagrams (P&IDs), electrical diagrams, Regulatory Guide (RG) 1.97 (Revision 3, Categories 1 and 2), NUREG-0737, and plant equipment verification walkdowns.

The original EQML, submitted to NRC on March 10, 1983, was compared to the most recent EQML found in the USAR Table 3.11(B)-3. Numerous changes were made between the two revisions of the EQML using FSAR change request forms. EQML changes will be controlled by a new

procedure (KPN-D-324, "EQ Summary Document") when the procedure is approved.

The procedures for developing and maintaining the EQML define the EQML and assign overall responsibility for maintenance of EQ engineering files to the nuclear plant engineering/technical support department. These procedures also control deletions from the EQML, as well as additions. The process as described was adequate to ensure that the appropriate determination could be made for equipment added to or deleted from the EQML. The NRC inspection team identified no plant equipment that was required to be on the EQML that was not included.

Additionally, the EOPs were reviewed with WCGS operations personnel. The NRC inspection team selected 16 items of equipment required to be used with the EOP for loss-of-coolant accident (LOCA)/main steam line break (MSLB) and verified that they were all listed in the EQML as qualified.

The NRC inspection team also reviewed the post-accident monitoring equipment program status. RG 1.97, "Instrumentation for Light Water Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident," was reviewed against USAR Tables 3.11(B)-3 and 7A-3, and RG 1.97, Table 2 recommendations. All necessary equipment required by RG 1.97 was included on the EQML or a satisfactory explanation was documented as to why it was not included.

Based on the NRC inspection team's review, the 10 CFR 50.49 EQML is considered satisfactory.

No violations, deviations, or unresolved items were identified by the NRC inspection team.

f. EQ Documentation Files (EQF)

The licensee's EQF at WCGS has been established and is being maintained to meet the requirements of 10 CFR 50.49. The requirements are contained in WCGS engineering Procedures KPN-D-319, Revision 1, KPN-D-324, Revision 0, and WCGS Nuclear Department Directive No. III.24.0, Revision 2. These procedures and the directive apply to the activities for environmental qualification of equipment important to safety as committed in the WCGS USAR, Revision 0, Appendix 3.11(B) and 3.11(N). Procedure KPN-D-319 is primarily intended to be used for developing EQWPs by Bechtel, SNUPPS, or the licensee. The EQWPs in the EQF are the result of qualification documentation (test reports, test plans, vendor descriptions and data, correspondence, etc.) to the requirements of NUREG-0588, Revision 1, "Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment." The EQWPs in the EQF consist of: (1) EQ signature sheet; (2) EQ evaluation check

sheet; (3) check sheet supplements (qualification contingencies); (4) equipment evaluation work sheets; and (5) references used to complete the EQWP (i.e., test reports, letters, drawings, calculations, analyses, etc.).

The NRC inspection team examined files for 38 selected equipment items (EQWPs) to verify the qualified status of equipment within the scope of 10 CFR 50.49. In addition to comparing plant service conditions with qualification test conditions and verifying the bases for these conditions, the NRC inspection team selectively reviewed areas such as: (1) required post-accident operating time compared to the duration of time the equipment has been demonstrated to be qualified; (2) similarity of tested equipment to that installed in the plant; (3) evaluation of adequacy of test conditions; (4) aging calculations for qualified life; (5) replacement part schedules; (6) the effects of decreases of insulation resistance on equipment performance; (7) adequacy of demonstrated accuracy; (8) evaluation of test anomalies; and (9) applicability of EQ problems as reported in IE Information Notices (INs) and IE Bulletins (IEBs) and their resolution. The files adequately documented qualification of equipment and were readily auditable, complete, and accurate.

During this review of the EQF, the NRC inspection team identified violations to 10 CFR 50.49, the unresolved items, and open items described below:

(1) EQWP-01013, Raychem Cable Termination Material

WCNOC committed to incorporating Wyle Test Reports 17859-02B and -02P (not in the EQF during the NRC inspection) that demonstrates qualification for some nonstandard splice configurations at the WCGS into the Raychem EQ file EQWP-01013. Contrary to paragraph 5(1) of NUREG-0588, Category I, the file as reviewed did not support qualification of the installed splice configurations or establish similarity between tested and installed splices, as discussed in paragraph 4.h(1) of this report. In addition, some licensee-identified splice configurations appear to have fallen outside the bounds of all available type test documentation which qualification could be supported.

The licensee letter WM 87-0309 to NRC Region IV dated November 20, 1987, further discussed Wyle Laboratories Qualification Test Report No. 17859-02P which documents the testing of a number of configurations of splices from various suppliers. Included in this test were Raychem WCSF-N splices with seal length significantly less than 2 inches (as little as 1/2-inch seal on some test samples) and bend radii to approximately 1.2 times the O.D. of the splice. This report was obtained through membership in the Nuclear Utility Group on Equipment Qualification (NUGEQ) and is now available for review in the WCGS EQF. The Raychem splice bend radii less than 5

times the O.D. installed at WCGS were because of the small physical size of the terminal boxes used for transmitters. A calculation based on conformance of the Raychem splice configurations to the inside dimensions of the terminal boxes yielded the smallest bend radius configuration at WCGS to be approximately 1.43 times the splice O.D. EQWP E-01013 will be revised to reflect the above test report results and the results of other ongoing programs addressing Raychem splices as appropriate.

A licensee program to walkdown approximately 150 of the Raychem splices at WCGS in harsh environment areas revealed: (a) one splice with a seal length less than 1/2-inch which has been replaced; (b) two splices that had adhesive missing from the end of the shrink tubing; (c) two splices that were identified as not having the tubing fully shrunk; and (d) one splice that was missing a shim. These splices have been replaced by the licensee. Further, evaluations of installed configurations are being conducted in accordance with station procedures.

