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Vol. 15, No. 4

Licensee Contractor and Vendor Inspection Status Report

Quarterly Report
October–December 1991

U.S. Nuclear Regulatory Commission

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Division of Reactor Inspection and Safeguards
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

ABSTRACT

This periodical covers the results of inspections performed by the NRC's Vendor Inspection Branch that have been distributed to the inspected organization during the period from October 1991 through December 1991.

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PREFACE

A fundamental premise of the Nuclear Regulatory Commission (NRC) licensing and inspection program is that licensees are responsible for the proper construction and safe and efficient operation of their nuclear power plants. The total government-industry system for the inspection of commercial nuclear facilities has been designed to provide for multiple levels of inspection and verification. Licensees, contractors, and vendors each participate in a quality verification process in compliance with requirements prescribed by the NRC's rules and regulations (Title 10 Code of Federal Regulations). The NRC performs an overview of the commercial nuclear industry by inspection to determine whether its requirements are being met by licensees and their contractors, while the major inspection effort is performed by the industry within the framework of ongoing quality verification programs.

The licensee is responsible for developing and maintaining a detailed quality assurance (QA) plan with implementing procedures pursuant to 10 CFR 50. Through a system of planned and periodic audits and inspections, the licensee is responsible for assuring that suppliers, contractors and vendors also have suitable and appropriate quality programs that meet NRC requirements, guides, codes and standards.

The Vendor Inspection Branch (VIB) reviews and inspects nuclear steam system suppliers (NSSSs), architect engineering (AE) firms, suppliers of products and services, independent testing laboratories performing equipment qualification tests, and holders of NRC licenses (construction permit holders and operating licenses) in vendor-related areas. These inspections are performed to assure that the root causes of reported vendor-related problems are determined and appropriate corrective actions are developed. The inspections also review the vendors' conformance with applicable NRC and industry quality requirements, the adequacy of licensees' oversight of their vendors, and that adequate interfaces exist between licensees and vendors.

The VIB inspection emphasis is placed on the quality and suitability of vendor products, licensee-vendor interface, environmental qualification of equipment, and review of equipment problems found during operation and their corrective action. When nonconformances with NRC requirements and regulations are found, the inspected organization is required to take appropriate corrective action and to institute preventive measures to preclude recurrence. When generic implications are identified, NRC assures that affected licensees are informed through vendor reporting or by NRC generic correspondence such as information notices and bulletins.

This periodical (White Book) is published quarterly and contains copies of all vendor inspection reports issued during the calendar quarter for which it is published. Each vendor inspection report lists the nuclear facilities to which the results are applicable thereby informing licensees and vendors of potential problems. In addition, the affected Regional Offices are notified of any significant problem areas that may require special attention.

The White Book also contains a list of selected bulletins and information notices involving vendor issues. Copies of other pertinent correspondence involving vendor issues are also included in this White Book issue.

Correspondence with contractors and vendors relative to inspection data contained in the White Book is placed in the USNRC Public Document Room, located in Washington, D.C.

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INSPECTION REPORTS

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

OCT 07 1991

Docket No. 99900001

Mr. R. H. Ihde, President
Babcock & Wilcox Fuel Company
Post Office Box 10935
Lynchburg, Virginia 24506-0935

Dear Mr. Ihde:

SUBJECT: NOTICE OF NONCONFORMANCE
(NRC INSPECTION REPORT NO. 99900001/91-01)

This letter addresses the inspection of your facility at Lynchburg, Virginia conducted by Mr. R. L. Cilimberg and Mr. L. L. Campbell of this office on August 27-30, 1991 and the discussions of their findings with you and other members of your staff at the conclusion of the inspection. The purpose of the inspection was to determine if the supply of nuclear fuel assemblies by the Babcock & Wilcox Fuel Company's (B&W) Commercial Nuclear Fuel Plant (CNFP) is in accordance with nuclear utility specifications and the CNFP quality assurance (QA) program. The inspectors were especially interested in circumstances associated with CNFP's reported failure to remove felt cleaning plugs from fuel rods before loading the rods with fuel pellets.

Areas examined during the NRC inspection and our findings are discussed in the enclosed report. This inspection consisted of an examination of procedures and representative records, interviews with personnel, and observations by the inspectors. During this inspection it was found that the implementation of your QA program failed to meet certain NRC requirements which are summarized as follows: (1) a 100% visual inspection of cladding was not performed; (2) a component discrepancy report (CDR) was not written on fuel rods which contained felt cleaning plugs; and (3) procedures did not provide adequate instructions for visual examination of fuel cladding.

This inspection also identified an unresolved item pending action by B&W to determine the root cause of fuel rods containing felt cleaning plugs, and to ensure that the problem does not extend to fuel assemblies which have been or will be shipped to any B&W nuclear customers. The unresolved item may also require an evaluation in accordance with Section 21.21 of 10 CFR Part 21. You are requested to provide us with a written response with sufficient information to address the unresolved item. The failure by B&W to document this deviation when it was discovered in March 1991 has resulted in a five month delay in determining the root cause, generic implications, action to prevent recurrence, and the evaluation required by 10 CFR Part 21 to determine if a deviation or a failure to comply has occurred.

The specific findings and references to the pertinent requirements for the above nonconformances are identified in the enclosed Notice of Nonconformance.

The responses requested by this letter and the enclosed Notice are not subject to the clearance procedures of the Office of Management and Budget as required by the Paperwork Reduction Act of 1980, Public Law No. 96-511.

In accordance with 10 CFR Part 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosures will be placed in the NRC's Public Document Room.

Sincerely,

Leif J. Norrholm, Chief
Vendor Inspection Branch
Division of Reactor Inspection
and Safeguards
Office of Nuclear Reactor Regulation

Enclosures:
Notice of Nonconformance
Inspection Report 99900001/91-01

NOTICE OF NONCONFORMANCE

Babcock & Wilcox Fuel Company
Lynchburg, Virginia

Docket No.: 99900001/91-01

During an inspection conducted at the Babcock & Wilcox Fuel Company's (B&W) Commercial Nuclear Fuel Plant (CNFP) in Lynchburg, Virginia, on August 27-30, 1991, the inspection team from the U.S. Nuclear Regulatory Commission (NRC) determined that certain activities were not conducted in accordance with NRC requirements, which are contractually imposed on CNFP by contracts with NRC licensees. The NRC has classified these items, as set forth below, as nonconformances to the requirements of Title 10 of the Code of Federal Regulations, Part 50 (10 CFR Part 50) Appendix B, imposed on CNFP by contract and the supplemental requirements of its nuclear utility customers.

A. Criterion V of Appendix B to 10 CFR Part 50 requires that activities affecting quality be prescribed by documented procedures and be accomplished in accordance with these procedures.

Section 6.3.6 of QC-502,"Fuel Rod Inspection (In process and Final)," Revision 12, dated February 21, 1989, requires that quality control (QC) perform a 100% visual examination of fuel cladding for cleanliness after felt plugs have been blown through each tube. Revision 12 was in effect during March 1991.

Contrary to the above, a 100% visual examination was not performed by QC, because felt cleaning plugs were found in 22 fuel rods after visual examination and cleanliness acceptance was to have been performed by QC (91-01-01).

B. Criterion V of Appendix B to 10 CFR Part 50 requires that activities affecting quality be prescribed by documented procedures and be accomplished in accordance with these procedures.

Criterion XV of Appendix B to 10 CFR Part 50 requires, in part, that nonconforming items be reviewed and accepted, rejected, repaired or reworked in accordance with documented procedures.

Criterion XVI of Appendix B to 10 CFR Part 50 requires, in part, that significant conditions adverse to quality be identified, and the cause of these conditions, and the corrective action taken be documented and reported to appropriate levels of management.

Sections V, XV, and XVI of the B&W Quality Assurance Program Manual (QAM) 56-1177617-00 are consistent with the requirements of Appendix B to 10 CFR Part 50 and require that a Component Discrepancy Report (CDR) document a nonconforming item and that a Contract Variation Approval Request (CVAR) document a nonconformance which violates design requirements.

Contrary to the above, CNFP did not issue a CDR to document the presence of felt cleaning plugs which were found in 22 fuel rods being fabricated for the Haddam Neck/Connecticut Yankee (CY) nuclear plant on March 19, 1991. CNFP did not issue a CVAR to initiate the design review which, five months later determined that heating of felt plugs can result in fuel rods with residues which contain 1.5 to 15 parts per million hydrogen (91-01-02).

C. Criterion V of Appendix B to 10 CFR Part 50 requires that activities affecting quality be prescribed by documented procedures and be accomplished in accordance with these procedures.

Contrary to the above, MA-450, "Zircaloy Cladding End Preparation," Revision 15, dated February 21, 1989, did not provide guidance to the operator for the extent of QC inspection required or what notification was required to be given to QC to ensure that the visual examination for cleanliness was performed. Additionally, MA-450, Revision 16, dated March 8, 1991, and QC-802, Revision 13, dated April 29,1991, did not provide the extent of the inspections to be performed by the operator or the QC inspector (91-01-03).

Please provide a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C. 20555, with a copy to the Chief, Vendor Inspection Branch, Division of Reactor Inspection and Safeguards, Office of Nuclear Reactor Regulation, within 30 days of the date of the letter transmitting this Notice of Nonconformance. This reply should be clearly marked as a "Reply to a Notice of Nonconformance" and should include for each nonconformance: (1) a description of steps that have been or will be taken to correct these items; (2) a description of steps that have been or will be taken to prevent recurrence; and (3) the dates your corrective actions and preventive measures were or will be completed.

Dated at Rockville, Maryland
this 8 day of October 1991.

ENCLOSURE 2

ORGANIZATION:	BABCOCK AND WILCOX FUEL COMPANY COMMERCIAL NUCLEAR FUEL PLANT LYNCHBURG, VIRGINIA
REPORT NO.	99900001/91-01
CORRESPONDENCE ADDRESS:	Mr. R. H. Ihde, President Babcock and Wilcox Fuel Company Post Office Box 10935 Lynchburg, Virginia 24506-0935
ORGANIZATIONAL CONTACT:	Mr. W. T. Engelke, Manager of Quality Assurance
NUCLEAR INDUSTRY ACTIVITY:	Nuclear Fuel assembly supplier for Babcock & Wilcox (B&W) and Westinghouse designed reactors.
INSPECTION CONDUCTED:	August 27-30, 1991

Uldis Potapovs 9-27-91

for R. L. Cilimberg, Team Leader — Date
Reactive Inspection Section No. 1
Vendor Inspection Branch (VIB)

L. L. Campbell, VIB

Uldis Potapovs 9-27-91

Uldis Potapovs, Chief — Date
Reactive Inspection Section No. 1
Vendor Inspection Branch

INSPECTION BASES:	10 CFR Part 21 and Part 50, Appendix B
INSPECTION SCOPE:	To review the B&W Fuel Company's Commercial Nuclear Fuel Plant (CNFP) Quality Assurance (QA) program relative to the supply of fuel assemblies to nuclear facilities.
PLANT SITE APPLICABILITY:	Numerous.

1 INSPECTION SUMMARY

1.1 Nonconformances:

1.1.1 Contrary to Criterion V of Appendix B to 10 CFR Part 50, and Section 6.3.6 of QC-802, "Fuel Rod Inspection (In process and Final)," Revision 12, dated February 21, 1989, a 100% visual inspection was not performed as indicated by the presence of felt cleaning plugs which were discovered in 22 fuel rods after visual examination and cleanliness acceptance were to have been performed by QC. The fuel rods were being manufactured for the Haddam Neck/Connecticut Yankee (CY) nuclear plant (91-01-01).

1.1.2 Contrary to Criteria V, XV, and XVI of Appendix B to 10 CFR Part 50, Commercial Nuclear Fuel Plant (CNFP) did not issue a Component Discrepancy Report (CDR) and a Contract Variation Approval Request (CVAR) to identify, document, evaluate, resolve, and process the nonconformance of felt cleaning plugs in 22 fuel rods for CY (91-01-02).

1.1.3 Contrary to Criterion V of Appendix B to 10 CFR Part 50, MA-450, "Zircaloy Cladding End Preparation," Revision 15, dated February 21, 1989, did not provide guidance to the operator for the extent of QC inspection required or what notification was required to be given QC to ensure that the visual examination for cleanliness was performed. Additionally, MA-450, Revision 16, dated March 8, 1991, and QC-802, Revision 13, dated April 29, 1991, did not provide the extent of the inspections to be performed by the operator or the QC inspector (91-01-03).

1.2 Unresolved Item

1.2.1 The NRC inspectors determined that Babcock and Wilcox (B&W) has initiated actions to identify the root cause for felt cleaning plugs being contained in loaded fuel rods. An evaluation in accordance with Section 21.21 of 10 CFR Part 21 may also be required. Pending receipt by NRC of a written response containing the B&W evaluations, this issue is identified as an unresolved item (91-01-04).

2 STATUS OF PREVIOUS INSPECTION FINDINGS

The two open findings from previous inspections were not addressed during this inspection.

3 INSPECTION FINDINGS AND OTHER COMMENTS

3.1 Entrance and Exit Meetings

The Nuclear Regulatory Commission (NRC) inspectors informed B&W staff of the scope of the inspection, outlined areas of concern, and established working interfaces during the entrance meeting on August 27, 1991. On August 30, 1991, the NRC inspectors summarized the inspection findings, observations, and concerns to B&W management during the exit meeting.

3.2 Background

On August 21, 1991, Northeast Utilities Service Company (NU) informed the NRC resident inspector at the CY nuclear plant of what was characterized as a breakdown in the B&W QA program. NU advised that CNFP failed to remove the felt cleaning plugs from CY fuel rods prior to loading the rods with fuel pellets during March 1991. NU was not informed of this problem until August 12, 1991. NU requested that B&W stop the manufacturing process and perform a root cause evaluation. NU personnel arrived at CNFP on August 13, 1991 to conduct a review. NU instructed B&W to restart manufacturing fuel assemblies for CY based on their review of corrective actions taken by B&W at CNFP since March 19, 1991, and their observations of the manufacturing process in August. The NRC conducted this inspection to determine the suitability of fuel assemblies being supplied to CY by CNFP and to evaluate the B&W QA program for compliance with NRC requirements.

3.3 Fabrication of CY Fuel

The NRC inspectors determined what had occurred during March 1991, by discussion with B&W staff and by observations of the CNFP fabrication of CY fuel. Tubing to be used for fuel cladding is partially cleaned by blowing a felt cleaning plug through each tube with compressed air on an automated blowing machine (BMC). The BMC contains a switch or flag which is activated when the cleaning plug exits from each tube being cleaned. When the flag is activated the tube is released and moves to a station where each tube is to be visually inspected in accordance with QC-802, Revision 12, to ensure that the tubes are free from debris. During March 1991, an operator detected a felt plug in a fuel rod when he was performing a plenum check of rods which had been loaded with fuel pellets. This incident was treated as an in-process nonconformance which is permitted by section 15.3 of the B&W QAM. The NRC inspectors determined that the visual inspection was not performed or the plugs would have been seen during this inspection. (See Nonconformance 91-01-01)

The inspectors also concluded that a CDR and a CVAR should have been written to document the nonconformance and corrective action in accordance with Appendix B to 10 CFR Part 50. (See Nonconformance 91-01-02)

The in-process rework during March 1991 was quite extensive in that radiography and unloading of CY fuel rods discovered felt cleaning plugs in 22 fuel rods in a population of 31 rods produced in sequence. This group fell within the first 175 rods produced of the total 9700 fuel rods for CY which have not been shipped to CY. This information supports the B&W contention that the presence of felt plugs in loaded fuel rods is an isolated event. This incident probably occurred during a 15 minute time period. However, the root cause of the deviation has not been determined by B&W which resulted in the inspectors identifying an unresolved item (91-01-04).

3.4 Document Review

The NRC inspectors reviewed the B&W QAM; document 56-1178235-00, "QA Plan for Manufacturing Operations at CNFP;" QC-1412, "Corrective Action," Revision 5, dated January 4, 1989; QC-1413, "Nonconforming Materials, Parts, and Components," Revision 9, dated September 11, 1990; QC-1423, "Contract Variation Approval Request (CVAR)," Revision 4, dated February 1, 1989; QC-1433, "Reporting Defects and Noncompliances-10CFR21," Revision 8, dated January 23, 1991; QC-802, Revisions 12&13; MA-450, Revisions 15&16; MA-453, "Fuel Rod Loading Procedure," Revision 46, dated March 18, 1991; route cards for CY fuel; and CDRs 8986, 9000, 9016.