This item is considered a violation to 10 CFR 50.49 (also refer to paragraphs 4.g(1), 4.h(1)(a), 4.h(1)(b), and 4.h(1)(c) of this report). (482/8724-01)

(2) EQWP BOP-Limitorque, HE-1, and HE-4, Limitorque Motor Operator, Energized Space Heaters

The NRC inspection team reviewed the above EQWPs in the licensee's EQF and identified the following deficiencies as a result of the file review associated with a walkdown of selected equipment identified in each file.

(a) Limitorque Motor Operator Space Heaters (EQWP BOP-Limitorque) Inside Containment

These motor operators, reviewed by the NRC inspectors, are primarily located inside the containment. These operators are single voltage motors with "Radiation Class" or "Class RH" insulation, and all are above the postulated flood elevation for the areas in which they are located.

Qualification of the space heaters for use in the Class IE control circuits of these Limitorque motor operators was not established in the EQF. The analysis, used in determining that no failure mode of the space heaters existed that could adversely affect the operation of these operators, was not established fully in the file. Qualification of the space heaters was based primarily on Bechtel's conclusion that the only failure mode of these heaters is an open circuit. The analysis found in the file did not show how this conclusion was reached. Supplementary information present in the file

that was apparently used as a basis for this conclusion was Limitorque Laboratory Report 681541. In addition, this report describes testing of a Ward Leonard motor, ID No. 30/25F750WL8005, which was installed in a Limitorque motor operator with the actuator assembly subjected to a design basis accident (DBA) test. This test report does not adequately describe: (1) the test setup regarding orientation and electrical interfaces (such as conduit entries and seals, if any), (2) the actual test instruments used to monitor the test, and (3) the purpose of the test. Also, the heater was only energized during the last 10 minutes of the 30-day LOCA type test stimulation. During this test, resistance measurements were made between the two heater leads and to ground; however, only four measurements were taken throughout the 30-day LOCA type test. The lowest recorded resistance measurement was 15K ohms; however, the voltages at which three of these resistance measurements were taken, are not recorded in the test data. It was concluded by the NRC inspection team that the test report used to qualify the heaters, and provide the basis for Bechtel's evaluation, did not conform to current industry standards used in establishing qualification of electrical equipment used in Class 1E circuits.

The air temperature rise because of the close proximity of degradable material to space heaters had not been properly addressed by the licensee. A review of the licensee's methodology indicated that bulk temperature rises inside the limit switch compartment were used to establish the thermal aging temperatures and that no consideration was given to the temperature rises because of the close proximity of components to the heaters. During the walkdown, the NRC inspector noted the heaters were within 0.5 to 1-inch of either: (1) wire insulation; (2) the phenolic material of the terminal strips; or (3) the fibrite/melamine material of the limit switch finger board. In one case (LF-FV-0095), the NRC inspector noted the X1 jumper wire from points 18C to 17Z on the torque switch was within 0.010-inch of the heater, but showed no evidence of insulation degradation. The heater lead wires, which were not connected, were found in contact with the space heater and showed evidence of insulation degradation.

(b) Limitorque Motor Operator Space Heaters (EQWP HE-1) Insulation Containment

Qualification of the space heaters for use in the Class 1E control circuits of these Limitorque motor operators was not established in the EOF. The analysis used in determining that no failure mode of the space heaters

existed that could adversely affect the operation of these operators was not fully established in the file. (Refer to paragraph 4.f(2)(a) above.)

During the NRC walkdown inspection of EP-HV-8808A, two space heaters were observed to be installed in the limit switch compartment with the closest component to the heater being the heater lead wires. There was approximately 0.5 to 1-inch clearance between the lead wire insulation and heater. The licensee's position on qualification of space heaters and response to IN 86-71 regarding the reported burned or damaged wires identified in Limitorque motor operators with space heaters is outlined in paragraph 4.f(2)(a) above.

The air temperature rise because of the close proximity of degradable material to the heaters also had not been properly addressed. Refer to paragraph 4.f(2)(a) above.

(c) Limitorque Motor Operator Space Heaters (EQWP HE-4)
Outside Containment

The NRC inspection team found that some of these Limitorque motor operator switch compartment space heaters were connected and energized. The following concerns were identified:

- 1) The licensee had performed an analysis of the aging of the operator motor switch compartment because of the temperature rise caused by the heater. A worse-case condition of an SMB-000 operator (smallest switch compartment) and a 40-watt heater were used in the calculation in which a temperature rise of 32°F resulted inside the compartment. This would cause a sizable reduction in qualified life of the operator based on the limiting degradable material in the switch compartment.
- 2) The analysis had considered that the air temperature rise within the limit switch compartment was uniform, but no effects of localized heating of items in close proximity to the heater was considered. During the NRC walkdown, including a WCGS walkdown, control and motor lead wires have been identified near and in contact with energized heaters. There have also been reported instances of burned and degraded wiring by WCGS. The NRC inspection team concluded that all possible effects of aging and damage to these motor operator components and wiring have not been analyzed by the licensee and that wiring damage as a result from the energized heaters has occurred.

- 3) The power source for heaters is provided to terminal blocks inside the operator from the same Class 1E power supply, and through the same qualified field cables, that supplies power to the operators. The jumper wires from the terminal block to the heater have also been qualified; however, the heater has not been qualified (tested), and failure of the heater in a short-circuit mode would cause a loss of power for the operator. The licensee stated that the heater could fail, only in the open mode, which would not cause power interruption.

The licensee's position could not be supported by test data or analysis. (Refer to paragraph 4.f(2)(a) above.)

The licensee's position on qualification of space heaters and response to IN 86-71 regarding aging and damaged wiring, and components is also outlined in the licensee letter WM 87-0309 to NRC Reg on IV dated November 20, 1987. The licensee stated that switch compartment space heaters in Limitorque motor operators located inside containment were to be removed prior to restart from the second refueling outage. In addition, a portion of limit switch compartment space heaters located in all EQ Limitorque operators outside containment would be removed, as time and schedule permits. The remaining space heaters would be removed in conjunction with scheduled maintenance on all EQ operators throughout the third refueling outage. During this work effort, the compartments would be examined by the licensee for signs of aging and degradation, and deficiencies identified would be corrected. The licensee also committed to revision of the EQWPs which would be revised to reflect the new configuration without space heaters. A JCO for the compartment space heaters installed and energized was provided with the WM 87-0309 letter.

In conclusion, the post-inspection information provided by WCGS which cited a worst-case 32°F rise in bulk switch compartment internal air temperature for the last 2.5 years, and calculated an effect on qualified life, did not adequately establish qualification in that there was no discussion of the heat rise effect on components subject to thermal aging degradation. The reduction in qualified life under these conditions could be as large a factor of four for some materials. Based on the length of time installed and original qualified life, some Limitorque motor operator qualified life would be substantially modified, based on consideration of these factors.

These items (paragraphs 4.f(2)(a), 4.f(2)(b), and 4.f(2)(c) above) are considered a violation to 10 CFR 50.49. (482/8724-03)

(3) Limatorque Motor Operator Undervoltage/Frequency Operation
(EQWP HE-4 and EQWP BOP-Limatorque)

(a) Limatorque Motor Operator Undervoltage/Frequency
Conditions (EQWP HE-4) Outside Containment

Limatorque motors for valve actuators are required to operate at voltages above and below the motor-rated voltage of 460 volts. The EQWP check sheet supplement stated that variations of ± 10 percent in voltage and ± 5 percent frequency are part of the required NEMA motor design standards for starting duty requirements considered in the design of each individual motor operator. The test report used to qualify the EQWP HE-4 motor operators (Westinghouse Report WCAP-8687, Supplement 2, H04A, Revision 3, dated August 1986) did not demonstrate qualification of the operators for either the high or low voltage requirements. Documentation could not be presented during the NRC inspection to show that these voltage requirements had been considered in the Limatorque motor operator valve sizing particularly with regard to thermal overload protective device selections.

(b) Limatorque Motor Operator Undervoltage/Frequency
Conditions (EQWP BOP-Limatorque) Inside Containment

Documentation could not be presented during the NRC inspection which addressed testing the valve actuators for undervoltage/frequency conditions during accident environments. IEEE Standard 323-1974 requires that voltage in power supplies be applied to the tested equipment. Statements found in the file regarding the NEMA standards used in designing motors were found to be unacceptable. Because these standards may not consider the degraded condition of a motor under the postulated environments of a DBA, the licensee was required to ensure their actuator motors were properly oversized for undervoltage/frequency applications in harsh environments to support Limatorque's position as found in Limatorque Test Report B0058.

The licensee letter WM 87-0309 to NRC Region IV dated November 20, 1987, stated that the operation of Limatorque motors for valve actuators at 10 percent reduced voltage is taken into consideration by Limatorque when sizing the operator. During normal sizing for a reduced voltage application, the motor size is increased to provide the required motor torque at the reduced voltage. Limatorque, in Qualification Test P0212, subjected the test actuator to degraded voltages and frequencies with no effect on actuator performance. The results of the test are documented in the Limatorque EQWPs HE-1, HE-4, and

BOP Limitorque. WCGS stated that a separate evaluation was being prepared to determine the operator capability at a reduced voltage for the Limitorque operators qualified by EQWPs HE-1, HE-4, and BOP Limitorque. The available thrust or torque for each qualified operator at 80 percent voltage (a value 10 percent beyond the tested reduced voltage), as compared to the required thrust or torque for each operator based on system parameters, would be evaluated. The schedule for completion of this task is March 1988.

The above concerns in paragraphs 4.f(3)(a) and 4.f(3)(b) are considered an Unresolved Item (482/8724-07).

- (4) EQWP BOP-Limitorque, HE-1, and HE-4 Limitorque Motor Operator Thomas & Betts (Models RB-4 and RB-6) Crimp Connector Splices

The NRC inspection team reviewed the above documentation files as follows:

- (a) Limitorque Motor Operator Crimped Connector Splices (EQWP HE-4) Outside Containment

During the documentation file review, the EQWP check sheet supplement stated that dual voltage motor leads for Class B insulated motors are spliced using Thomas & Betts crimp connectors RB-4 and RB-6 as discussed in WCGS PMR 01787. During the NRC walkdown inspection, motor operators BN-LCV-112E, BN-HV-8812B, and EM-HV-8821B were found to have these crimp type connectors installed in the motor leads of the dual voltage motors. Based on information provided by the licensee, a total of 49 Limitorque operators are equipped with dual voltage motors and have the RB-4 and RB-6 crimped connections. Thirty-eight motor operators were provided by Westinghouse (HE-4 specification) and eleven were provided directly from Limitorque (M-221 and M-223A specification). Qualification test reports provided for the operators contained in the EQWP HE-4 did not include qualification of the RB-4 and RB-6 connector splices.

Type testing of motor operators documented in Limitorque reports B0003, 60U376A, and 600198 addressed dual voltage motor testing, however, documentation as to the type of connector splice was not available. Also, no configuration control was evidenced in documents contained in the file, to demonstrate the prevention of contact of the crimp connector splices with each other, or shorting to ground.