MA-450, Revision 15 and QC-802, Revision 12, controlled the cleaning and inspection of fuel cladding during March 1991. MA-450, Revision 15, did not address or provide guidance to the operator for the extent of inspection to be performed by QC nor did it provide requirements to notify QC to perform the cleanliness inspection. Review of route cards confirmed that felt cleaning plugs were found in the fuel rods on the night of March 19, 1991, and that inspection after plug cleaning was to have been performed in accordance with QC-802, Revision 12. The route card did not specify visual inspection and QC-802, while requiring 100% visual inspection by QC, did not establish interface requirements to ensure the operator would notify QC to perform the inspection. MA-450, Revision 16, requires the operator to perform in-process visual inspection to ensure the absence of chips, debris, and cleaning swabs (plugs), but a 100% visual inspection is not specified. QC-802, Revision 13, requires QC to visually inspect the conditioned ends and inside diameter of the cladding for cleanliness but does not state whether the inspection is random, partial, or 100%. (See Nonconformance 91-01-03)

3.5 B&W Investigation

The B&W Fuel Engineering Department became aware of the felt plug deviation in August 1991 and the decision was made to investigate the deviation to determine the root cause, to ensure that defective fuel rods have not been shipped to any customer, to determine the effect of felt plugs on fuel rod performance, and to perform corrective action to ensure that fuel rods with felt plugs are not shipped to nuclear facilities. A CDR was issued on August 8, 1991 and a number of specific documents were scheduled to be written on elements of the investigation and corrective actions. B&W has determined that welding of a lower end cap adjacent to a felt plug can result in a residue containing 1.5 to 3.0 parts per million (ppm) hydrogen and retort drying of a fuel rod containing a felt plug can result in a residue containing 12 to 15 ppm hydrogen. B&W has concluded that 1.5 to 15 ppm of hydrogen in a fuel rod would result in hydriding of the cladding during operation in the reactor core at CY sufficient to cause leaks in each fuel rod which contained the felt residue. If fuel rods have been shipped to nuclear facilities by B&W which contain felt cleaning plugs or the residue from those plugs, B&W has concluded that those rods contain a defect as defined in Section 21.3(d) of 10 CFR Part 21. B&W representatives have stated that corrective actions are ongoing to ensure that any fuel rods containing felt cleaning plugs or the residue from those plugs have been isolated within CNFP and have not been shipped to any nuclear facility.

3.6 10 CFR Part 21

The inspectors determined that B&W has maintained the required postings, imposed 10 CFR Part 21 on purchase orders, and implemented procedure QC-1433, Revision 8. The inspectors emphasized to B&W management that the evaluation required by Section 21.21 of 10 CFR Part 21 had been delayed considerably by the five month delay between the discovery of the potential deviation in March 1991 and the documentation which did not begin until August 1991. B&W representatives acknowledged the requirement for a written evaluation which is presently in-process and indicated that it will be completed when results are available from the investigation discussed in section 3.5 above. No violations were found during this inspection.

3.7 Personnel Interviews

Discussions with B&W personnel in production, maintenance, engineering, QA, and management provided statements to the NRC inspectors which indicate that the felt plug deviation probably occurred during a tour of CNFP by potential customers. These personnel believed that the felt plugs were lodged in the 22 tubes during the tour, and the flag switch was activated manually to give the impression to the visitors that the BMC was operating normally. Whoever activated the flag switch was probably not aware that the felt plugs had not exited from the tubes. Two engineers on the tour stated, months later, that they remember observing that the felt plugs were not exiting from the tubes when the tour stopped at the BMC.

4 PERSONNEL CONTACTED

+	*	R. Alto, Plant Manager
		R. Burge, QC Inspector
	*	S. Carter, Supervisor
	*	T. Coleman, Manager
	*	E. Coppola, Manager
	*	B. Cyrus, Engineer
		G. Day, Level II RT Examiner
+	*	C. Dideon, Manager
+	*	W. Engelke, QA Manager
+	*	J. Ford, Manager
+	*	R. Foster, Quality Administrator
+	*	K. Harris, Inspection Manager
	*	R. Ihde, President
		R. King, Supervisor
		R. Knight, Contract Analyst
		R. Mayberry, QA Foreman
		D. Mitchell, Engineer
		W. Overstreet, Operator
	*	R. Penoza, Manager
	*	R. Reith, Manager
		A. Reynolds, Plenum Checker
+	*	T. Schuler, Manager
	*	J. Taylor, Manager
+		J. Tennant, Manager
	*	W. Tibbs, Manager
		C. Vandegrift, Leadman
		S. Wilkerson, Supervisor
		R. Williamson, Engineer

\+ Attended entrance meeting on August 27, 1991
* Attended exit meeting on August 30, 1991

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

NOV 05 1991

Docket No. 50-255

Consumers Power Company
ATTN: Gerald B. Slade
General Manager
Palisades Nuclear Generating Plant
27780 Blue Star Memorial Highway
Covert, Michigan 49043

Dear Mr. Slade:

SUBJECT: ASSESSMENT OF THE PROCUREMENT AND COMMERCIAL-GRADE DEDICATION PROGRAMS AT THE PALISADES NUCLEAR GENERATING PLANT, REPORT NO. 50-255/91-201

This letter transmits the report of the assessment conducted May 13 through May 17, 1991, at the Consumers Power Company's (CPC's) Palisades Nuclear Generating Plant, by R. L. Pettis, S. D. Alexander, L. L. Campbell, and B. Rogers of the U. S. Nuclear Regulatory Commission's (NRC's) Vendor Inspection Branch and R. Langstaff and P. Rescheske of NRC Region III. At the conclusion of the assessment, we discussed our findings with your staff as identified in the appendix of the enclosed report.

The staff performed the assessment to review CPC's program for the procurement and dedication of commercial-grade items used in safety-related applications in accordance with the requirements of Appendix B to Part 50 of Title 10 of the Code of Federal Regulations (10 CFR Part 50) and to also determine the extent to which the licensee had implemented the initiatives of the Nuclear Management and Resources Council (NUMARC) in this area.

The NRC assessment team concluded that CPC has not made a significant effort to strengthen its commercial-grade dedication program. The overall program description did not appear consistent with the dedication philosophy described in Electric Power Research Institute (EPRI) Report NP-5652, "Guideline for the Utilization of Commercial Grade Items in Nuclear Safety Related Applications (NCIG-07)," as endorsed by NRC Generic Letter (GL) 89-02, "Actions to Improve the Detection of Counterfeit and Fraudulently Marketed Products," March 21, 1989. The team also noted that the program description, including most of the pertinent implementing procedures, did not completely address the issues contained in GL 89-02, which specified certain restrictions or conditions concerning the use of EPRI NP-5652 dedication methods as acceptable methods to achieve compliance with Appendix B. If the program is properly modified and implemented to address these issues, it could provide adequate control over the commercial-grade procurement process. Specific strengths and weaknesses are discussed in detail in the enclosed report.

At the time of the assessment, CPC was conducting a self-assessment to review the comprehensive procurement initiative improvements suggested in NUMARC 90-13, "Nuclear Procurement Program Improvements." The initiative called for the licensee to complete its review by July 1, 1991, and to complete implementation by July 1, 1992. Although CPC could not provide documentation during the assessment to support its progress in this area, CPC management stated that it would meet these goals.

The assessment team identified weaknesses both in the overall procurement program and its implementation. In several internal quality assurance (QA) audits performed since 1989, CPC had identifed concerns similar to those raised by the assessment team. Despite CPC's procedural revisions to incorporate the philosophy described in EPRI NP-5652, and in response to internal QA audit findings, the program was not substantially improved to correct the fundamental cause of those findings and to align the program with regulatory requirements.

CPC believed that not all the critical characteristics identified needed to be verified, but only those necessary to demonstrate that the item received was the item specified. While this position may be consistent with the EPRI NP-5652 definition of critical characteristics, we interpret the "item specified" to encompass attributes necessary for performance of the item's safety functions. Generic Letter 91-05, "Licensee Commercial-Grade Procurement and Dedication Programs," April 9, 1991, states that the licensee is responsible for identifying these attributes, establishing acceptance criteria and providing reasonable assurance of conformance to these criteria. The assessment team also noted that for the majority of dedications performed, procedures did not require that CPC identify and document the safety function and critical characteristics of the item.

In accordance with 10 CFR 2.790(a), the staff will place a copy of this letter and the enclosures in the NRC Public Document Room.

Although no response is required to this report, we expect you to consider the concerns raised herein. If you have any questions concerning this assessment, we will be pleased to discuss them with you. Thank you for cooperating in this assessment process.

Sincerely,

B A Boger

Bruce A. Boger, Director
Division of Reactor Projects III, IV, V
Office of Nuclear Reactor Regulation

Enclosure:
Assessment Report 50-255/91-201

Consumers Power Company
Gerald B. Slade

Palisades Nuclear Generating Plant

cc:

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Judd L. Bacon, Esquire
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U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
DIVISION OF REACTOR INSPECTION AND SAFEGUARDS

Report No.:	50-255/91-201
Docket No.:	50-255
Licensee No.:	DPR-20
Licensee:	Consumers Power Company 1945 West Parnall Road Jackson, Michigan 49201
Facility Name:	Palisades Nuclear Generating Plant
Assessment at:	Covert, Michigan
Assessment Conducted:	May 13 through May 17, 1991

Robert L. Pettis Jr. 10-23-91

Robert L. Pettis, Jr., P.E., Team Leader — Date
Vendor Inspection Branch (VIB)

Other Inspectors:
S. Alexander, EC and Test Engineer, VIB
L. Campbell, Reactor Engineer, VIB
B. Rogers, Reactor Engineer, VIB
P. Rescheske, Reactor Inspector, RIII
R. Langstaff, Reactor Inspector, RIII

Approved by: 10/23/91

Leif Norrholm, Chief — Date
Vendor Inspection Branch
Division of Reactor Inspection
and Safeguards
Office of Nuclear Reactor Regulation

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Between May 13 and May 17, 1991, the U.S. Nuclear Regulatory Commission's (NRC's) Vendor Inspection Branch conducted an assessment of the Consumers Power Company's (CPC's, the licensee's) activities to procure and dedicate commercial-grade items (CGIs) used in safety-related applications at the Palisades Nuclear Generating Plant (PNGP). The assessment team reviewed CPC's procurement program in order to assess the power company's compliance with the quality assurance (QA) requirements of Appendix B to Part 50 of Title 10 of the Code of Federal Regulations (10 CFR Part 50) and to assess the status of CPC's implementation of the Nuclear Management and Resources Council (NUMARC) initiatives on procurement and commercial-grade dedication.

The NUMARC Board of Directors has approved procurement initiatives as described in NUMARC 90-13, "Nuclear Procurement Program Improvements," which commit licensees to assess their procurement programs and take specific action to strengthen inadequate programs. The first phase of these initiatives addresses dedication of CGIs, and was scheduled to be implemented by January 1, 1990. It commits licensees to meet the intent of the guidance provided in Electric Power Research Institute (EPRI) NP-5652, "Guideline for the Utilization of Commercial Grade Items in Nuclear Safety Related Applications (NCIG-07)." The NRC has conditionally endorsed this EPRI guideline in Generic Letter (GL) 89-02, "Actions to Improve the Detection of Counterfeit and Fraudulently Marketed Products," March 21, 1989. The second phase of the initiatives is the comprehensive procurement initiative and addresses vendor audits, tests and inspections, obsolescence, information exchange, and general procurement. In this phase, licensees commit to review their programs by July 1, 1991, to determine, on the basis of guidance in NUMARC 90-13, if improvements are needed in the above areas, and to complete such improvements by July 1, 1992.

The staff performed this assessment to determine the current status of the activities to improve the procurement program in relation to the industry's commitments discussed above and NRC requirements in this area. The NRC assessment team reviewed procedures and representative records, interviewed CPC's staff (including senior managers and PNGP personnel), and made observations. The team also met with CPC's corporate and plant managers to discuss relevant aspects of commercial-grade dedication and to identify areas requiring additional information. At the exit meeting on May 17, 1991, the assessment team discussed its observations with CPC representatives and senior managers. The assessment team's specific conclusions are summarized below.

- CPC has not made a significant effort to strengthen its commercial-grade dedication program, and the overall program description does not appear consistent with the dedication philosophy described in EPRI NP-5652, as endorsed by NRC GL 89-02. The assessment team also noted that the program description, including most of the pertinent implementing procedures, did not completely address the issues contained in NRC GL 89-02 which specified certain restrictions or conditions concerning the use of EPRI NP-5652 dedication methods as acceptable methods to comply with Appendix B. Specifically, the PNGP QA program did not address the GL 89-02 restrictions on the use of EPRI Methods 2 and 4. If modified and implemented to address these concerns, and others noted below, the existing program could provide adequate controls over the commercial-grade procurement process.

- CPC's management provided limited support and resources to improve its commercial-grade dedication program. The assessment team noted that the recent steam generator replacement outage contributed to CPC's lack of resources and attention towards improving the procurement and commercial-grade dedication program and its implementation at the PNGP.

- CPC's practice is that not all of the critical characteristics identified to assure safety function need to be verified. The NRC staff's position is that Appendix B requires the licensee to verify all characteristics that are critical to ensure that the item performs its safety functions for its particular plant application.

- Quality Assurance Department Procedure (QADP) 7.5, "Commercial Grade Surveys," required that CPC perform a survey of commercial-grade suppliers once every three years and did not require periodic reviews and evaluations of the supplier during this period. The assessment team noted that it may be necessary to perform commercial-grade surveys at a frequency other than on a triannual basis due to changes in the supplier's quality program, procedures, processes, management, or personnel performing the work activities. Commercial-grade surveys should be scheduled at a frequency commensurate with the status, importance, and complexity of the item or process being surveyed.

- The program did not require CPC to identify the quality assurance/control program or procedures used by commercial-grade suppliers to control the manufacture of the item as referenced in EPRI NP-5652.

- Palisades Administrative Procedure (PAP) 10.03, "Procurement of Material," Material Management Procedure (MMP) 10, "Acceptance and Dedication Planning," and PAP 9.30, "Q-List," required CPC to identify and document the safety functions and critical characteristics of only those items dedicated under CPC's dedication plan approach, which represents approximately 20 percent of the total population of commercial-grade dedications performed at the PNGP.

- CPC had revised PAP 10.03 and MMP 10 to incorporate the guidance of EPRI NP-5652 and to address the findings of several internal QA audits. However, CPC had not substantially improved the program to correct the fundamental cause of those findings.

- The assessment team found inconsistencies in the procedures involving the definitions and use of terms such as "critical" and "quality" characteristics.

- The program did not provide for establishing documented verifiable traceability of CGIs to their original equipment manufacturer (OEM) as addressed in Criterion VIII of Appendix B and NRC GL 89-02. The types of OEM information of concern includes: qualification type testing; production sample destructive testing; and information on the history of changes to the design, the material, and the manufacturing process. This is of particular significance because the licensee often verified critical characteristics under the current program against information, including certificates of conformance, supplied by the vendor and the acceptance method referred to as engineering document review. However, PAP 10.03 and MMP 10 did not require the use of commercial-grade surveys, as described under acceptance Method 2 in EPRI NP-5652, to validate that information. If only certificates of conformance are used, the procedures still required that the licensee consult the Evaluated Certificate of Conformance Suppliers List (ECCSL). However, most of the suppliers listed were evaluated for general acceptance of certificates of conformance on the basis of broad-based, programmatic audits, some of which were several years old.

- The PNGP staff stated that it would consult the ECCSL only to determine if a commercial-grade survey of a supplier had been accomplished. However, the procedures did not prescribe this limitation. The procedures did not require that the licensee review the survey report to verify that it applies to the items being dedicated and to determine if any of the critical characteristics for specific applications of PNGP could be verified on the basis of that survey.

- Since late 1990, QADP 7.5 has provided methods for surveying commercial-grade suppliers. These surveys must identify the specific critical characteristics of the item purchased as specified in Method 2 of EPRI NP-5652. However, in the dedication program procedures PAP 10.03 and MMP 10, the licensee did not address the use of or reference to this procedure or the associated QADP 7.2, "Supplier Evaluation." Although QADP 7.5 required that the supplier's quality program be documented and effectively implemented, this procedure did not completely address the issues contained in NRC GL 89-02. Specifically, the procedure did not address the verification of the program controls of both distributors and manufacturers when applicable. No other procedure addressed this situation.