(b) Limiterorque Motor Operator Crimped Connector Splices
(EQWP HE-1 and BOP-Limiterorque) Inside Containment

The principal documentation used to establish qualification of these dual voltage motor operators was Limitorque Report 600456, contained in Limitorque Report B0058. Several concerns were identified during the file review regarding the qualification of the Thomas & Betts, Models RB-4 and RC-6, crimp connector splices used in the dual voltage motor actuators installed inside containment. This file referenced WCAP-8687, Supplement 2-H04A, where a similar valve actuator with a dual voltage motor operator was tested using similar crimp connector splices under outside containment conditions. It was established by the NRC inspection team that all nuclear steam supply system (NSSS) and balance of plant (BOP) supplied actuators, equipped with dual voltage motors, are classified as NUREG-0588, Appendix E, Category C, type equipment. Category C equipment is equipment that will experience environmental conditions of DBAs through which it need not function for mitigation of said accidents, and whose failure (in any mode) is deemed not detrimental to plant safety or accident mitigation, and need not be qualified for any accident environment, but will be qualified for its nonaccident service environment. The NRC inspection team reviewed the licensee evaluations regarding the required nonaccident service environment (radiation) and concluded that qualification of EQWP HE-1, and BOP-Limiterorque dual voltage motor operators were established.

- (c) The licensee letter WM 87-0309 to NRC Region IV dated November 20, 1987, in response to paragraphs 4.f(4)(a) and 4.f(4)(b) concerns, stated that a qualification test for Thomas & Betts RB-4 and RB-6 nylon crimp connector splices used in dual voltage Limitorque operators was being performed by Wyle Laboratories. An 8-year screen qualification test was completed successfully in late October 1987 with a completed test summary. A 40-year qualification test is being conducted and completion and issuance of a final test report is scheduled for early 1988. The results of the test program will be incorporated in EQWP HE-4 and the BOP Limitorque EQWP to document the qualification when the final test report is issued. A JCO was submitted to the NRC with letter WM 87-0309. The JCO indicated that the Thomas & Betts connector splices were qualified for 14.7 years, taking heater effects and WCGS ambient temperatures into account, on the basis of the completed Wyle tests.

NUREG-0588, Revision 1, Category I, paragraph 5, requires that qualification documentation shall verify that each type of electrical equipment is qualified for its application and meets its specified performance requirements. The basis of qualification is required to be explained to show the relationship of all facets of proof needed to support adequacy of the complete equipment. Data used to demonstrate the qualification of the equipment is required to be pertinent to the application and organized in an auditable form. The documentation is required to include sufficient information to address those items identified in NUREG-0588, Appendix E, which includes splices (Item 16). The NRC inspection team's concern in paragraph 4.f(4)(a) above is considered an Unresolved Item (482/8724-05).

(5) EQWP, ESE-1C, Tobar Model 32PA1212 Pressure Transmitter

The EQF indicated a design modification made to Tobar Model 32PA1212 transmitters as a result of EQ type testing. The NRC inspection team could not verify that the modification was incorporated on the Tobar transmitters installed at WCGS.

The licensee letter WM 87-0309 to NRC Region IV dated November 20, 1987, indicated that the modifications which added silicon to the Veritrac Model 76PH2 transmitters qualified by WCAP-8687 Supplement 2-E01B, Revision 1, was incorporated in all Westinghouse-supplied Tobar transmitters. In addition, transmitters provided by Tobar directly to end users are also qualified to the same test report.

Refer to paragraph 4.h(1) for NRC walkdown concerns.

No violations, deviations, or unresolved items were identified by the NRC inspection team.

(6) EQWP ESE-49A, Barton, Model 581-4, Differential Pressure Indicating Switch

- (a) The NRC inspection team reviewed EQWP ESE-49A which included an accuracy requirement of ± 10 percent. This 10 percent accuracy requirement documented in EQWP ESE-49A was found to be inconsistent with the intent of the test and should not have been included in the file.

The licensee letter WM 87-0309 to NRC Region IV dated November 20, 1987, stated that the EQWP would be revised to delete the 10 percent accuracy requirement for needed clarification of the file.

No violations, deviations, or unresolved items were identified by the NRC inspection team.

- (b) The test report in EQWP ESE-49A on RVLIS hydraulic isolator documents a problem with qualification of the hydraulic isolator for harsh environment applications. The Barton differential pressure indicating switch was found qualified only for hydraulic isolation as documented in EQWP ESE-49A. The switching mechanism of this switch does not perform a safety-related function and is not qualified for harsh environment applications at WCGS.

Also, the performance requirements for the RVLIS hydraulic isolator documented in EQWP ESE-49A does not address sensing line errors and did not include performance data. However, WCAP-8687 is referenced in EQWP ESE-49A. The performance requirements, Section 3.2 of WCAP-8687, Supplement 2-E49A, address the performance of the pressure switch as a hydraulic isolator. It includes sensing line errors and consideration for use of this switch in other applications (where its switching function is utilized). The performance data taken during the qualification testing of the pressure switch is available at Westinghouse. This data was recorded via strip chart recorders, but because of the voluminous nature of the raw data, and that most data taken were to be used to support qualification in other applications, the data was not included in the report. The summary statements found in Section 7.0 of the WCAP-8687 supplement are based on review of this raw test data.

No violations, deviations, or unresolved items were identified by the NRC inspection team.

- (c) The NRC inspection team had a concern with regard to the licensee providing an auditable link between the tested and installed configuration of the RVLIS hydraulic isolator. Investigation into the file revealed a documentation inconsistency. The EQ data package (contained in WCAP 8587, Supplement 1) documents the testing of Barton pressure switch Model 581-4 whereas the EQ test report and EQWP ESE-49A documents Model 581.

The licensee letter WM 87-0309 to NRC Region IV dated November 1987 stated that the hydraulic isolator of both Models 581 and 581-4 are identical. Improvements made by Barton in the switching mechanism are incorporated in Model 581-4. Westinghouse has confirmed that Barton pressure switch Model 581-4 was tested. EQWP ESE-49A will be revised to reflect the correct model number. The improvements of the Model 581-4 are to be documented in the EQF.

No violations, deviations, or unresolved items were identified by the NRC inspection team.

- (d) The NRC inspection team had a concern with regard to the tested configuration of the RVLIS hydraulic isolator as documented in EQWP ESE-49A not matching the installed configuration. The NRC inspection team found that the test configuration is only typical of the plant-installed configuration for the equipment tested. As a hydraulic isolator, the pressure switch is located in the sensing line between a transmitter and the process line measured. For the measurement of the pressurizer level (RVLIS function), two pressure switches are used, one each in both of the transmitters process line connections (loops A and B).

The licensee letter WM 87-0309 to NRC Region IV dated November 20, 1987, responded to this concern in that an error in the EQ test report, found in WCAP-8687, Supplement 2-E49A, Revision 1, Section 3.2, page 5 was identified. EQWP ESE-49A would be revised to reflect correct information, regarding verification, during the test, by monitoring the output of the correct transmitter (loop B) receiving the pressure signal. The purpose of the loop A test configuration was to gather performance data relevant to the pressure switches performance in other applications. Loop A was intended to confirm that the process line measurement by the pressure switch was independent of variations in process fluid volume. The data taken for this configuration was via the indicating switch electrical output and is considered to be relevant to the pressure switch's performance of functions other than as a hydraulic isolator.

This item is considered an Open Item (482/8724-10).

- (7) EQWP E-035B, Kulka Terminal Blocks, Used in Control Circuits Inside Containment

The NRC inspection team reviewed the application of Kulka terminal blocks in control circuits inside containment. Conax Qualification Test Report on Kulka terminal blocks, IPS 675, 1981, is used as the basis for qualification. Test Report IPS 675 documents a maximum leakage current of 0.16 milliamps at 539 volts during LOCA testing.

The licensee letter WM 87-0309 to NRC Region IV dated November 20, 1987, indicated Kulka terminal blocks located in the electrical penetrations and terminal boxes, are qualified by EQWP E-035B. They are used in the control circuits of inside containment safety-related equipment qualified by the following EQWPs and to the effects of the following leakage currents as evaluated by the licensee:

(a) Limiterque Operators (EQWF HE-1 and BOP-Limiterque)

The motor starters for the Limitorque operator are either size 1 or size 2. Size 1, the worst-case, requires 1.26 ampere to pick up its coil and draws 0.185 ampere during continuous operation. Leakage currents of 0.16 milliamps will not affect the operation of the starter coils.

(b) ASCO Series 8316 Control Valves (EQWP HE-2)

ASCO series 8316 control valves have power removed from them on a containment isolation signal. Therefore, leakage current during an accident condition does not apply.

(c) Target Rock 79AB Series Control Valves (EQWP HE-10A)

These solenoid valves, which are used in head vent, excess letdown, and accumulator vent applications, draw 0.8 amps at 125VDC. Leakage currents of 0.16 milliamps will have no affect on these valves.

(d) Bettis Actuators (EQWP M-237)

Bettis actuators control the containment minipurge isolation valves. The isolation valves are closed by removing power from ASCO solenoid valves which are appurtenances to the Bettis actuators. Since power is removed from the ASCO valves during accident conditions, leakage currents during accident conditions do not apply.

(e) Valcor 52600 Series Control Valves (EQWP J-603A)

These valves are used as process sample line valves and as containment isolation valves. In accordance with Instruction Manual J603A-00080 for these valves, the solenoids draw 1.5 ampere at 120VAC. Leakage current of 0.16 milliamps will not affect the operation of these valves.

The leakage currents identified by the licensee in paragraphs 4.f(7)(a) through 4.f(7)(e) above, regarding Kulka terminal blocks qualified by EQWP E-035B, are sufficiently small during LOCA conditions so as to not affect the safety-related control circuits inside containment at WCGS. EQWP E-035B will be revised to reflect this information in the EQF.

No violations, deviations, or unresolved items were identified by the NRC inspection team.

(8) EQWP E-028, Marathon Terminal Blocks, Model 1600

These terminal blocks are used inside and outside containment in Limitorque motor operator limit switch circuits including valve position indicators. They are also used in control circuits for pressurizer power operated relief valves (PORVs). Applied voltage is limited to 120V. The licensee stated that operation of circuits which have Marathon 1600s is not affected by leakage currents of up to 300 milliamps. The file contained Wyle Laboratories Test Reports 45603-1 and 17657 as the basis for qualification.

- (a) In test report 17657, leakage currents were measured during LOCA testing. Leakage currents did not exceed the 300 milliamps criteria given by the licensee. The circuits were always energized during testing.
- (b) In test report 45603-1, insulation resistance was not measured during the LOCA testing. Leakage currents were monitored indirectly by placing a fuse in the test circuit such that leakage currents greater than the fuse rating would open the fuse. A 12-amp fuse was used in the 132V test to monitor the leakage currents. After a power failure during testing had been corrected, the facility power was abruptly reapplied. Upon reapplication of power, the 12-amp fuse opened. The NRC inspection team's concern with this file is that the 12-amp fuse was blown when the testing circuit was reenergized. Also, testing the terminal block circuitry under constant power is not the worst case as demonstrated by the interruption of facility power. Terminal block circuitry in containment may experience similar power profiles as experienced in the test, and this test has demonstrated an unacceptable leakage current during a power transient. The Marathon 1600 file indicates that unacceptably high leakage currents may occur during power transients, and documented test results do not demonstrate that equipment can perform its required function for all postulated harsh environment.

The licensee letter WM 87-0309 to NRC Region IV dated November 20, 1987, responded to the NRC inspection concern by addressing specifically in detail all aspects of the test anomaly described above, in Wyle Test Report 45603-1. The licensee did not agree with the dispositioning of this anomaly as contained in the test report as follows:

- 1) The Wyle test setup, described in the report, applied voltage and current to a serpentine arrangement and measured total leakage current from six terminal blocks to ground, of which four of the blocks are not

used at WCGS. Because of this test setup, it was not possible to determine positively the source of the leakage current.