- PAP 10.03 did not require the licensee to document the technical evaluation associated with the safety classification of replacement parts and was not consistent with the requirements of QADPs 7.2 and 7.5.

1 INTRODUCTION

The NRC's Vendor Inspection Branch assessed Consumers Power Company's (CPC's) efforts to improve programs for procuring and dedicating commercial-grade items (CGIs) used in safety-related applications. The NRC staff reviewed the CPC program to assess its compliance with Appendix B to 10 CFR Part 50 and to assess the status of implementation of the Nuclear Management and Resources Council (NUMARC) procurement initiatives for the Palisades Nuclear Generating Plant (PNGP). The staff performed the assessment from May 13 to May 17, 1991, at the Jackson, Michigan, office of CPC and the PNGP site, located at Covert, Michigan. In performing the assessment, the staff made observations, held discussions with the licensee's managers and corporate and site personnel, and reviewed records and procedures for the licensee's procurement and commercial-grade dedication program.

The NRC staff is conducting assessments at selected licensees' facilities to review their implementation of improved programs to dedicate CGIs and to assess the improvements made in the areas covered by NUMARC's comprehensive procurement initiative. This initiative, approved on June 28, 1990, by the NUMARC Board of Directors, directed licensees to meet the guidance provided in Electric Power Research Institute (EPRI) NP-5652 and to review and strengthen their procurement programs in accordance with specific guidance provided in NUMARC 90-13.

The specific areas reviewed and the team's observations are described in Sections 2 through 4 of this report. Section 5 describes the conclusions, strengths, and weaknesses, and Section 6 describes the exit meeting. The Appendix is a list of the persons contacted during the assessment.

2 COMMERCIAL-GRADE DEDICATION PROGRAM REVIEW

The assessment team reviewed CPC's programs and related commitments associated with the implementation of the NUMARC initiatives, including the program for procuring and dedicating CGIs used in safety-related applications at the PNGP. "Dedication" is the process by which an item, not manufactured and supplied under an approved 10 CFR Part 50 Appendix B QA program, is verified to be suitable for use in a nuclear safety-related application. A commercial-grade dedication program must be conducted under an Appendix B QA program because it consists of activities affecting quality.

2.1 Procurement Process and Procedures

The procurement process for the PNGP was described and prescribed in a hierarchy of procedural documentation beginning at the CPC corporate level with the Nuclear Operations Department Material Management Standard (NODS) M01, "The Procurement Process," which governs the overall procurement process for all the CPC nuclear plants. The team reviewed the currently effective revision of this standard, Revision 20, April 12, 1990, which added the first reference in this document to EPRI NP-5652. In Section 5.3.1, the procedure addressed the use of acceptance plans in addition to or in conjunction with a receipt inspection. The acceptance methods described in Section 5.3.2 were receipt inspection (in conjunction with a review of the supplier's document); certificates of conformance or certificates of compliance; source verification; and post-installation test. The procedure described the circumstances under which this method would be appropriate for verifying acceptance by certificate of conformance as being similar to those circumstances under which receipt inspection could be used. A receipt inspection could be used when the item is simple in design and involves standard materials, processes, and tests. Although on this basis the procedure discouraged the use of certificates of conformance, it did not recognize the actual circumstances under which it may be preferable, or at least more practical, to accept certain attributes of an item on the basis of certificates of conformance, if adequate supporting documentation is provided when required, and if the validity of all the documentation including the certificates of conformance is adequately verified before placing the item in service. Although the procedure did address inclusion of supporting documentation when required, it included the following note pertaining to acceptance of certificates of conformance:

> The evaluation of the supp r's ability to provide a valid Certificate of Conformance Compliance need not be completed at the time the order is placed, and need not be completed in order to accept and use the items.

The note also required that the evaluation be completed in a timely manner and commendably included the effects on past procurements. However, allowing the use of unvalidated certificates of conformance for accepting and using items in safety-related applications is inimical to ensuring the suitability of the application.

Section 5.3.2.c described the circumstances under which the licensee should verify the source. Some of the conditions given were appropriate, but the procedure included the statement "when the quality of commercial, 'off the shelf,' items ordered without imposition of QA program requirements on the supplier cannot be verified by receipt inspection, source verification shall be applied." Although this may be one condition under which source verification may be appropriate, this provision of the procedure excluded the use of commercial-grade surveys which may be acceptable under similar circumstances. This method is not recognized elsewhere in the procedure.

Section 5.3.3 dealt specifically, but superficially, with commercial-grade dedication. It stated, in part: "Suitability and dedication of a commercial grade item for a safety-related application may be accomplished by any one of the following: a. Like-for-like replacement:...b. Alternate replacement:...c. First-time procurement:...." Although it was not clear how suitability was to be verified, the section reasonably described the distinctions between these types of procurements, but did not explain how an item was determined to be like-for-like.

The assessment team concluded that NODS-M01 did not provide an adequate framework, consistent with 10 CFR Part 50 Appendix B, GL 89-02, or EPRI NP-5652, within which CPC could implement acceptable programs to dedicate CGIs for use in safety-related applications at its nuclear power plants.

PAP 10.03, "Procurement of Material," governs the overall procurement process for the PNGP. The team reviewed the currently effective revision of this procedure, Revision 8, of December 27, 1989. The team found that Paragraph 4.5 correctly defined "critical quality characteristics" in a similar manner to that in which the term was defined in NODS-M01. However, in practice, not all critical characteristics must be verified.

This procedure also defined the PNGP quality classifications for procurement. Procurements of items intended for safety-related plant applications from a supplier with an approved 10 CFR Part 50 Appendix B QA program, and who accepts the reporting responsibilities of 10 CFR Part 21, are designated class "Q" procurements. Procurement of items for safety-related applications from commercial-grade suppliers (who may be listed in the ECCSL when the items meet the definition of a CGI in 10 CFR 21.3(a)(4)(a-1) are designated class "CQ" procurements. Nonsafety-related procurements are designated "NQ," and certain of these which involve special considerations such as seismic and environmental qualification, special shielding or enclosures, or fire protection are designated "AQ" because they carry augmented quality requirements. Also, certain radwaste systems and components have special requirements and are treated as safety-related.

The two major phases of the procurement process before receipt are the technical review of the procurement documents and the QA review. Section 4.8 did not define QA review, but only stated which group performed it. Section 4.9 addressed the dedication plan, stating that it can include basic receipt inspection, testing, certification, and verification of critical characteristics. Although this term is used elsewhere in the industry, it was not defined for the PNGP. This section introduced the first of many ambiguities and inconsistencies involving terms and their definitions. This section also used the "acceptance method worksheet" referred to elsewhere in the PNGP program procedures as an acceptance plan worksheet (APW) and "dedication plan agreement" referred to elsewhere in the program simply as a dedication plan (DP). Section 6.3 discussed the determination of safety functions and quality characteristics, but PAP 10.03 did not require documenting the technical evaluation associated with the safety classification replacement parts. Attachment 5 to PAP 10.03, "Technical Review," provided the only guidance, merely asking if the item was safety-related. Although the licensee had not yet implemented PNGP's new procedure which covered technical evaluation and safety classification, the assessment team's review of a draft version is discussed in Section 2.2 of this report.

Attachment 5 also provided three means of specifying the acceptance methods to be employed in any given procurement:

- Section 2.A Notelines - instructions for a receipt inspection that was documented either in the purchase requisition (an Authorization to Purchase or (ATP)) or in a document used to requisition material from stock to be dedicated (an Authorization to Add, Delete, or Redescribe Stock Items, Form 1069). Notelines may or may not appear on the purchase order (PO).

- Section 2.B Acceptance Plan Worksheet - used for multiple acceptance activities such as material analysis, source surveillance, receipt inspection, or bench testing, which are all to be listed on the APW. This worksheet could be used in conjunction with a DP. The inspectors noted that the form used as the APW provided for documenting the quality characteristics and associated acceptance criteria, but not critical quality characteristics.

- Section 2.C Dedication Plan - used to perform verification activities for a CGI after the licensee performed a receipt inspection specifying post-receipt inspection activities such as installation tests, system hydrostatic tests, or installation activities to verify acceptance. The PNGP staff stated that DPs, which are the only documents on which all critical quality characteristics are supposed to be listed, were used in only about 20 percent of the CGI dedications performed. However, the assessment team reviewed various DPs and found that only a sample of the critical quality characteristics were selected to be verified in order to provide reasonable assurance that the item received is the item specified. The assessment team also noted that the description of the block contents on the form was inconsistent with the terms and instructions in the implementing procedure for DPs further adding to the ambiguity regarding which characteristics must be verified. Following the description of the DP was the question "Is the item commercial grade?" This paragraph did not reference or describe the tests for making a CGI d(cermination. The next paragraph introduced a new subject abruptly, discussing the verification of attributes such as part number, material, catalog number, drawing, model number and serial number, but did not describe a means for formally documenting this information.

o The paragraph "Commerical Grade" provided several options without requiring any action. Paragraph 5 provided for the use of certificates of conformance if the vendor was on the ECCSL. However, PAP 10.03 and MMP 10 did not require the licensee to use commerical-grade surveys, as described under acceptance Method 2 in EPRI NP-5652 to validate that information. The value of using the ECCSL was questionable because most of the suppliers listed were evaluated for general acceptance of certificates of conformance on the basis of broad-based, programmatic, QA audits, some of which were several years old. The PNGP staff stated that the ECCSL was only consulted to determine if a commercial-grade survey of a supplier had been accomplished. However, the procedures did not prescribe this limitation on the use of the survey. In addition, the procedures did not require that the licensee review the survey report to determine if it applies to the items being dedicated and to determine which if any of the critical characteristics for PNGP applications could be verified from that survey.

Since late 1990, QADP 7.5 has provided methods for surveying commercial-grade suppliers to evaluate specific items and critical characteristics consistent with the provisions of EPRI NP-5652. However, use of or reference to this procedure or the associated QADP 7.2, "Supplier Evaluation," were not addressed in dedication program procedures PAP 10.03 and MMP 10. Although QADP 7.5 required that the supplier's quality program be documented and effectively implemented, this procedure did not completely address the issues contained in GL 89-02 regarding verification of the program controls of both distributors and manufacturers when applicable. This situation was not addressed elsewhere in the procedures for the PNGP dedication program.

In addition, EPRI NP-5652 provides guidance on measures to add assurance that CGIs are manufactured and tested in accordance with the supplier's commercial quality controls as reviewed and approved during commercial-grade surveys. However, CPC had not yet implemented that guidance in that the team found no programmatic requirements at the PNGP for invoking the supplier's documented commercial quality controls (specifically identified) in procurement documents or requiring supplier certifications to identify the specific controls or standards under which the CGIs were produced. The licensee did not have specific guidance to verify that such certifications were provided and that identified controls or programs matched those invoked in the procurement documents as reviewed and approved in the associated survey.

The team reviewed the other principal document governing aspects of procurement and dedication, MMP 10, Revision 1, of July 26, 1989, and identified the following deficiencies:

- The references in this procedure did not include EPRI NP-5652 or GL 89-02.

- Paragraph 4.14, in the Section "Definitions," defined "critical characteristics," differently from the definition in PAP 10.03. It was defined as those critical or functional attributes of an item that are necessary to ensure fitness for use. However, the paragraph then allowed them to be selected from the quality characteristics identified in PAP 10.03.

- In Section 1.A of Attachment 3 to MMP 10, the licensee listed the following types of acceptance methods that are "normally used" for "Q" material and equipment and "may include:" (1) engineering document review, (2) source verification, (3) receipt inspection, (4) receipt inspection documented in a valid certificate of conformance, (as opposed to APW) and (5) DP with critical characteristics to be verified by the "user department" at time of installation. The assessment team could not determine the manner in which critical characteristics would be verified through APWs or DPs for "Q" procurements, that is, to procure basic components, not CGIs. Paragraph I.B, which was supposed to cover CGIs, "CQ" materials, and equipment, stated that acceptance methods normally used are the same as for "Q" materials and equipment. while this may be true in practice, this erroneous statement fails to recognize the fundamental distinctions between Appendix B manufacturers and commercial-grade suppliers.

- Attachment 4 to MMP 10 provided a sample APW and the instructions on completing it. The instructions specified quality characteristics but did not require the licensee to identify safety functions or critical characteristics. Although space was provided for listing the acceptance criteria, the procedures did not require, nor provide space for documenting the test or inspection results, and did not require or provide for documenting the traceability of such results to the item itself.

Appendix B to 10 CFR Part 50 (in particular, Criteria III and VII) requires that licensees ensure that all material, equipment, and services are suitable for their safety-related applications. Therefore, the licensee must (1) identify the important characteristics for each item required to assure that the item will perform its safety function; (2) establish methods of verification and appropriate acceptance criteria; and (3) document the verification of conformance to these criteria to provide reasonable assurance that the items will perform their safety functions under all design basis conditions. Therefore, the PNGP dedication program should satisfy these criteria for CGIs.

However, upon reviewing the program and the implementing procedures and holding discussions with the PNGP staff, the assessment team concluded that it was CPC's position and practice that not all of those characteristics identified as critical (defined appropriately in CPC procedures as those essential to safety function) need be verified but rather, only those necessary to show that the item received is the item specified. The NRC position is that the licensee needs to verify all critical characteristics which are essential to the performance of the item's safety function to assure that the item received is the item specified.

Finally, the program procedures did not provide for establishing documented verifiable traceability of CGIs to their OEM. Such traceability is important both to help identify counterfeit and fraudulent material and to demonstrate that the information supplied by the vendor applies to the actual items received. OEM information of concern includes qualification type testing; production sample destructive testing; and information on the history of changes to the design, material, and manufacturing process. This is of particular significance to the licensee for PNGP because it often verified acceptance by verifying the critical characteristics under the current program as implemented against information and documentation supplied by the vendor, including certificates of conformance and engineering documents.

2.2 Draft Technical Evaluation Checklist

The licensee developed PNGP's draft technical evaluation checklist, Revision Draft 4 of Attachment 2 to PAP 10.04, using the guidance of EPRI NP-6406, "Guidelines for the Technical Evaluation of Replacement Items in Nuclear Power Plants (NCIG-11)," which has not been endorsed by the NRC. In reviewing this draft checklist, the assessment team identified the following deficiencies:

2.2.1 Section 6.1 of the checklist contained three criteria for determining if a replacement item could be considered "like-for-like." The checklist stated that any one of these criteria was sufficient for a like-for-like determination. The like-for-like criteria were as follows:

> (a) Same as original, same manufacturer, same internal controls, same supplier (an identical item); or (b) Identical item, purchased from alternate supplier; or (c) Manufactured by another manufacturer, to the same design and industry standards, and under at least as stringent controls as was the original.

The first of these criteria corresponded roughly to part of the definition of like-for-like given in GL 91-05: the item was purchased at the same time from the same supplier as the item being replaced. The second criterion corresponded to the second of three procurement scenarios listed in Section 3.5.1.1, "Like-for-Like Evaluation," of EPRI NP-6406 that this EPRI report describes as ones that "do not affect the validity of the "Like for Like" determination." However, PNGP's third like-for-like criterion (6.1.c), although roughly corresponding to the third NP-6406 like-for-like procurement scenario, was not an appropriate criterion for a like-for-like determination. Merely manufacturing to "industry standards" according to NP-6406, or even to "the same design and industry standards" according to the PNGP checklist, does not guarantee that the items will be identical in form, fit, function, including fabrication processes and materials. As stated in GL 91-05, a like-for-like determination could be made if the items were procured from the same vendor at the same time. Otherwise, the licensee must verify that the design, materials, or manufacturing processes have not been changed since the items being replaced had been procured. This verification may be difficult when the replacement item was purchased at a different time from a different manufacturer.

2.2.2 Section 3.0 of the checklist contained two tests for determining if any given function of a part of a safety-related component should itself be classified as safety-related. The first test (3.0.c) was to determine if any of the functions of the part (required to be listed in Table 3.1 of the checklist) is active or passive, as defined in PAP 10.04. If active, then that function was considered to be safety-related and the checklist, operating as a logic tree, sent the reviewer to section 4.1 which designated the part as safety-related. If the function was determined to be passive per Section 3.0.d, then a failure modes and effects test was applied. Each failure mode (to be listed in Table 5.1) was evaluated for its effect on the part's parent component and for its effect on the performance of the safety function of "any other component." If there was no effect on the parent component (only), the classifier or reviewer was sent to Section 4.2 where the part was designated nonsafety-related. If it was determined, however, that a passive failure mode could prevent the parent component (or "any other component") from performing its safety function, then the checklist directed the reviewer to Section 4.1 where the part would be designated as safety-related.