- 2) The 132 VAC terminal blocks in the Wyle test were allowed 12 amps leakage current, however, the leakage current was a summation of the leakage from 54 possible paths to ground. The fuses were not examined during the power outage, but were only discovered to be blown upon restoration of power. It was highly probable the fuses blew upon loss of power when an inductive voltage transformer at the laboratory generated high voltage levels.

The licensee further stated that justification for the acceptability of Marathon 1600 terminal blocks for WCGS application is contained in Wyle Test Report 17657.

The licensee will be revising EQWP E-028 to contain an analysis which would reflect a better dispositioning of the Wyle test anomaly.

This item is considered a violation of 10 CFR 50.49 (482/8724-04).

(9) EQWP ESE-43C, ESE-43E, and ESE-43G, Westinghouse Cable Splice Assemblies

Westinghouse hardline potting adaptor cable splice assemblies are used for thermocouple splicing above the reactor vessel head and at the reference junction box. EQWP ESE-43C applies to these assemblies before the second refueling outage, and EQWP ESE-43E and ESE-43G will be in effect after the second refueling outage. The EQF contained Westinghouse Test Reports WCAP-8687, Supplement 2-E43C, WCAP-8687, Supplement 2-E43E, and WCAP-8687, Supplement 2-E43G to support qualification of these cable splice assemblies.

During type testing, Westinghouse used a gamma dose of 8.6×10^6 rads to simulate a required lifetime beta dose of 4.15×10^8 rads. The equivalent gamma dose was determined by an analysis which took credit for design shielding at the location of the assemblies. The report did not describe the analysis or the shielding used. The utility supplied the NRC inspection team with additional information and analysis with regard to the shielding requirements, and this concern was resolved.

WCGS will incorporate the additional documentation in the appropriate EQWPs of the EQF.

No violations, deviations, or unresolved items were identified by the NRC inspection team.

(10) EQWP E-062, Boston Insulated Wire (BIW) 600V Cable

Ethylene propylene rubber insulation/chlorosulfonated polyethylene jacket (EPR/CSPE) 600V cable is used for instrument applications inside containment. The file contained BIW test document No. 10466-E-062. A licensee report which addressed instrumentation accuracy requirements was submitted separately to the NRC inspection team. The report indicated that the BIW cable used in instrumentation circuits produced acceptable accuracies for their applications. The licensee should incorporate this report and any additional information to establish acceptable accuracies for their applications, into EQWP E-062 in the EQF.

No violations, deviations, or unresolved items were identified by the NRC inspection team.

(11) EQWP E-061, Eaton (Samuel Moore) Thermocouple Extension Cables

This cable consists of ethylene propylene base (EPDM) insulation and Hypalon jacket. The file contained an Isomedix test report dated June 1978 to establish the radiation qualification as applicable to WCGS. The NRC inspection team identified the following concern. The licensee reduces the beta dose by taking credit for jacket shielding. The Isomedix test report did not demonstrate that the jacket survived the radiation test intact. An addendum to the June 1978 report was supplied to the NRC inspection team which did state that the cable jacket was intact after testing. This addendum (September 19, 1978) will be added to EQWP E-061 in the EQF.

No violations, deviations, or unresolved items were identified by the NRC inspection team.

g. IE Information Notices and Bulletins

The NRC inspection team evaluated the licensee's activities related to the review of EQ-related INs and IEBs.

Procedure KGP-1311, Revision 0, controls the licensee's Industry Technical Information Program (ITIP) which includes handling: (1) INs and IEBs; (2) industry technical information; (3) INPO Significant Operating Experience Reports; and (4) NSSS Technical Bulletins. The ITIP did not contain guidelines to determine whether an issue has EQ implications when not directly applicable to WCGS. Personnel who screen this information are not required to have EQ training (even overview), so that issues with generic aspects that might be pertinent to WCGS are not likely to be recognized. The licensee stated that this procedure is being revised to route all such correspondence to EQ personnel in the Nuclear Plant Engineering Department, which was being implemented at WCNO. The licensee

stated in their letter WM 87-0309 to NRC Region IV dated November 20, 1987, that personnel who initially screen ITIP information would receive EQ training by June 30, 1988.

The NRC inspection team reviewed the status of actions on EQ-related INs and verified implementation of WCGS's program for processing and tracking NRC IEBs and INs as they relate primarily to EQ. The licensee had reviewed and evaluated appropriate EQ-related INs and IEBs from IEB 79-01 through IN 87-08. Narrative summaries of the evaluations of IEBs and INs in the data base printout were reviewed. Actions pertaining to selected INs were reviewed in detail and are discussed below:

(1) IN 86-53, Improper Installation of Heat Shrinkable Tubing

- (a) WCGS actions regarding this IN were reviewed in accordance with Temporary Instruction (TI) 2500/17. The file on IN 86-53 indicated that the licensee had initially determined that the Raychem installation procedures in use at WCGS were consistent with the manufacturers instructions. The file also contained a KG&E internal memorandum, dated December 5, 1986, which discussed the December 1986 meeting of the Electric Power Research Institute (EPRI) EQ Advisory Group in which Raychem issues were addressed. It stated that utilities had found improper splices despite having proper procedures and noted that WCGS EQ documentation did not address improperly installed splices.

WCGS's failure to maintain equipment in a qualified configuration or provide adequate documentation to qualify splices is identified as a violation to 10 CFR 50.49 as discussed in paragraph 4.f(1) of this report.