Section 4.1, in addition to designating the part as safety-related, contained the three tests for meeting the 10 CFR Part 21 definition of a CGI for procurement purposes. However, Section 4.2, which designated the part nonsafety-related, stated, in part: "If it [the part] could prevent some other component (not its parent component) from performing a safety related function,...the item must be purchased AQ." However, as stated, Section 4.2 directly contradicted the provision in Section 3.0.d that with a passive failure mode affecting a safety function of the parent component or any other component, the part would be classified safety-related (i.e., to be purchased "Q" or "CQ"). While it is recognized that this statement in Section 4.2 should not logically be encountered if the determination were made in Section 3.0.d that any passive failure mode of the part could affect any component's safety function (thus sending the classifier to Section 4.1), its presence in contradiction to Section 3.0.d, created an ambiguity in which the checklist effectively directed two mutually exclusive dispositions of the part under the same condition. The assessment team found that ambiguity could result from the qualifier added in Section 3.0.d that included "any other component" in the conditions for determining that the passive failure mode would render the part safety-related. Nevertheless, if the intent of Section 4.2 was to exclude parts with passive failure modes affecting other than the parent component from the category of safety-related (i.e., "AQ"), then the condition in the second test under Section 3.0.d was misstated by including "any other component." Conversely, if the intent was to classify parts with such passive failure modes (affecting parent and/or any other component) as safety-related, then the statement in Section 4.2 was inconsistent and it would be impossible to comply with the provisions of Section 4.2 without violating Section 3.0.d.

2.2.3 Section 5.0 provided for determining the part's "critical characteristics for design," presumably as defined in EPRI NP-6406 on which the licensee claimed to have based draft procedure PAP 10.04. However, this section was inconsistent with NP-6406 in that it provided for consideration only of the passive failure modes in determining the critical characteristics for design. In Section 5.0.c, the licensee equated these modes with "design characteristic(s) (resistance to failure) [sic] which will provide assurance of the part's capability to perform its safety function." The mere resistance to these passive failure modes alone does not guarantee successful performance of any active safety functions. In addition, this provision excluded the identification of the critical characteristics for design that would be derived directly from those active safety functions in addition to those related to resistance to passive failure modes as called for in Section 3.4 of EPRI NP-6406.

2.2.4 Section 4.2, designated the part as nonsafety-related and commendably contained certain operability and reliability considerations that are often overlooked for nonsafety-related components and their parts. These considerations include seismic and environmental qualification and special shielding or enclosures. While these considerations can be important for certain nonsafety-related equipment, they are of primary importance to safety-related equipment. However, the checklist did not provide for including these considerations in determining the critical characteristics to be derived from safety-related functions. Although the paragraphs addressing the seismic and environmental aspects in Section 4.2 called for checking the corresponding box in Table 3.1 (shielding/enclosure has no box in the table), if a part were classified safety-related, the classifier properly following the steps should not get to Section 4.2. Thus, these items would not be considered for safety-related functions.

2.2.5 Used in conjunction with Attachments 1 and 3 to PAP 10.04, the Attachment 2 technical evaluation checklist would lead the procurement parts classifier or dedicator to select from the list of critical characteristics for design only those critical characteristics for acceptance that would provide reasonable assurance that the item received is the item specified. Although the licensee need not verify all design characteristics of an item, the licensee must verify all those essential to the performance of its safety functions and to its suitability for its safety-related application under all design basis conditions.

2.3 Pre-1990 Program

To assess the progress that the licensee for PNGP claimed to have made in improving its procurement and dedication process since 1987, the team reviewed two previous revisions to PAP 10.03: Revision 6, of April 4, 1988, and Revision 7, of December 4, 1988. The team found that Revision 6 mentioned CGIs in the context of their 10 CFR Part 21 definition but did not address commercial-grade dedication.

Revision 7, approved after EPRI issued NP-5652 in June 1988, referenced this document in its final draft form. Revision 7 defined the CPC terms "quality characteristics" and "critical quality characteristics," defining "critical quality characteristics" as those quality characteristics which, when verified as acceptable, provide reasonable assurance that the item will perform its intended functions. Nevertheless, the procedure only superficially addressed the process of performing commercial-grade dedication in Attachment 5, "Technical Review," which simply required that quality characteristics and critical quality characteristics be determined or verified and that acceptance methods be determined. While some examples of critical characteristics were provided in Attachment 6, the team found no means by which to document the process formally. The licensee had revised PAP 10.03 and MMP 10 to incorporate the guidance of EPRI NP-5652 and to respond to internal QA audit findings. However, the licensee had not corrected the fundamental cause of those findings.

In summary, the team identified several weaknesses in the procurement and dedication program as described and prescribed in currently effective procedures. The most significant weakness was the slow progress in improving the program in accordance with the first phase of the NUMARC procurement initiatives to be implemented by January 1, 1990. The team noted that CPC had identified concerns similar to those raised during this assessment previously in several internal QA audits performed by CPC since 1988.

2.4 Material Receipt, Documentation and Procedure Control

The licensee performs receipt inspection of CGIs (scheduled for dedication) at the PNGP in two phases. In phase one, the licensee reviews purchase documents before releasing them for planning inspections. In phase two, the licensee inspects the item after receipt, which is controlled by MMP 30, "Receipt Inspection," Revision 2, December 12, 1990. Upon receiving procurement documents for Q, CQ, and AQ items, the receipt inspector or assigned material management personnel prepare a receipt inspection checklist (RIC) identifying receiving inspections to be performed based on information obtained from procurement documents. All receipt inspections performed must be identified on procurement documents and may include notelines, reference to generic receipt inspection plans (GRIPs), acceptance plans, or other instructions. If a DP has been prepared for the tests following the receipt inspection (and usually after installation), the preparer will note the DP on the RIC. Before completing the RIC, the preparer will compare the various procurement documents for agreement with the ATP and identify any discrepancies to the initiator for resolution. If a package is rejected during the review process, the package is placed on hold until the discrepancies are resolved. If the information agrees, the reviewer stamps the purchase documents, initials and dates indicating acceptance, and then completes the RIC, which is reviewed and approved by a certified Level II receipt inspector. Section 5.2.2.a of PNGP Procedure MMP 30 provides for the licensee to begin completing the RIC after receiving the item but does not describe the specific conditions for this practice. All incoming shipments are first processed by the material management stock clerk who reviews the shipping and delivery instructions on the PO to determine if any special conditions apply to the item. Inspections, if required, are performed in accordance with the requirements of the RIC. Section 5.2.2.d of MMP 30 provides detailed instructions for reviewing certificates of conformance but does not address the review of certificates of compliance. Receipt inspection personnel interviewed were not aware that a certificate of compliance required additional information such as a certified mill test report to substantiate the statements made on the certificate.

The assessment team noted the following weakness in the receipt inspection program: NMP 30 did not provide requirements for accepting certificates of compliance. For example, the PO and PR for DP 90-M-036 required a certificate of compliance for the body and bonnet of a relief valve (RV 2104). The certificate of compliance received identified the material but did not have or reference any additional information to substantiate the statement as required by Section 4.2 of NMP 10.

If the receipt inspection of the item cannot be completed or accepted and the problem cannot be resolved, the licensee places a hold tag on the item and notes this action on the RIC. If the RIC references a DP, the licensee must perform additional post-receipt testing as part of the dedication process. The licensee adds a commercial-grade stick-on tag before implementing a DP. Section 6.1.7 of Procedure 5.13, "Material Control During Maintenance," Revision 3, March 20, 1990, with Change Notice MRN-A-90-064, provided controls for ensuring that DP testing is incorporated in the work order package.

The licensee has only a small staff for performing receipt inspections at PNGP. Thus, the licensee only reviews documents and takes measurements. Other PNGP or CPC organizations perform special tests and analysis. The Laboratory Commercial Services (LCS) division of CPC has a fully equipped metrology department and can calibrate every instrument used during receipt inspection at the PNGP. Also, the LCS Chemical Services and Metallurgical Services Departments conduct studies and perform chemical and failure analysis, particle and alloy analysis, optical and electron microscopy, and physical testing. The technical evaluation and testing personnel conduct technical studies, evaluations, and tests in the electrical, mechanical, and environmental disciplines and can perform vibration testing, including seismic qualification and rotating equipment signature analysis. The nondestructive testing services department offers a wide variety of services including eddy current, acoustic emission, and radiography. The LCS QA program, according to published literature, meets the requirements of 10 CFR 50 Appendix B, and LCS accepts 10 CFR Part 21 reporting responsibilities. Licensees other than CPC also use the facility. The assessment team concluded that the LCS facility, if fully used by PNGP, is a strength of the licensee's commercial-grade dedication activities. The team also concluded that the receipt inspection program, if properly implemented, should provide the necessary controls for accepting material if the procurement documents correctly identify required inspections to be performed to support the dedication process.

2.5 Parts Classification System

The licensee classified procurement documents as "Q," meaning that the items described therein are safety-related or important to safety (nonsafety-related, but supplied in accordance with technical and quality requirements identified in the various procurement fields on the Q list). "CQ" items are within the scope of the Q list and are purchased as commercial-grade and dedicated as "Q" for both safety-related and important-to-safety applications. "NQ" items are those items that are not within the scope of the Q-list and are not processed through QA reviews and receipt inspection. If the licensee can not determine the Q list status of a component, structure, or other item, or desires a change to the Q list, a request is processed in accordance with MMP 9.30, "Q-List," Revision 6, of January 24, 1990, to initiate the necessary reviews and changes. However, the request is not required for spare parts or for equipment below the component level because equipment at this level is not included in the Q list or the PNGP database.

The assessment team reviewed the PNGP program requirements for parts classification including the requirements for documenting the analysis and evaluations supporting the classification process. Section 6.3 of PAP 10.03 required that the originator of procurement documents determine the safety-related functions and a prelim[illegible]lassification of the item to be purchased in accordance with PAP 9.30 and i[illegible]ted that the technical and QA reviewers will formally determine the procurement classification. The procedure stated that the classification of parts and subcomponents depends upon the safety function of the parent component. The team noted that the procedure did not require the licensee to document the technical evaluation. Section 7.3 specified only that the technical reviewer know the technical and quality requirements for the item being purchased and know who has access to pertinent information. Section 7.3 also stated that the originator shall assist the technical reviewer in completing the final "Q", "CQ", or "NQ" procurement classifications. Attachment 5 contained the requirements for performing technical reviews and provided guidance to the reviewer for determining the classification of the item. Section 7.4 addressed the QA review of procurement documents and required that the QA reviewer determine the classification of an item in accordance with MMP 10. Attachment 1 of MMP 10 provided the QA reviewer the same guidance for determining the classification of an item as provided to the originator of the procurement documents.

The assessment team concluded that a weakness existed in the parts classification process in that the procedures incorporated little of the guidance contained in Appendix B of EPRI NP-5652 and Sections 3.2 and 3.3 of EPRI NP-6406. PNGP procedures also failed to address a number of the essential elements of the classification process such as the item's failure modes and the effects of these failure modes on the parent component and on surrounding components.

The assessment team interviewed two PNGP senior engineers and concluded that they were familiar with most of the elements that should be considered when performing a technical evaluation to classify an item. The team noted that the basis for the evaluation was not documented because PNGP procedures only required the licensee to identify the classification of the part and the evaluator's signature approving the classification. Criterion III of Appendix B applies to changing an item's classification from safety-related to nonsafety-related or in performing the initial technical evaluation to determine a part's classification.

2.6 Commercial-Grade Supplier Selection, Qualification, and Surveys

The NRC assessment team reviewed the process of selecting and qualifying commercial-grade suppliers used for PNGP procurements. QADP 7.5 provides the requirements for qualifying suppliers and performing commercial-grade surveys. The assessment team also reviewed Revision 1 of QADP 7.5, approved on April 19, 1991, with an effective date of June 19, 1991, to determine the progress made by the licensee in this area.

2.6.1 Supplier Selection

PNGP material management personnel informed the assessment team that the OEM, or its authorized distributor, is the desired source from which to obtain a replacement component or part. If the OEM cannot provide an identical replacement, the next step is to request an equivalent replacement and evaluate its acceptability. When the OEM no longer stocks or carries the product, the licensee would attempt to procure the replacement item from another licensee or alternate source. If an identical or equivalent replacement component or part is not available, the design change process provides the alternative route of purchasing the item. If the item to be purchased is safety-related, the licensee would attempt to purchase from a supplier who has an Appendix B QA program and will accept 10 CFR Part 21 reporting responsibilities. If the OEM or selected supplier will not accept this responsibility and the safety-related replacement item is not a basic component, the licensee would purchase the item as commercial-grade and dedicate it.

While reviewing PNGP's use of EPRI Method 2 to verify critical characteristics, the assessment team noted that the licensee reviewed the ECCSL in order to select suppliers qualified to supply certificates of conformance. Procedures MMP 10 and PAP 10.03 addressed the use of the ECCSL which required that approved suppliers furnishing certificates of conformance be shown on the list. PNGP uses certificates of conformance as a method to take credit for the supplier's program controlling a critical characteristic as provided for by Method 2 of EPRI.

The assessment team reviewed QADP 7.2 and identified discrepancies between CPC Corporate QA in Jackson, Michigan, and the PNGP materials management procedures. Both Procedures, MMP 10 and PAP 10.03, reference the ECCSL and required its use in determining if a certificate of conformance could be used to verify critical characteristics. QADP 7.2 did not require the licensee to perform commercial-grade surveys and did not address the ECCSL. The assessment team interviewed both PNGP and CPC Corporate personnel and noted that the ECCSL was no longer being maintained and that it should only be used to determine if a commercial-grade survey had been performed in accordance with QADP 7.5. The assessment team also noted that if the ECCSL indicated that a commercial-grade survey had been performed, PNGP material management personnel must obtain a copy of the survey and determine if it confirmed that the supplier's program adequately controlled the specific item's characteristic which it desired to verify using EPRI Method 2. If a commercial-grade survey had not been performed, material management would request that one be performed in accordance with QADP 7.5. This process appeared consistent with QADPs 7.2 and 7.5, but PNGP site procedures still only address the review of the ECCSL as the basis for determining if a certificate of conformance could be used to verify and item's critical characteristics. The assessment team identified this as a significant weakness since many CGIs dedicated relied on the use of certificates of conformance. Many of the suppliers listed on the ECCSL were qualified by audits and surveys performed to requirements not consistent with QADP 7.5 and EPRI NP-5652. Also, MMP 10, PAP 10.03, and QADP 7.5 did not address the issue of surveying both the manufacturer and the distributor of the item, as contained in GL 89-02.

2.6.2 Supplier Qualification and Surveys

The Supplier Evaluation and Corrective Action (SECA) section of CPC's QA department, located in Jackson, Michigan, performs and evaluates commercial-grade surveys based upon the needs identified by materials management. Before 1989, CPC performed only programmatic and broad-based surveys and audits. From late 1989 until the end of 1990, the licensee considered many of the elements of EPRI NP-5652 when performing commercial-grade surveys, but did not achieve full compliance until early 1991. PNGP personnel stated that by June 1991, the ECCSL would be replaced by the Commercial-Grade Suppliers List (CGSL) which will identify the suppliers surveyed and the item and the specific characteristics that can be verified using EPRI Method 2. PNGP's existing program should be strengthened by implementing the CGSL. However, the team noted that neither Revision 1 of QADP 7.5 nor any other PNGP procedure addressed the control or use of the CGSL. The licensee noted that the procedure only required that suppliers be surveyed triennially if they actually supplied components within that period. However, the procedure had no provisions by which to perform periodic annual evaluations to evaluate the supplier's performance.

The assessment team reviewed the following commercial-grade surveys to determine if the requirements of QADP 7.5 were being effectively implemented:

(1) Ellis & Watts survey of spare parts for heating, ventilating and air conditioning (HVAC) equipment, May 9, 1991

(2) John Crane, Incorporated, for mechanical shaft seals, April 12, 1991

(3) Moore Products Company for pressure regulators, April 4, 1991

After reviewing the surveys, the assessment team concluded that additional procedural guidance was necessary to address the methods used to confirm and document that a supplier (including its subsupplier) is controlling and verifying critical characteristics.