- (b) It was not clear from the IN 86-53 file that WCGS had performed subsequent walkdowns to resolve the above issue until improper splices were found by NRC inspectors during this inspection as discussed in paragraph 4.h(1) of this report. Subsequent to the inspection, WCNOC provided additional information on this issue, in response to NRC concerns, and stated that they had now conducted a walkdown of 150 splices in harsh accident environment areas. Most fell within Raychem specification limits or within the bounds of those qualified in recent testing at Wyle Laboratories (Project 17859-2). WCNOC had obtained the test reports through the Nuclear Utility Group on EQ (NUGEQ). Deficient splices including those identified by the NRC were replaced. While reworking these splices, WCNOC also found some bolted splices in which the heatshrink tubing was determined to be too small for the application. This condition was reported to the NRC in a November 18, 1987, Licensee Event Report (LER).

WCGS's failure to maintain equipment in a qualified configuration or provide adequate documentation to qualify splices is identified as a violation to 10 CFR 50.49 as discussed in paragraph 4.f(1) of this report.

- (c) The post-inspection information also detailed WCNOG's plans to inspect 100 percent of remaining Raychem splices in instrument circuits to verify that they are acceptable per Raychem recommendations. WCNOG also reported that they are developing a sample plan based on the total population of Raychem splices in control circuits. Acceptance criteria for the control circuits will be based on tested configuration of splices reported in Wyle Report No. 17859-02B. Power circuits were qualified in a different configuration and are considered by WCNOG to be outside the scope of this sample plan inspection program.
- (d) The NRC inspection team reviewed Procedure INC S-0506, Revision 2, "Wire Splicing and Termination with Raychem," dated August 11, 1987. Previous revisions, effective when most splices would have been installed, were unavailable to the NRC inspection team for review during the inspection.

No violations, deviations, or unresolved items were identified by the NRC inspection team.

- (e) Raychem Application Guide WCSF-N, Revision 1, was listed as a reference, but not referred to in Procedure INC S-0506. A precaution was listed to adhere to minimum bend radius standards for field wire during installation in or on any terminal; however, minimum bend radius requirements for splices were not covered. The procedure required cable/wire surfaces to be cleaned, but there was no requirement to pull back braided jacketing and install splices only on smooth nonwoven surfaces. The procedure contained a table that specified total required length of splices based on diameter. The procedure also requires shims to be cut at least 2 1/4 inches long for accident condition applications, at least 1 1/8-inch for nonaccident condition applications, and requires that the entire length of the shim be applied to a suitable sealing surface to maintain a minimum seal length. The NRC inspection team determined (a) what was suitable was not defined; (b) minimum seal length was not defined; (c) the terms "accident" and "nonaccident conditions" were not defined including how the determination was made was not specified; and (d) minimum shrink overlap length for the joint between

any sealing component of the splice (not just shims) was not specified. The procedure included a section on installation of heatshrink on a bolted V-splice. It is not clear that the V-splice would be a qualified configuration in that it relies on inserting filler material between the wires and then a heatshrink end cap over them, in lieu of using a breakout boot, to seal around the adjacent wires as they exit the splice, as used in the standard Raychem kit for V-splices. Without specifically requiring use of Raychem procedures to make up for these deficiencies, this procedure is considered inadequate for installation of splices in accordance with Raychem specifications for Raychem-qualified configurations.

WCGS's failure to maintain equipment in a qualified configuration or provide adequate documentation to qualify splices is identified as a violation to 10 CFR 50.49 as discussed in paragraph 4.f(1) of this report.

(2) In 86-03, Unidentified Internal Wiring in Limitorque Motor Operators

WCGS actions regarding this IN was reviewed in accordance with TI 2515/75. Review of the file on this including licensee walkdown and maintenance records indicated that WCGS had conducted plant walkdowns and replaced all unidentified wiring with qualified wiring. No discrepancies in this area were noted in the NRC's plant physical walkdown inspection of selected Limitorque switch compartment internals.

No violations, deviations, or unresolved items were identified by the NRC inspection team.

(3) IN 84-90, Superheated Steam Release During a Main Steam Line Break (MSLB)

This issue has been analyzed in detail at WCGS and several formal submittals have been made to the NRC. The issue is currently under review by the NRR, and the qualification of various components subject to the superheated steam environment will remain unresolved pending completion of the review. WCNOG has prepared JCOs for affected equipment. The NRC inspection team found them to adequately address safe interim operation, but most of the analyses are not sufficient to demonstrate final qualification.

This item is considered an Unresolved Item (482/8724-06).

(4) IN 86-71, Energized Space Heaters in Limitorque Valve Operators

The licensee's response to this concern addressed the issue of the qualification of heater lead wires and heater failure modes

and effects. Reduction in qualified life for valve operators, as found by the NRC inspection team during this inspection, are discussed in paragraph 4.f(2) of this report, and is identified as a violation to 10 CFR 50.49.

(5) IN 86-104, Unqualified Crimp Type Connectors

The licensee's response and evaluation of this issue addressed, in particular, Thomas & Betts "blind-barrel" nylon crimped connectors used in Limitorque valve operators with dual voltage motors. Insufficient documentation for qualification, as found by the NRC inspection team during this inspection, are discussed in paragraph 4.f(4) of this report, and is identified as an Unresolved Item.

h. Plant Physical Inspection

The NRC inspection team walked down and physically inspected approximately 47 components. The inspection team examined attributes and characteristics such as mounting configuration, orientation, interfaces, model numbers, ambient environment, and physical condition.

(1) Raychem Splices to Pressure Transmitters

During the plant walkdown, the NRC inspectors identified Raychem splices that were not installed according to Raychem specifications, in configurations not qualified under existing WCGS EQ documentation. WCNO's failure to maintain this equipment in a qualified configuration or provide adequate documentation to qualify splices is identified as a violation to 10 CFR 50.49 as discussed in paragraph 4.f(1) of this report.