The team found that much of the discussion contained in the surveys reviewed described the process based on reviews of procedures and programs and not on actual observations of the work activity controlling the critical characteristic. A review of the QA program and procedures may not be sufficient for confirming that the selected CGI's critical characteristics are properly controlled. For example, the Ellis & Watts survey described the manner in which the material, dimensions, rating, and part number should be controlled and verified. However, the CPC survey team did not observe any design evaluations, nuclear fabrication activities, inspections, receiving activities, or review records for these activities. The CPC survey team did not review or discuss the performance of engineering evaluations and design control measures to determine the form, fit, and function of spare HVAC parts not meeting the requirements of the original equipment drawing.

The surveys reviewed also indicated that some suppliers audited their subsuppliers, maintained approved supplier lists and accepted certificates of conformance. An audit or commercial-grade survey which only confirms that a supplier has established a quality assurance/control program and procedures to provide requirements for controlling, reviewing, and auditing supplier's subsuppliers, may not be an adequate basis for concluding that a subsupplier is adequately controlling the item's critical characteristics. If a subsupplier is verifying a critical characteristic and the purchaser is taking credit for this verification through its prime supplier, EPRI NP-5652 specifies that the purchaser confirm that the critical characteristics are being controlled. The assessment team noted that the method used by CPC to confirm that each critical characteristic was being controlled was not clearly identified and documented in the survey reports.

The assessment team concluded that the licensee had well defined and controlled its use of third party audits. CPC uses these audits for maintaining its Appendix B suppliers list and will use third party commercial-grade surveys to support its CGSL. QADPs 7.2, 7.5, and 18.2 provide requirements for screening third party audits and surveys and, if properly implemented, should provide assurance that they are acceptable for use in the supplier qualification process. The team noted that when adverse findings or discrepancies are identified, materials management reviews the documents for the effect on past procurements.

2.7 Fraud Detection

When the NRC conducted the assessment, the licensee had not yet implemented its program for detecting fraudulent material, "Procurement Misrepresented Products Detection Program," which contained six major elements: investigating issues, assessing procurement annually, assessing nonconforming material reports (NMRs) annually, testing, visiting suppliers, and disseminating information. The team noted that the licensee had received NRC Information Notice (IN) 89-70, "Possible Indications of Misrepresented Vendor Products," including Supplement 1, and had processed it along with GL 89-02. PNGP personnel stated that the licensee had incorporated the information contained in the GL into the fraud detection program. The team reviewed the receiving inspection and procurement programs, interviewed PNGP personnel, and found that the licensee was not yet implementing the program. The team also reviewed Revision 2 of the program, of July 16, 1990, and found that it did not specifically address receipt inspection which is a major component of fraud detection as noted in IN 89-70 and GL 89-02. The team also noted that PAP 10.03 and MMP 30, "Receipt Inspection," did not completely address the issues contained in these documents. PAP 10.03 provided the only specific guidance on fraudulent products and stated, "Molded case circuit breakers shall be purchased as new, with traceability to the manufacturer." Additionally, attachments to 3 of the 30 GRIPs reviewed (GR-E05, GR-E11 and GR-M06) also provided guidance for detecting fraudulent products during receipt inspections. Personnel performing receipt inspections had received some offsite training concerning fraudulent materials but no onsite training existed in this area. CPC participates in the joint audit process of the Nuclear Utility Procurement Issues Council and the Institute for Nuclear Power Operations.

2.8 Review of Procurement Packages

The NRC assessment team reviewed several procurement packages to determine if the licensee had implemented the necessary procedural controls to ensure that quality characteristics, identified in the DPs and APWs, were correctly translated into the procurement documents.

2.8.1 DP 90-M-007, February 14, 1990, dedicated an air filter for a valve operator. The quality characteristic that directly affected the air filter safety function was listed as quantity of flow. The specified means of verifying this quality characteristic was to stroke the valve according to procedure ESS-M-8 or the installing work order.

2.8.2 DP 90-M-009, November 31, 1990, dedicated a check valve for use in a diesel engine fuel system. The quality characteristics that directly affected the check valve safety function were listed as opening pressure, shell pressure, material, connection size, and part number. The licensee was to verify the opening pressure and shell pressure after receipt inspection by Technical Specification Test RM-55A or RM-55B and the corresponding work order. The licensee would verify the connection size and part number during receipt inspection. The only verification of material was a visual examination conducted during receipt inspection. Independent material certification or testing was not performed nor required. PNGP personnel stated that normally only a standard receipt inspection (visual examination) is conducted :o verify brass materia

2.8.3 DP 90-M-016, February 15, 1990, dedicated a lube oil pump for a diesel generator prelube system. The quality characteristics that directly affected the pump safety function were listed as operability and temperature. The assessment team noted that although the pressure retaining function was listed as "Q" for this component, it was not listed as a quality characteristic in the DP. The characteristics to be verified after receipt inspection were listed as operability and lube oil temperature. The acceptance method used to verify that the lube oil pump operated was that the prelube failure alarm did not initiate. A certificate of conformance stating that the pump was equivalent to the original pump ordered (which was supported by a survey of the manufacturer's distribution office performed in 1988) was also required. However, the assessment team was not aware of any survey of the manufacturing facility for this item.

2.8.4 DP 91-I-012, March 4, 1991, dedicated a one-half inch valve used to isolate an instrument line from the ımary coolant system. The quality characteristic that directly affected the valve's safety function was listed as the pressure retaining capability of the valve, which was to be verified by a pressure test at 2060 pounds per square inch gauge (psig). Material testing for this item consisted of confirming the material was non-magnetic during the receipt inspection.

2.8.5 DP 91-M-013, March 5, 1991, dedicated a relief valve. The quality characteristics which directly affected the relief valve safety function were listed as connections, material, and cracking pressure. The quality characteristic to be verified after receipt inspection was cracking pressure with an acceptance criterion of 150 psig. No verification of reseating pressure was specified since it was not listed as a quality characteristic and no form of material certification was required.

2.8.6 DP 91-I-008, March 25, 1991, dedicated a Nanmac H12-1 digital temperature-indicating switch purchased under PO 1010-5541-CQ for use in plant equipment having identification numbers TIS-1900, 1901, 1902 and 1903. A review of this file identified the following discrepancies:

- The printout for these mark numbers, generated from the Automated Material Management System (AMMS) plant equipment configuration database, called for a type H8-2 switch for TIS-1900. TIS-1901, 1902 and 1903 were supposed to be type H12-3 switches. The file contained no evidence of an engineering equivalence evaluation.

- The safety functions listed on the DP were very general, and the quality characteristics and the critical characteristics restated the item's safety function of temperature indication and switch actuation.

- The licensee had not yet performed preinstallation calibration checks but would perform these just before use. However, the procedure to be used and identification of the referenced calibration sheets was not listed.

- The receipt inspection report referenced GRIP E05-12 which was not in the file. The review of a sample GRIP E05-12 indicated that seismic and/or environmental qualification for these items were to be verified, but there was no documentation in the file to support this.

2.8.7 DP 90-E-032, October 3, 1990, dedicated Teledyne, type 256L100-80, big beam, emergency lighting units (ELUs) purchased from Englewood Electrical Supply in Jackson, Michigan, under PO 2004-6279-CQ for use in various emergency lighting locations throughout the plant. The file included a copy of work request 137103 and work order 24001277 (completed August 24, 1990), which documented the installation and testing of one of the units as plant equipment number ELU-1. The team reviewed this file and identified the following discrepancies:

- The AMMS printout indicated that the model number of the beams used was 256L100-80 as opposed to the 256L100-80 used in the PO. The file contained no other information to resolve this discrepancy.

- The quality characteristics were incorrectly and incompletely stated under Item 5 of the DP in that the entry was a description of the voltage test with some unclear acceptance criteria as opposed to a statement of the quality characteristics such as the charging voltage and the battery voltage under load with alternating current (ac) power off. Not mentioned were such important lighting characteristics as the minimum light intensity (or average incident light in target area) at the lowest allowable battery voltage, or at end of minimum required operating time (the work order indicated an 8.5 hour "duration test"); and area required to be illuminated.

- Under Item 6 of the DP, only voltage verification and a functional check were required to be verified. It was not clear how this would provide reasonable assurance of the item's ability to adequately perform its safety function.

- The acceptance criteria listed in Item 7 of the DP basically restated what was listed in Item 6, substituting that the "light will have to light per Technical Specification AE-5" for "work with ac power off" as in Item 6, which has the same meaning, except that the specification actually consisted of a functional check and a light-aiming check for each light. This file did not contain the acceptance criteria for the voltage checks listed inappropriately in Item 5, and did not contain the operating time requirement listed in the work order. The work order also stated that Technical Specification AE-5A was to be performed but this was not mentioned in the DP. The team noted that no light intensity acceptance criteria were listed, nor was it identified as a quality characteristic.

° Item 8 of the DP should describe the manner in which the critical characteristics are to be verified. Item 8 should include references to procedure numbers and other elements. However, Item 8 listed only Technical Specification AE-5 which verified only that the light comes on with ac power off and that the unit was properly aimed. The specification did not require the licensee to verify the voltage or operating time.

° The team reviewed Work Order 24001277 and Work Request 137103 for replacing ELU-1 and found that procedure SC-87-364 was used, but it was not mentioned elsewhere in the file. The work order was signed off as completed and released on August 24, 1990, yet the narrative under the summary of work performed section stated that Technical Specification AE-5 should be performed. The work order included no entry indicating that these had been completed and that the 6.2-volt direct current (vdc) load voltage check had been completed. The work order also stated that the licensee had measured a 6.5-vdc float voltage but did not indicate the quality characteristic to which this voltage corresponded. It was noted that no electrical checks of the transformer were required that would not be verifiable indirectly by the charge voltage such as insulation resistance and there was no indication that the licensee had considered the shelf life of the battery. Also, this file contained no documentation to support the traceability of the parts to their OEMs or of the consideration of seismic or environmental qualification issues.

The assessment team also reviewed APW packages 90-047, 90-064 and 90-142 in which the licensee had procured and accepted CGIs for safety-related applications in 1990. The APWs identified the quality characteristics and the acceptance methods for the items. The licensee performed standard receipt inspections and reviewed documents for acceptance. The licensee also verified the quality characteristics by reviewing the PO, the item tags and markings, and a certificate of conformance from the supplier. The packages did not indicate source verification and did not require post-receipt testing. The assessment team considered the quality characteristic determination to be generally adequate, however, the verification methods were weak. Further, the licensee had not identified the safety classification and function of the item in the APWs.

In summary, the team found that the licensee had not identified clearly and consistently the safety functions specific to the particular application. The licensee had not adequately identified the critical characteristics as dictated by safety function and had not selected all of these for verification. The licensee had not always adequately performed acceptance testing to verify those characteristics that were selected. Standard receipt inspection consisted of verifying markings, such as part number, and visually examining the item for conformance to the PO. Many of the DPs only included a standard receipt inspection and an operability test for dedication.

2.9 Corporate Quality Assurance Internal Audits

The assessment team reviewed three internal QA audits performed by CPC's corporate QA department since January 1990. In a February 1989 audit, CPC concluded that the procurement process at the PNGP did not conform to the EPRI guideline. CPC responded to this finding by committing to conduct audits in this area semi-annually. The team reviewed the following reports: QA-89-17, February 23, 1990; QA-90-10, August 17, 1990; and QA-90-13, January 11, 1991.

Audit QA-89-17 indicated that the licensee had made limited progress since February 1989 and also identified two findings: inadequate storage and control of material, and inadequate procurement procedures. The CPC audit team also concluded that the plant administrative and material management procedures were disjointed and lacked the required specificity to accomplish the various tasks. The audit team identified specific weaknesses in the selection of critical characteristics, dedication, receipt testing, and the suppliers' QA program.

Audit QA-90-10 indicated that the licensee was continuing to align its procurement process to EPRI NP-5652. However, the licensee had not yet completed the revisions to its procedures to specify a complete program. The CPC audit team found that the licensee had failed to implement DPs and to follow procedures for classifying chemicals and consumables. The audit team also noted that the licensee's evaluations of commercial-grade suppliers were inadequate. The audit team reviewed previous audit findings and found that corrective action involving procedure revisions was either not completed or did not adequately resolve the problems.

Audit QA-90-13 resulted in three findings: inadequate storage, procedural inadequacies for storing compressed gas cylinders, and failure to perform source verifications. Followup of previous audit findings indicated that the licensee was continuing to perform corrective actions.

The NRC assessment team reviewed the responses and corrective actions to these audits. However, the licensee had not yet completed its substantial effort to revise the commercial-grade procurement and dedication program to align it with the industry's initiatives. CPC indicated that it had not further developed a major program revision draft. Further, the assessment team noted that the licensee was conducting a self-assessment to assess the procurement process and its alignment with the industry's initiatives.

2.10 Management Involvement and Commitment

The licensee for PNGP initiated changes to the program in late 1987 when the EPRI guideline was in its third draft. In November 1987, the licensee established a plant policy for procuring and dedicating CGIs and in May 1988, established the material management department to assist in implementing the program. The licensee brought a number of existing functions together in the new department including five personnel from the QA department. Since 1988, the licensee has made several changes including implementing the NUMARC initiative on procurement and commercial-grade dedication which was formally incorporated into PAP 10.03 in January 1989. The licensee also revised other procedures to incorporate the EPRI guidance, including MMP 10 and QADP 7.5.

The assessment team found licensee management participated in the procurement and commercial-grade dedication program at the PNGP. For example, the Vice

President of Nuclear Operations commissioned the current internal procurement self-assessment and the plant manager participated on NUMARC's Nuclear Plant Equipment Procurement working group which initiated the NUMARC procurement initiatives. In May 1991, the licensee added several more personnel, including degreed engineers, to the material management staff and the corporate supplier evaluation department. However, due to the recent steam generator replacement outage, the licensee had not devoted sufficient management attention to develop and implement an effective program.

3 PROCUREMENT TRAINING REVIEW

In 1988, the licensee provided initial training on the PNGP procurement program and the use of its procedures. Since that time, the licensee has provided supplemental training. At the time of the assessment, the licensee had not developed a formal training course on procurement and commercial-grade dedication. However, the self-assessment has prompted the licensee to begin planning a formal course on procurement scheduled for late 1991. Details on the course content were not available at the time of the assessment.

Late in 1988 before implementing PAP 10.03, the licensee provided about 30 personnel with training on this procedure which implemented the program. Since then, the materials management group has made several presentations to plant personnel on the procurement and commercial-grade dedication process. This group made one of the presentations in response to a QA audit finding. Members of the procurement engineering group have attended industry seminars and workshops on commercial-grade dedication. Several system engineers who were originators of the DPs indicated to the NRC assessment team that they were familiar with the program and its procedures. However, PNGP personnel interviewed during the NRC assessment had limited knowledge of the commercial-grade dedication process, as outlined in EPRI NP-5652 and GL 89-02.

Corporate QA personnel from SECA, who perform vendor surveys, regularly attend industry seminars and workshops on commercial-grade dedication and perform individual study of the industry's initiatives. The QA personnel received this training even though many of them have helped to develop the industry's procurement initiatives. Members of the SECA group interviewed during the NRC assessment appeared knowledgeable of the commercial-grade dedication process as outlined in EPRI NP-5652 and GL 89-02.

4 IMPLEMENTATION OF NUMARC COMPREHENSIVE PROCUREMENT INITIATIVE

The assessment team reviewed the status of CPC's implementation of the NUMARC comprehensive procurement initiative (CPI) as described in NUMARC 90-13, "Nuclear Procurement Program Improvements," approved by the NUMARC Board of Directors on June 28, 1990. This initiative commits licensees to assess their procurement programs and take specific action to strengthen inadequate programs. The CPI calls for licensees to complete their review by July 1, 1991, and to complete implementation by July 1, 1992. These guidelines are summarized in the enclosure to a commission paper, "NUMARC Initiatives on Procurement" (SECY 90-304), August 24, 1990.