(a) Tobar Model 32PA1212 pressure transmitter (Plant ID No. BB-PT-0455, pressurizer pressure) is located in the containment. The pigtail lead Raychem splices were found bent with less than the Raychem-specified minimum bend radius (5 x splice O.D.) and had less than 2 inches of seal. The EQWP ESE-1C file listed only model Nos. 32PA1 and 32PG1; however, the installation test data sheet listed model No. 32TA1212. Inspection of the installed transmitter indicated the "TA" on the test data sheet had been recorded in error and information provided by the licensee resolved differences in documented and installed model numbers. The numbers following "PA1" simply referred to different instrument application ranges and should not affect DBA performance. (Refer to paragraph 4.f(5) for EQF EQWP ESE-1C review.)

(b) ITT Baron Model 764 level (differential pressure) transmitter (Plant ID No. BB-LT-0459, pressurizer level) is located in the containment. The pigtail lead Raychem

splices had no adhesive protruding from the heatshrink tubing ends. This appears to be indicative of under-shrinking. The splices were also bent through 90° angles with much less than 5 x splice O.D. bend radius, and seal lengths were less than 2 inches.

- (c) ITT Baron Model 764 pressures transmitters (Plant ID Nos. AB-PT-0514 and AB-PT-0544, steam generator steamline pressure) are located in the steam tunnel. The pigtail lead Raychem splices had no adhesive protruding from some of the sleeve ends.

(2) Minco RTD Installed Configurations

The NRC inspection team walked down the Minco Model S8809 RTDs (Plant ID Nos. TE-1318 and TE-1327 for the reactor vessel level indication density compensation system) located in the containment. The documented configuration of Minco RTDs in EQWP ESE-42A did not match the installed configuration. EQWP ESE-42A documents that the terminal boxes used as splice boxes for Minco RTD cables in the Reactor Vessel Level Instrumentation System are to be located above maximum postulated containment flood level. The EQWP does not document qualification for submergence of the terminal boxes. The NRC inspection team determined that several cable termination end seal assemblies of these RTDs in terminal boxes TB-23208 and TB-23210 (at the 2004 foot level as measured against wall markings and confirmed by Bechtel Drawing No. E-1R2322D(Q)) were located below flood level. The documented DBE flood level in the area is 2004 foot 6 inches indicating that the potted end of the seal assemblies and the external lead wires in the junction boxes would be subject to submergence under accident conditions during which they would be required to function.

The licensee letter WM 87-0309 to the NRC Region IV Office dated November 20, 1987, indicates that the terminal boxes have been relocated above flood level consistent with configuration documented in EQWP ESE-42A and evaluation of the previously installed configuration by the licensee is being conducted.

The unqualified condition of these RTD configurations is considered a violation to 10 CFR 50.49. (482/8724-02)

(3) Limitorque Motor Operator (EQWP-BOP Limitorque, HE-1, and HE-4) Compartment Degradation Because of Energized Heaters

Refer to paragraph 4.f(2) of this report.

(4) Limitorque Motor Operator Greases (EQWP HE-4) Outside Containment

Two valves whose qualification was covered under WCAP-8687, Supplement 2-H04A (EQWP HE-4), EJ-HV-8804A, and EJ-HV-8804B were identified by WCGS personnel as having questionable greases. A review of the maintenance records revealed that the greases of these two valves had not been changed out and discussions with licensee personnel disclosed that no schedule had been established to replace the greases. It should also be noted that these valves are NUREG-0588, Appendix E, Category C type equipment. Category C equipment is equipment that will experience environmental conditions of DBAs through which it need not function for mitigation of said accidents, and whose failure (in any mode) is deemed not detrimental to plant safety or accident mitigation, and need not be qualified for any accident environment, but will be qualified for its nonaccident service environment.

The licensee letter WM 87-0309 to NRC Region IV dated November 20, 1987, assured grease change out on the identified Limitorque operators to be completed prior to startup from the second refueling outage.

No violations, deviations, or unresolved items were identified by the NRC inspection team.

(5) Limitorque Motor Operator (EQWP HE-4) Outside Containment, Damaged Motor Leads

Two motor leads had been damaged and subsequently repaired with tape in an SMB-000 series operator with mark number EMHV-8821B. The damage had apparently resulted when the wires were caught between the limit switch compartment and cover during the cover installation. It could not be determined during the NRC inspection if the defect had been reported, analyzed, and repaired by an approved method.

The licensee letter WM 87-0309 to NRC Region IV dated November 20, 1987, indicated a WCGS investigation which revealed an open work request on EM-HV-8821A. Pending completion of the repair, black electrical tape was wrapped around the damaged wire for personnel safety. A revision to the work request was issued October 12, 1987, to replace the damaged motor lead.

No violations, deviations, or unresolved items were identified by the NRC inspection team.

(6) Delaval Containment Sump Level Switch LF-LE-0009A
Model XM-54852 (EQWP J481)

During the NRC walkdown, it was observed that level switch LF-LE-0009A junction box had a loose connection at the switch tube permitting silicon fluid leakage.

The licensee letter WM 87-0309 to NRC, Region IV dated November 20, 1987, indicated repair on Level Switch LF-LE-0009A has been completed. Other containment sump level switches would be inspected and repaired, as required prior to startup from the second refueling outage.

No violations, deviations, or unresolved items were identified by the NRC inspection team.

5. Open Items

Open items are matters which have been discussed with the licensee, which will be reviewed further by the NRC inspector, and which involve some action on the part of the licensee.

6. Unresolved Items

Unresolved items are matters about which more information is required in order to ascertain whether they are an acceptable item, an open item, a deviation, or a violation. These unresolved items, which if ascertained to be a violation, may be followed up with enforcement action in accordance with NRC enforcement guidance on 10 CFR 50.49.

7. Exit Interview

An exit interview was conducted with WCGS personnel on October 23, 1987, at the conclusion of the onsite inspection during which the scope of the inspection findings were summarized.