On January 11, 1991, the licensee's Support Services Director of the Nuclear Operations Department (NOD) issued a memorandum, "Procurement Self-Assessment," to the NOD Vice President and the plant general manager proposing to establish a self-assessment team. The self-assessment was to assess current NOD procurement and material control polices, programs, processes, procedures and activities against the intent of the NUMARC CPI and identify redundant enhancements needed to effectively implement it. On March 11, 1991, the assessment team began full-time assessment activities. The team consisted of six full-time members representing material management, engineering, and QA from both PNGP and the Big Rock Point Plant including the CPC general office. An engineering consultant was also added to the licensee's team.

The PNGP management informed the NRC assessment team that the licensee will meet the NUMARC CPI milestone of July 1, 1991. At the time of the NRC assessment, the licensee had completed half of the self-assessment and had not yet developed the documentation to support the team's draft recommendations or conclusions. The schedule also called for the licensee to complete revisions to NODs A-21 and M-01 by the middle of September 1991. During interviews, the NRC assessment team found that the cognizant managers generally understood the implications and commitments of the NUMARC CPI however, the team could not judge the effectiveness of the licensee's program to meet the goals of the CPI.

5 CONCLUSIONS

CPC had not significantly strengthened, improved, and implemented its commercial-grade dedication program since it committed to implement the guidance contained in EPRI NP-5652, as modified by GL 89-02, by January 1, 1990. Specific weaknesses were: (1) CPC's understanding that not all the critical characteristics identified need to be verified, but only those necessary to demonstrate that the item received was the item specified, (2) procedures that did not require CPC to identify and document the item's safety functions and critical characteristics for items other than DPs, and (3) the lack of an improvement to the program to reflect internal QA audit findings. The NRC assessment team found strengths in certain aspects of the licensee's training program, and its extensive testing capabilities to perform EPRI Method 1 acceptance activities.

6 EXIT MEETING

On May 17, 1991, the assessment team conducted an exit meeting at the PNGP site. The Appendix is a list of the persons contacted during the assessment. During the exit meeting, the team summarized the scope of the assessment and its observations. Throughout the assessment, the team met with licensee management and staff to discuss concerns. The licensee did not identify any information as proprietary.

APPENDIX

PERSONS CONTACTED

Consumers Power Company

D. Hoffman, Vice President, Nuclear Operations
G. Slade, Plant General Manager
T. Palmisano, Manager, Adminstration and Planning
R. Orosz, Manager, Nuclear Engineering and Construction
R. Volt, Manager, Jackson Test Laboratory
R. Rice, Operations Manager
D. Hughes, Director, Nuclear Services
G. Daggett, Supervisor, Procurement Engineering
J. Kuemin, Licensing
W. Jewell, Procurement Engineering
D. Jones, Supplier Evaluation
D. Anderson, Performance Assessment
S. Beachum, Senior Engineer
D. Morse, Materials Management
G. Yeisley, Senior Engineer
K. Osborne, System Engineering Superintendent
P. Donnelly, Safety & Licensing Director
A. Crickenberger, Material Services Supervisor
J. Alderink, Industry Experience and Assessment
R. Beeker, Quality Assurance Supervisor
M. Fox, Senior Quality Assurance Consultant
P. Fitton, Senior Engineer
R. Margol, Staff Engineer
P. Farron, Consultant

U.S. Nuclear Regulatory Commission

R. Pettis, Team Leader, VIB
S. Alexander, EQ and Test Engineer, VIB
B. Rogers, Reactor Engineer, VIB
L. Campbell, Reactor Engineer, VIB
C. VanDenburgh, Section Chief, VIB
G. Wright, Branch Chief, Region III
P. Rescheske, Reactor Inspector, Region III
R. Langstaff, Reactor Inspector, Region III
R. Roton, Resident Inspector, PNGP

Northeast Utilities

M. Ahern, Procurement Engineer, Millstone Plant

NUMARC

B. Bradley, Senior Project Manager

All persons listed attended the exit meeting on May 17, 1991.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

DEC 2 0 1991

Docket No. 99900003

Mr. William Ogden, Acting Manager
General Electric Company
Nuclear Fuel and Components
Manufacturing Facility
Post Office Box 780
Wilmington, North Carolina 28402

Dear Mr. Ogden:

SUBJECT: NRC INSPECTION REPORT NO. 99900003/91-01

This letter addresses the inspection of your facility at Wilmington, North Carolina conducted by Mr. S. L. Magruder, Mr. R. L. Cilimberg, and Mr. R. K. Frahm, Jr. of this office on November 18-22, 1991, and the discussions of their findings with you and your staff at the conclusion of the inspection. The purpose of the inspection was to review General Electric's Nuclear Fuel and Components Manufacturing Facility (GE NF&CM) plant operations and quality assurance program. In addition, the inspectors reviewed the GE NF&CM procurement and dedication program and followed up on previous inspection findings.

Areas examined during the NRC inspection and our findings are discussed in detail in the enclosed report. This inspection consisted of an examination of procedures and representative records, interviews with personnel, and observations by the inspectors. No violations, nonconformances, or unresolved items were identified during this inspection.

In accordance with 10 CFR Part 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be placed in the NRC's Public Document Room.

Leif J. Norrholm, Chief
Vendor Inspection Branch
Division of Reactor Inspection
and Safeguards
Office of Nuclear Reactor Regulation

Enclosure:
Inspection Report No. 99900003/91-01

ORGANIZATION: GENERAL ELECTRIC COMPANY
WILMINGTON, NORTH CAROLINA

REPORT NO.: 99900003/91-01

CORRESPONDENCE ADDRESS: General Electric Company
Nuclear Fuel and Components Manufacturing Facility
Attn: Mr. W. Ogden, Acting Manager
Post Office Box 780
Wilmington, North Carolina 28402

ORGANIZATIONAL CONTACT: Mr. James W. Currier, Jr., Manager
Customer Service and Quality Audits

NUCLEAR INDUSTRY ACTIVITY: Nuclear fuel assembly supplier.

INSPECTION CONDUCTED: November 18-22, 1991

Stewart L. Magruder — 12/18/91

Stewart L. Magruder, Team Leader — Date
Special Projects Section
Vendor Inspection Branch (VIB)

Ramon L. Cilimberg, VIB
Ronald K. Frahm, Jr., VIB

Gregory C. Cwalina — 12/20/91

Gregory C. Cwalina, Chief — Date
Special Projects Section
Vendor Inspection Branch

INSPECTION BASES: 10 CFR Part 21 and 10 CFR Part 50, Appendix B

INSPECTION SCOPE: Review plant operations and General Electric's Nuclear Fuel and Components Manufacturing Facility (GE NF&CM) quality assurance program. Also, follow up on previous inspection findings and review GE NF&CM procurement and dedication program.

PLANT SITE APPLICABILITY: Numerous Boiling Water Reactor (BWR) sites.

1.0 INSPECTION SUMMARY

There were no violations, nonconformances, or unresolved items identified during this inspection.

2.0 STATUS OF PREVIOUS INSPECTION FINDINGS:

2.1 (Closed) Nonconformance (89-01-01):

Contrary to Criterion V of Appendix B to 10 CFR 50, pen and ink changes to the lab results were made on Chemet Laboratory reports of nodular corrosion testing of Zirconium alloy tube samples by Fuel Component Operation (FCO) Quality Assurance (QA) engineers without documented procedures to prescribe the accomplishment of this activity.

The Nuclear Regulatory Commission (NRC) inspectors determined that, as a result of retraining and management directives, pen and ink changes were not being made on subsequent reports and, therefore, this issue has been resolved.

2.2 (Closed) Nonconformance (89-01-02):

Contrary to Criterion V of Appendix B to 10 CFR 50 and Section 14.0, "Test Parameters," of Chemical Metallurgical & Spectrochemical (CM&S) Analytical Method 2.1.1.3, Revision 2, dated August 29, 1988, evidence of accurate recordings of the analysis of influent at the beginning of each temperature cycle and at least 3 effluent sample readings every 2 hours throughout the whole nodular corrosion test period were not available.

The NRC inspectors confirmed that continuous instrument recordings and hourly manual recordings of influent and effluent analyses have been made since June 14, 1989, corrosion testing has been in accordance with procedural requirements and, therefore, this issue has been resolved.

3.0 INSPECTION FINDINGS AND OTHER COMMENTS

3.1 Entrance and Exit Meetings

The NRC inspectors informed GE NF&CM staff of the scope of the inspection, outlined areas of concern, and established working interfaces during the entrance meeting on November 18, 1991. On November 22, 1991, the NRC inspectors summarized the results of the inspection for GE NF&CM management during the exit meeting.

3.2 Background

GE's NF&CM facility produces fuel for the majority of Boiling Water Reactors (BWRs) in the United States. Raw materials such as UF_6 gas, Zircaloy 2 (Zr2) tube shells and bar stock, and stainless steel bar stock are converted by GE NF&CM processes into finished products such as complete fuel assemblies, control rods and core support pieces. This inspection was intended to provide the NRC inspectors with an overview of the operations at the facility and an opportunity to assess the effectiveness of the quality assurance program. It also provided an opportunity to investigate some specific concerns related to the performance of GE fuel in operating reactors and to close out issues from a previous inspection.

3.3 Observations of Work in Process

The NRC inspectors observed work in process through numerous stages of the fuel manufacturing operation. The processes are highly automated and well controlled by certified operators and Quality Control (QC) inspectors. Material flowed smoothly through the shops and personnel interacted in a professional and effective manner. The NRC inspectors noted that all gages and measuring equipment being utilized at the inspection stations were within their calibration schedule. Detailed procedures were available and were being followed by both the operators and QC inspectors at each of the stations observed. The following paragraphs provide a more detailed account of the specific processes observed and the observations made by the NRC inspectors.

3.3.1 Pellet Pressing

The fuel pellet pressing operation was observed by the NRC inspectors for a portion of a specific enrichment blend. The pellets were pressed, chamfered and marked with their enrichment simultaneously by a rotary press. The operator randomly verified proper pellet length, diameter, green density, and pellet integrity in accordance with Quality Control Operator Requirements (QCOR) 3.1.1, "Pellet Pressing," Rev. 28, dated March 4, 1991. The operator scrapped three pellets which had significant chips in excess of the procedural limit.

3.3.2 Pellet Sintering

The NRC inspectors observed the loading of several boats of pellets into the sinter furnace. The sinter furnace heats the pellets to high temperatures to achieve the proper ceramic density. The furnace operator was observed performing a sintered diameter and density verification using a gamma densitometer on a sample of 5 pellets per boat for four boats in accordance with QCOR 3.1.3.1, "Pellet Sintering," Rev. 24, dated October 23, 1990. The minimum, maximum, and average gamma density and pellet diameter for each sample were found to be within acceptable limits per the QCOR.

3.3.3 Pellet Grinding

The fuel pellet grinding operation and subsequent inspection was observed by the NRC inspectors. During the process the pellets, which have just been sintered, are ground to a specified diameter and measured by a laser. The operators check the pellets per QCOR 3.1.4.1, "UO2 Pellet Grinding," Rev. 16, dated August 19, 1991.

The NRC inspectors observed a QC inspector subject a random sample of pellets to the inspections required by Quality Control Inspection Instruction (QCII)

3.2.3.1, "Pellet Grinding," Rev. 31, dated August 19, 1991. The inspections included checking pellet integrity, length, diameter, surface finish, end squareness and chamfer. All of the inspections were performed correctly by the QC inspector and no defective pellets were found.

3.3.4 First End Plug Welding

The NRC inspectors observed the automated first end plug welding operation for several fuel rods. The weld machine produces a flush weld between the lower end plug and an empty Zircaloy fuel tube, then subsequently examines the weld with an ultrasonic (UT) microscope to determine if the weld characteristics are within acceptable parameters. The machine also performs several quality checks including end plug serial number and diameter verification, end plug-to-tube parallelism acceptability, and weld diameter verification.

The machine operator works to QCOR 7.1.13, "Automated First End Plug Weld Station #3," Rev. 3, dated November 5, 1991, which primarily consists of station set up and calibration verifications. QCII 7.2.7.2, "Automated Flush Weld Inspection Station #3," Rev. 11, dated October 29, 1991, is used by the QC inspector which consists of visual checks and review of QA station printouts from the weld machine as well as handling of rejected rods. Weld samples are submitted to the Chemet lab for corrosion testing on a weekly basis.

3.3.5 Fuel Rod Loading

The NRC inspectors observed the operation of the automatic rod loading machine and the inspections associated with it. The machine weighs and loads fuel pellets into tubing automatically but relies on the operators to provide the correct enrichment pellets in the right order and amount. The operators are guided by QCOR 4.1.5.1, "Fuel Rod Loading - Automatic Rod Loader - UO2," Rev. 11, dated April 26, 1991. The procedures are adequate to ensure that the process is properly performed and were followed conscientiously by the operators.

QCII 4.2.2.1, "Fuel Rod Loading (UO2)," Rev. 18, dated April 23, 1991, was also reviewed by the NRC inspectors. This details the inspections that are required to be performed by a QC inspector during the operation. The inspections include verifying that the machine's scale is properly calibrated, that the plenum gage used to check that the correct length of pellets are inserted in the tube is calibrated, and that proper enrichment control is being maintained by the operators. All of the inspections observed were performed properly.

3.3.6 Final End Plug Welding

After the fuel rods are pressurized with helium, the end plugs are bead welded to the loaded fuel rods for GE-8, GE-9 and GE-10 designs in accordance with QCOR 4.1.3.1, "Final Welding," Rev. 17, dated January 30, 1989, and inspected per QCII 4.2.5.1, "Fuel Rod Final Welding," Rev. 23, September 23, 1991. Every rod is visually inspected for weld integrity and ring gaged for weld diameter. In addition, every 36th rod welded is subjected to x-ray analysis and bench gaged for end plug parallelism verifi..tion, as are all welded out of parameter and all reworked rods. Weld samples are submitted to the Chemet lab for corrosion testing on a weekly basis.

The NRC inspectors observed the automate final end plug welding operation, which is used solely for GE-11 designs, for portions of two fuel rod lots. The weld machine produces a flush weld between the upper end plug and a loaded Zircaloy fuel tube, then pressurizes the fuel rod through a small hole in the upper end plug, which is immediately seal welded. The machine subsequently inspects the rod for leaks using a helium detection system and examines the weld with a UT microscope to determine if the weld characteristics are within acceptable parameters. The weld operator followed QCOR 4.1.9.0, "Flush Final End Plug Welder & UT Inspection," Rev. 0, dated April 19, 1991, to assure the weld process was properly controlled.

The QC inspector was observed performing several ring gage weld diameter checks and a random bench gage end plug parallelism verification as required by QCII 4 2.6.0, "Fuel Rod Final Flush Welding & UT Inspection," Rev. 1, dated June 6, 1991. The QC inspector was also observed placing two rods on an Inspection Report (IR) due to UT rejections based on largest pore values beyond specification limits. The NRC inspector verified proper and current certifications for both the welder and QC inspector and found no anomalies.

3.3.7 Certification Release Inspection

After the fuel rods have completed non-destructive assaying by scanners, the certification release inspector provides the final review of the documentation packages for each fuel rod lot, certifies the completeness and accuracy of the records, and releases approved lots to the bundle assembly area per QCII 5.2.18, "Fuel Rod Record Inspection and Release," Rev. 13, dated November 8 1991. This group also reviews the documentation packages for completed fuel bundle assemblies and certifies them to be shipped to the nuclear sites per QCII 5.2.7 "Fuel Bundle Certification," Rev. 4, dated May 7, 1991.

The NRC inspectors reviewed records associated with two fuel rod lots in the Certification Release Inspection area. One lot package was for a typical 99 rod lot which was 100% accepted and had the proper documentation to support it. The second lot package was for a split lot (only 49 rods) which had three rods rejected due to excessive Gadolinium spikes and improper zone density. The NRC inspectors traced one of those rejected rods to its rework inspection report and verified that it was properly reworked and reinspected.

3.3.8 Fuel Bundle Assembly

The operation of the automated bundle assembly machine (ABAM) was observed by the NRC inspectors for portions of a fuel bundle in accordance with QCOR 5.1.6.1, "Fuel Bundle Assembly - ABAM," Rev. 6, dated March 20, 1991. The operator loads fuel rods into the machine, which sorts them by bundle assembly number based on the serial number of the individual rods. The sorted rods are then inserted into the fuel bundle assembly in their predetermined locations by reading the rod serial number and comparing it to the design project configuration matrix. The automated reader was unable to determine several serial numbers so the operator was prompted to manually enter the serial number after visual determination. In one instance, the operator intentionally entered an incorrect serial number to demonstrate that the computer will disallow any serial numbers which have not been pre-assigned to the matrix of the bundle being assembled.

3.3.9 Bundle Leak Testing

The NRC inspectors observed the leak check operation on a fuel bundle assembly. The QC inspector verified the calibrated built-in leak to be within acceptable limits per QCII 5.2.7, "Fuel Rod/Bundle Leak Check," Rev. 31, dated April 3, 1991, by viewing the helium mass spectrometer output prior to measuring the actual leak rate of the bundle. The actual leak rate was subsequently verified to be within the acceptable limits so the QC inspector accepted the bundle in the automated tracking system and released it to final bundle inspection.

3.3.10 Final Bundle Inspection

The final bundle inspection for a fuel bundle assembly was also observed by the NRC inspectors. The QC inspector performed the 22 required visual inspections and measurements in accordance with QCII 5.2.8, "Fuel Bundle Final Inspection," Rev. 35, dated April 3, 1991. Inspections included serial number verifications, size and spacing measurements using several calibrated gages, and bundle integrity and appearance. All inspections were within acceptance limits so the QC inspector accepted the bundle in the automated tracking system.

3.4 Fuel Cladding

The NRC inspectors reviewed activities to determine what measures GE implements to ensure that fuel cladding exhibits a low susceptibility to nodular corrosion in BWRs. The technical basis for these activities is documented in Quality Notice C-Q-882, "IPHT Qualification Report for Barrier Fuel Tubing," Revision 0, dated April 19, 1990. Duplex tubeshells, or in-process breakdown tubing, consisting of Zr2 on the outside diameter and Zirconium (Zr) on the inside diameter are subjected to induction heat treating which forms a metallurgical structure which is resistant to nodular corrosion on the outside surface and pellet clad interaction (PCI) on the inside surface. Samples of the fuel cladding which is produced from this material are subjected to corrosion testing to substantiate that the material has a metallurgical structure which resists nodular corrosion.

Review of heat treating temperatures for 224 tubes confirmed that the material had been exposed to temperature ranges in accordance with procedural requirements.

The NRC inspectors reviewed the metallurgical structure of metallographic samples from 224 tubes to confirm that the material exhibited the specified metallurgical structure for resistance to nodular corrosion.

Review of 1,170 cladding samples which had been exposed to corrosion testing determined that this material exhibited resistance to nodular corrosion as confirmed by the appearance of the sample surface when compared to applicable visual standards.

The NRC inspectors observed work in process and determined that activities were being performed in accordance with the following drawings and procedures:

- P50YP240, "Zircaloy In-Process Tube Heat Treatment," Revision 2, dated June 27, 1990
- E50YP57, "Processing of Zr Alloy Fuel Components," Revision 5, dated April 10, 1991
- OPS4.8.176.2, "In-Process Heat Treatment (IPHT) Facility," Revision 5, dated July 19, 1991
- Drawing 137C8589, Revision 0, dated January 5, 1991
- B50YP220, "Zr Alloy Tubing with Zr Liner," Revision 19, dated December 15, 1989
- B50YP180, "Zirconium Lined Zircaloy-2 Tube Shell," Revision 17, dated June 12, 1991
- QCOR 14.1.5, "IPHT of Fuel Tubes," Revision 4, dated September 30, 1991
- Method 4.8.192, "IPHT Facility," Revision 2, dated December 13, 1990
- QCII 15.2.1, "IPHT," Revision 5, dated July 10, 1991
- QCII 16.4.1, "Fuel Tubing Certification & Release" Revision 15, dated September 18, 1991
- E50YP56, "Supplemental Corrosion Requirements for Zr Alloys," Revision 0, dated April 22, 1988
- CM&S 2.1.1.3, "Nodular Corrosion Testing of Zirconium Alloy Samples," Revision 3, dated August 21, 1989
- TCR-01, "Nodular Corrosion Visual Standard," Revision 3, dated December 31, 1990

3.5 Purchased Material Quality Control

The NRC inspectors interviewed personnel and reviewed procedures used in the Purchased Material Quality Control (PMQC) department in order to gain an understanding of the procurement process and the quality controls that are placed on it. The NRC inspectors were particularly interested in which materials were purchased safety-related, which were purchased commercial grade, and how the commercial grade items were dedicated.

GE NF&CM purchases very few items safety-related. With the exception of ASME Boiler and Pressure Vessel Code material and Hafnium, the majority of items are purchased commercial grade. Safety-related purchases are controlled by GE Quality Control (QC) Plan A-196, "Safety Related/ASME Code Suppliers-Quality Assurance System Requirements," Rev. 3, dated October 4, 1990. This procedure provides adequate guidance to assure that only qualified suppliers are used, proper documentation is provided by the supplier, and that the requirements of 10 CFR Part 21 are imposed on the supplier.

Commercial grade items are dedicated, in general, by a combination of receipt inspection, source inspection, and commercial grade survey. Many commercial grade suppliers have been audited by GE NF&CM. In addition, audits performed by GE Nuclear Energy, San Jose, CA are also used. QC Plans have been written for specific items and provide guidance on what quality requirements need to be imposed on purchase orders.

To gain a better understanding of the procedures used to place a commercial grade order and the methods used to dedicate an item, the NRC inspector observed a Process Control Engineer process a requisition. The requisition was for 20 stainless steel upper tie plate castings for GE-11 fuel. The engineer reviewed the requisition and, after consulting with another QC engineer, picked the correct testing and documentation requirements to be placed on the purchase order from a bank of standard requirements. The purchase order referenced GE engineering drawings, material specifications and QC plans. It also required that 8 of the 20 castings be x-rayed, 3 of the castings be 100% layout inspected, a microstructure test be performed, a test bar be provided and that certifications and heat treatment charts for all the castings be provided.

The NRC inspectors were also particularly interested in the method used by GE NF&CM to purchase Zirconium and Zircaloy raw material. Discussions with PMQC personnel indicated that this material is purchased commercial grade but that strict controls are placed on the vendors.

The NRC inspectors reviewed QC Plan A-208, "Zirconium and Zircaloy," Rev. 2, dated November 21, 1990, which defines the PMQC requirements for Zirconium and Zircaloy products used in the manufacture of channels and fuel bundles. The plan includes requirements that the vendor maintain a quality assurance program that demonstrates compliance to ANSI N45.2 (except criteria 4 and 12), submit copies of new drawings or procedures to GE for review and approval, provide visual reference standards, and provide material certifications with each order. These requirements, along with annual audits and routine testing, provide reasonable assurance that the material received is of high quality.

An example of the cooperation exhibited between GE and the three suppliers of Zirconium and Zircaloy is the "round robin" testing that was done recently. GE cut one sample from barstock, strip, and tubeshell material that each of the vendors supplied to GE. GE then sent three unmarked samples to each vendor for analysis. The results of the analysis proved that each vendor had supplied material within the tight chemical specifications required.

3.6 Peach Bottom Fuel Failures

The NRC inspectors discussed the recent discovery of leaking fuel bundles at the Peach Bottom plant with GE NF&CM customer service personnel. The issue was particularly interesting to the NRC inspectors because the initial report from the licensee indicated that three of the bundles were first cycle bundles and that one of the failures was believed to be due to a manufacturing defect. At the time of the discussion, an investigation team from GE NF&CM had just been dispatched to the site and no additional information was available.

Subsequent to the inspection, on December 17, 1991, a conference call was conducted involving the NRC inspection team leader and representatives of GE NF&CM, GE Nuclear Engineering (GENE), San Jose, CA, and Philadelphia Electric Company (PECO). This phone call provided the GE representatives with an opportunity to present the findings of the GE investigation team that had been at the site investigating the cause of the leaking fuel bundles.

The team found that there were a total of 11 bundles that had leaking fuel and that 3 of the bundles were first cycle bundles. Since the first cycle bundles were the ones most likely to have failed as a result of a manufacturing defect, the NRC inspectors were most interested in them. The team reported that a large amount of debris was found in the reactor during the investigation and that debris induced fretting failure was suspected for most bundles. Further inspections of the failed bundles are planned, however, since the failures appear to be caused by debris, no further NRC action is planned on this issue.

4.0 PERSONNEL CONTACTED

			D. Antley, QC Inspector
+	*	♦	W. Baker, QC Engineer, Quality Systems
		♦	J. Basilio, Fuel Engineer, PECO
		♦	J. Baumgartner, Fuel Engineer, GENE
+			B. Bentley, Manager, Fuel Manufacturing
			T. Brechtlein, Quality Liaison Manager
+	*		R. Calcaterra, Acting Manager, Purchased Material QC
			D. Christenson, Manufacturing Engineer
+	*		J. Currier, Mgr, Customer Service & Quality Audits
			P. Custer, Fuel Fabrication Inspector
	*		S. Dale, Acting Manager, Chemet Laboratories
			G. Fennell, Assembler
			R. Haughton, Program Manager, Special Projects
			R. Hoffman, QC Inspector
	*		B. Kaiser, Manager, Channels, End Plugs, & Spacers Mfg.
	*		C. Laing, Manager, Fuel Components QA
+	*		J. Liberman, Customer Service Engineer
			A. Lyon, Quality Engineer
			J. Mallard, QC Inspector
			C. Marlar, QC Inspector
			C. Mauitsby, Welder
			B. McKinnon, Certification Release Inspector
			F. McKoy, QC Engineer
	*		D. McLemore, Manager, Tubing Products Operation
			G. Moore, Operator
+	*		W. Ogden, Acting Manager, NF&CM
			R. Parnell, Senior Engineer
	*		L. Roth, Acting Manager, Wilmington Engineering
			N. Seals, Furnace Operator
+	*		P. Sick, Manager, QA
	*		K. Slaton, Communications Specialist
		♦	G. Story, Fuel Engineer, PECO
+			D. Tashjian, Mgr, Control Rods & Stainless Steel Products
			H. Taylor, QC Engineer
+	*		G. Thomas, Customer Service Engineer
			K. Toussaint, Specialist Process Control Engineer
			E. Whitaker, QC Inspector
			D. Williams, Zirconium Program Manager
			H. Young, Operator

+ Attended entrance meeting on November 18, 1991

* Attended exit meeting on November 22, 1991

♦ Participated in conference call on December 17, 1991

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555

October 10, 1991

Docket No.: 99900100

Ivan E. Wilkinson, PhD.
Vice President, Engineering
Limitorque Corporation
5114 Woodall Road
Lynchburg, Virginia 24506

Dear Dr. Wilkinson:

SUBJECT: NOTICE OF NONCONFORMANCE
(NRC INSPECTION REPORT NO. 99900100/91-01)

This letter addresses the U.S. Nuclear Regulatory Commission (NRC) inspection of your facility in Lynchburg, Virginia led by Mr. Michael Snodderly of this office on June 3-7, 1991, and the discussion of his findings with you and your staff at the conclusion of the inspection.

The NRC staff inspected Limitorque Corporation's (LC's) supply of motorized valve actuators to NRC licensees. The performance-based inspection was conducted to evaluate the LC quality assurance program. LC's implementation of its quality assurance program was examined in selected areas such as (1) corrective actions associated with 10 CFR Part 21 notifications that were submitted by either LC or NRC licensees, (2) engineering services performed by LC's Nuclear Support Group, and (3) LC's commercial-grade dedication program. Enclosure 2 provides the inspection report, which includes a discussion of the areas examined during the inspection and our findings. This inspection consisted of an examination of procedures and representative records, interviews with personnel, and observations by the inspectors.

During this inspection, NRC staff found the implementation of your quality assurance program failed to meet certain NRC requirements. Some material certifications were accepted on the basis of insufficient material verification and an LC quality control inspector used an inappropriate drawing to verify a critical characteristic. The program also lacked adequate procedures to prescribe procurement of certain actuator motors. The enclosed Notice of Nonconformance includes the specific findings and references to the pertinent requirements for all nonconformances.

Please provide us, within 30 days from the date of this letter, a written statement in accordance with the instructions specified in the enclosed Notice of Nonconformance. We will consider extending the response time if you can show good cause for us to do so.

The responses requested by this letter and the enclosed notice are not subject to the clearance procedures of the Office of Management and Budget as required by the Paperwork Reduction Act of 1980, Public Law No. 96-511.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter will be placed in the NRC Public Document Room.

If you have any questions concerning this inspection, we will be pleased to discuss them with you.

Sincerely,

Leif J. Norrholm

Leif J. Norrholm, Chief
Vendor Inspection Branch
Division of Reactor Inspection
and Safeguards
Office of Nuclear Reactor Regulation

Enclosures:
1. Notice of Nonconformance
2. Inspection Report No. 99900100/91-01

ENCLOSURE 1

NOTICE OF NONCONFORMANCE

Limitorque Corporation
Lynchburg, Virginia

Docket No.: 99900100/91-01

During an inspection conducted at the Limitorque Corporation (LC) facility in Lynchburg, Virginia, on June 3-7, 1991, the inspection team from the U.S. Nuclear Regulatory Commission (NRC) determined that certain activities were not conducted in accordance with NRC requirements, which are contractually imposed on LC by purchase orders from NRC licensees. The NRC has classified these items, as set forth below, as nonconformances to the requirements of Title 10 of the Code of Federal Regulations, Part 50 (10 CFR Part 50) Appendix B, imposed on LC by contract and the supplemental requirements of its nuclear utility customers.

A. Criterion III of Appendix B to 10 CFR Part 50 requires that design control measures shall provide for verifying or checking the adequacy of a design, such as by the performance of design reviews, by use of alternate or simplified calculational methods, or by the performance of a suitable testing program.

   LC Quality Control Procedure (QCP) 33, Section 33.D, states in part: "The independent reviewer shall perform a verification of the above evaluation process by performing spot checks of both retrieved data and calculated data. The independent reviewer shall indicate which items have been verified by initialing and dating next to the item verified."

   Contrary to the above, LC failed to specifically identify the items that the independent reviewer had verified for valve data sheets associated with the following LC order numbers: 176501 to Texas Utilities, 166750 to Virginia Power, and 174092 to Florida Power and Light (91-01-01).

   Corrective actions and preventive measures that were completed and reviewed during the inspection, as documented in Enclosure 2, NRC Inspection Report 99900100/91-01, were satisfactory to close this nonconformance and no additional response to this nonconformance is necessary.

B. Criterion III of Appendix B to 10 CFR Part 50 states in part: "Measures shall also be established for the selection and review for suitability of application of materials, parts, equipment, and processes that are essential to the safety-related functions of the structures, systems, and components."

Contrary to the above, LC's quality assurance program failed to include an adequate basis for accepting material certifications from certain suppliers. Specifically, LC 4 Inspection Plan No. 23, "Bar Stock, Tubing, Plate," Revision dated May 7, 1991, allows LC to accept material that may be part of a critical component if the supplier's material has been verified by spectrographic or laboratory analysis once per calendar year. LC does not perform audits or commercial-grade surveys of these material suppliers and, therefore, has no basis for accepting certification from these suppliers regarding homogeneity of lots or heats of material. This procurement philosophy also applied to fasteners, greases, and bearings (91-01-02).

Please see the instructions at the end of this notice to respond to this nonconformance.

C. Criterion X of Appendix B to 10 CFR Part 50 states in part: "...Activities affecting quality shall be established and executed by or for the organization performing the activity to verify conformance with the documented instructions, procedures, and drawings for accomplishing the activity."

Contrary to the above, an LC quality control inspector used Drawing 60-600-0070-1, Revision A, instead of the current Revision B to verify Belleville spring thickness (91-01-03).

Corrective actions and preventive measures that were completed and reviewed during the inspection, as documented in Enclosure 2, NRC Inspection Report 99900100/91-01, were satisfactory to close this nonconformance and no additional response to this nonconformance is necessary.

D. Criterion V of Appendix B to 10 CFR Part 50 states: "Activities affecting quality shall be prescribed by documented instructions, procedures, or drawings, of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures and or drawings. Instructions, procedures, or drawings shall include appropriate quantitative or qualitative acceptance criteria for determining that important activities have been satisfactorily accomplished."

Contrary to the above, LC failed to establish instructions, procedures, or drawings to control the dedication of commercial-grade actuator motors purchased from Peerless-Winsmith. As a result of an audit of Peerless-Winsmith conducted in January 1991, LC determined that Peerless-Winsmith could no longer be considered a safety-related vendor. LC was relying on Peerless-Winsmith to perform part of the dedication process and was performing the rest itself.

The exact duties to be performed by Peerless-Winsmith and LC were not specified anywhere. With the exception of the audit report, there was nothing in any quality assurance document, including the approved vendors list, that indicated Peerless-Winsmith was no longer considered a safety-related vendor (91-01-04).

Corrective actions and preventive measures that were presented during the inspection, as documented in Enclosure 2, NRC Inspection Report 99900100/91-01 were satisfactory to close this nonconformance.

Please provide a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C. 20555 with a copy to the Chief, Vendor Inspection Branch, Division of Reactor Inspection and Safeguards, Office of Nuclear Reactor Regulation, within 30 days of the date of the letter transmitting this Notice of Nonconformance. This reply should be clearly marked as a "Reply to a Notice of Nonconformance." For Nonconformance 99900100/91-01-02 (item B), include (1) a description of the steps that have been or will be taken to correct this item; (2) a description of the steps that have been or will be taken to prevent recurrence; and (3) the dates your corrective actions and preventive measures were or will be completed. For Nonconformance 99900100/91-01-04 (item D), include the dates your corrective actions and preventive measures were or will be completed.

Dated at Rockville, Maryland
this 23 day of October 1991

ENCLOSURE 2

ORGANIZATION: Limitorque Corporation
Lynchburg, Virginia

REPORT NO.: 99900100/91-01

CORRESPONDENCE ADDRESS: Dr. Ivan E. Wilkinson, P.E.
Vice President, Engineering
Limitorque Corporation
5114 Woodall Road
Lynchburg, Virginia 24506

ORGANIZATIONAL CONTACT: Rory D. Segen, Quality Assurance Manager
(804) 845-9721/528-4400

NUCLEAR INDUSTRY ACTIVITY: Motorized valve actuators, their replacement parts, and services.

INSPECTION CONDUCTED: June 3-7, 1991

Michael Snodderly 10-23-91
M. R. Snodderly, Team Leader Date
Reactive Inspection Section No. 1
Vendor Inspection Branch (VIB)

S. B. Brewer, General Engineer, VIB
D. C. Ford, Consultant, Ford & Associates
S. L. Magruder, Reactor Engineer, VIB
R. N. Moist, QA Specialist, VIB

Uldis Potapovs 10-23-91
U. Potapovs, Chief Date
Reactive Inspection Section No. 1
Vendor Inspection Branch

INSPECTION BASES: 10 CFR Part 21 and Part 50, Appendix B

INSPECTION SCOPE: (1) Corrective actions associated with 10 CFR Part 21 reports; (2) Engineering services; (3) Limitorque's commercial-grade dedication program; and (4) Corrective actions, unresolved items, and concerns from previous inspection reports.

PLANT SITE APPLICABILITY: Numerous.

1 INSPECTION SUMMARY

1.1 NONCONFORMANCES

1.1.1 Nonconformance 99900100/91-01-01

Contrary to Criterion III of Appendix B to Title 10 of the Code of Federal Regulations (10 CFR) Part 50 and Section 33.D of Limitorque Corporation (LC) Quality Control Procedure (QCP)-33, "Actuator Performance Data Verification," Revision 0, dated August 31, 1989, LC failed to specifically identify the items the independent reviewer had verified for certain valve data sheets.

1.1.2 Nonconformance 99900100/91-01-02

Contrary to Criterion III of Appendix B to 10 CFR Part 50, LC failed to document an adequate basis for accepting material certifications from certain suppliers.

1.1.3 Nonconformance 99900100/91-01-03

Contrary to Criterion X of Appendix B to 10 CFR Part 50, an LC quality control inspector used an inappropriate drawing to verify Belleville spring thickness.

1.1.4 Nonconformance 99900100/91-01-04

Contrary to Criterion V of Appendix B to 10 CFR Part 50, LC failed to establish instructions, procedures, or drawings to control the dedication of certain commercial-grade actuator motors.

1.2 UNRESOLVED ITEMS

1.2.1 Unresolved Item 99900100/91-01-05

The motor actuator characterization (MAC) software system provided significantly different output torque data for SMB-00 actuators than measured by an LC actuator test stand. This condition was reported to the U.S. Nuclear Regulatory Commission (NRC) by Carolina Power & Light Company in a 10 CFR Part 21 report dated April 29, 1991. Further research is required to determine the root cause of this discrepancy.

1.2.2 Unresolved Item 99900100/91-01-06

LC has committed to notify certain NRC licensees of a possible defect concerning the required tension of Reliance motor end bolts. This notification will be made via an LC maintenance bulletin. This item will remain open until the maintenance bulletin is issued.

1.2.3 Unresolved Item 99900100/91-01-07

LC has committed to notify certain NRC licensees of a possible defect concerning improper machining of actuator limit stop housings for HBC-1 actuators. This notification will be made via an LC maintenance bulletin. This item will remain open until the maintenance bulletin is issued.

2 STATUS OF PREVIOUS INSPECTION FINDINGS

2.1 NONCONFORMANCE

2.1.1 Nonconformance 99900100/90-01-01

(Closed) LC failed to establish documented instructions and procedures appropriate for the procurement of technical services involving material verification testing. During the 1990 inspection, the inspector reviewed Immediate Revision Notice 1 to QCP-10 and found it acceptable as initial corrective action to this nonconformance. In a letter dated October 19, 1990, LC reported that training of appropriate personnel was completed by July 2,1990. Therefore, this nonconformance is closed.

2.2 UNRESOLVED ITEMS

2.2.1 Unresolved Item 99900100/90-01-02

(Closed) LC was unable to reproduce motor pinion shaft key failures experienced at a Tennessee Valley Authority (TVA) plant as documented in Engineering Design Document-8. TVA personnel notified LC that this issue had been resolved by changing the motors from 3600 rpm to 1800 rpm. Therefore, this unresolved item is closed.

2.2.2 Unresolved Item 99900100/90-01-03

(Open) LC was still investigating valve actuator torque switch spring pack relaxation. LC was conducting tests designed to simulate field operating conditions in an attempt to reproduce the spring relaxation observed in certain installed LC actuators. The testing performed since the 1990 inspection showed that the tested spring packs took a 5 percent set at 200,000 psi stress after 6 months and remained stable after 9 and 12 months. LC will continue testing for another year to verify that the spring packs remained stable. The NRC will follow the progress of this testing as Unresolved Item 99900100/90-01-03.

3 INSPECTION FINDINGS AND OTHER COMMENTS

3.1 LIMITORQUE'S ACTIONS RELATIVE TO 10 CFR PART 21 REPORTS

The inspectors conducted a performance-based inspection of LC's quality assurance program by reviewing LC's actions taken in response to certain issues identified by LC and NRC licensees in 10 CFR Part 21 reports. NRC staff assigns a log number to these reports when they are received and their status is followed by the NRC's 10 CFR Part 21 tracking system. The issues reviewed by the inspectors and the associated actions taken by LC are discussed below.

3.1.1 MAC Software Deviations (Log Nos. 89-174 & 91-46)

The inspectors reviewed two 10 CFR Part 21 reports about apparent defects in MAC software supplied by LC. This software, when used in conjunction with an LC-supplied test stand, enables licensees to determine the output torque of actuators on the basis of measured spring pack deflection.

LC issued the first report on October 20, 1989 (NRC Log No. 89-174), after the results of spring pack testing done at Carolina Power & Light Company's (CP&L's) Brunswick plant showed that SMB-3 actuators had their closing torque switches set too low as a result of a MAC software error. This error caused the indicated output torque to read high and could have allowed the closing torque switch setting to be reached before the valve was fully closed.

To resolve this issue, LC retested all sizes of actuators for which the MAC software could be used. The results of these tests revealed that LC had made an error in recording data when testing the SMB-3 actuators in the initial development of the MAC software. The software was corrected and all affected licensees were informed. Therefore, this issue is closed.

CP&L issued the second report on April 29, 1991 (NRC Log No. 91-046), following the discrepancies discovered during testing at the Brunswick plant. The MAC software system output torque data for SMB-00 actuators was significantly different from output torque measurements indicated by an LC actuator test stand.

Although LC personnel recalled some telephone conversations with CP&L regarding the testing in January 1991, they were unaware that CP&L had submitted a 10 CFR Part 21 report on this subject until informed by the NRC inspectors. LC personnel were unsuccessful in their attempt to contact CP&L during the inspection to begin investigating the problem. LC committed to further research this issue and to notify other potentially affected customers. Pending further review during a future NRC inspection, this issue is designated Unresolved Item 99900100/91-01-05.

3.1.2 Motor End Bolt Failure (Log No. 89-49)

Vermont Yankee Nuclear Power Corporation issued a 10 CFR Part 21 report to describe the second occurrence of the failure of motor end bell bolts. The tie bolts, as they are commonly called, are a commercial-grade item supplied by Reliance as part of the motor assembly.

When LC was notified of the event, it had Taussig Associated, Inc., analyze the composition of the failed bolts. The bolts were identified as 1010 steel with a hardness of 91 HRB; no undesirable features or detrimental attributes were discovered. The root cause was determined to be a loss of pretensioning, which allowed the motor casing to loosen and vibrate. The vibration forces were transferred to the bolts, causing them to shear. LC verified the licensee's replacement with bolts of ASTM A193 Grade B7 material with a torque of 1.5 ft-lbs.

LC agreed to issue a maintenance bulletin to notify licensees of the need to verify the tensioning of the bolts. Until the maintenance bulletin is issued, this issue is designated Unresolved Item 99900100/91-01-06.

3.1.3 Casting Defects (Log Nos. 89-89 & 90-27)

The inspectors reviewed two 10 CFR Part 21 reports about problems with parts of LC actuators that were made from castings. Washington Public Power Supply System submitted the first report on June 2, 1989 (NRC Log No. 89-089). The report stated that excess material was left on the casting of the upper housing cover of the SMB-2 actuator. This caused pressure to be exerted on the drive sleeve of the upper thrust bearing and prevented free rotation of the bearing. This defect could cause the actuator to provide insufficient thrust to open or close its valve.

LC personnel were familiar with this report and stated that they had reviewed the issue and determined that the upper housing cover was not properly machined. They also stated that service history showed the incident to be an isolated event and that current inspection procedures should prevent recurrence. Therefore, this issue is closed.

Duquesne Light issued the second report on February 14, 1990 (NRC Log No. 90-027), describing a defect found in six HBC-1 actuators at the Beaver Valley Power Station (BVPS) that caused valve motion to cease prematurely in the open direction. BVPS personnel determined that improper machining of the actuator limit stop housing caused binding of the worm shaft bearing. This binding caused the actuator to produce excessive torque when opening the valve and actuated the torque switch before the valve was fully open. BVPS personnel discovered that the defective actuators were manufactured in 1971 and that the problem had been noted before but attributed to faulty torque switches, which were subsequently adjusted to allow the actuator to produce greater torque.

Although BVPS personnel indicated that they had contacted LC about the problem, the LC engineer that BVPS personnel claimed they talked to could not recall any discussions with them. As a result, LC had not performed any evaluation of the defect. The inspectors and LC personnel reviewed the limit stop housing drawing and determined that the cause of the defect was improper machining by the casting supplier. The inspectors and LC personnel agreed that, since the defective housings were manufactured in 1971, finding the root cause of the problem would be very difficult. Since this problem may exist in other actuators without licensees realizing the actual cause of the problem, LC agreed to inform all potentially affected licensees of this problem via a maintenance bulletin. Until the maintenance bulletin is issued this issue is designated Unresolved Item 99900100/91-01-07.

Because of the possible miscommunication between LC and BVPS personnel, LC conducted a training session with nuclear support and service personnel emphasizing the responsibilities of LC personnel in receiving, documenting, and evaluating possible deviations as defined in 10 CFR Part 21. The inspectors were provided a list of LC personnel who received this training on June 6, 1991.

LC also provided the inspectors with a copy of Revision 6 to QCP-22, "Reporting of Defects for Safety Related Equipment," dated June 5, 1991. This procedure implements the requirements of 10 CFR Part 21. The revision included paragraph 22.E.8 which states in part: "If the Part 21 Committee has information that a licensee has reported the condition and in the committee's evaluation it is possible the deviation may be present at other facilities, then the committee shall assure that the issue is addressed in the next maintenance bulletin or advisory mailing to the industry." These corrective actions should significantly reduce the possibility of reporting deficiencies, such as the motor end bolt failure and the casting defects, from reoccurring.

3.1.4 <u>SMB Torque Switch Roll Pin Failures (Log Nos. 90-131 & 91-37)</u>

LC issued a 10 CFR Part 21 report to document deficiencies in the performance of torque switch roll pins installed in certain SMB, SB, and SDB-00 valve actuators. LC performed preliminary testing that indicated these pins may fail after a limited number of declutching operations from the torque switch seated condition. Failures were observed between 11 and 58 declutching cycles, depending on the configuration of actuator spring packs and torque switch materials.

To correct this condition, LC implemented design change notice G-F605, dated October 23, 1990. As a design improvement, the torque switch shaft material was changed from 303 SST precision steel to 416 SST precision steel and the 3/32 inch roll pin was changed to a 1/8 inch groove pin. These design changes resulted in increasing the number of successful declutch cycles to approximately 200 as verified by prototype testing. These improved design torque switches were shipped to commercial facilities in late February 1991.

However, following these actions, the LC engineering department performed testing of two torque switches to confirm the life cycle obtained during prototype tests. Each of the tested switches failed at a range significantly lower than anticipated. Subsequent investigation determined that the new torque switch groove pins were defective and did not exhibit the tensile strength required for this application. Further investigation indicated that the supplied roll pin material was as specified in the LC purchase order and that the LC engineering standard had incorrectly specified the material to be purchased.

As a result of these deficiencies LC issued a 10 CFR Part 21 report on April 3, 1991, requiring affected licensees to return the potentially defective torque switches for replacement. LC actions included revision of the applicable engineering standard, creation of a new part number for the torque switch groove pin, and designation of a single source manufacturer for production of pin materials.

The inspectors verified that these actions had been accomplished and that the current bill of materials and engineering drawings correctly specify "Shearproof Type A Groove Pins" for the torque switch assembly. No additional deficiencies were noted; this issue is closed.

3.1.5 Torque Switch Mounting Bolts and Wire Terminal Screws (Log No. 90-70)

Rochester Gas and Electric submitted a 10 CFR Part 21 report on May 31, 1990, detailing a potential material defect in torque switch mounting bolts and wire termination screws.

LC quality assurance and engineering personnel indicated that the vendor had not received notification of this 10 CFR Part 21 report. Subsequently, LC convened its Part 21 Committee to determine the significance of this issue and specify any required corrective action. As a result of this meeting, LC issued a maintenance bulletin to ensure that torque switch mounting bolts and wire terminal screws are tightened on a periodic basis. This recommendation is commensurate with the actions taken by Rochester Gas and Electric to resolve the deficiencies.

In connection with this issue the inspectors noted that the material deficiencies identified by Rochester Gas and Electric involved SMA type torque switches. These switches were identified in 26 valve actuators, 14 of which performed a safety-related function. LC engineering personnel revealed that the SMA switch in question is no longer manufactured by LC and was never qualified for use in nuclear safety-related applications. In accordance with the requirements of 10 CFR 50.49 (g), these components should have been replaced by Rochester Gas & Electric before November 30, 1985. The nature and recent date of the subject Part 21 report would indicate that the required replacement had not been accomplished and should be further evaluated to determine regulatory compliance and potential impact upon plant operability. No additional deficiencies were noted; this issue, as it pertains to LC, is closed

3.1.6 Transposition Error in Actuator Sizing Calculation (Log No. 89-175)

LC issued a 10 CFR Part 21 report on October 20, 1989, to document errors in actuator sizing calculations for Texas Utilities' Comanche Peak Steam Electric Station. These errors resulted in an output torque at minimum voltage, which was less than that required to trip the actuator torque switch at its minimum setting. In the Part 21 report, LC requested Texas Utilities to determine torque and operating time requirements for the valves in question and forward this information to LC. LC stated that the calculation error was an isolated case not representative of LC's engineering activities.

Texas Utilities responded to the Part 21 report in a letter dated June 18, 1990, specifying a torque requirement of 75 in-lb for both of the valves in question. This information has been factored into LC's revised calculation.

The categorization of this issue as an "isolated case" was questionable since additional evidence of engineering errors was observed during the inspectors' review of LC calculations. A detailed discussion of this issue is provided in Section 3.2 of this report.

3.1.7 SMB-000 and SMB-00 Torque Switch Failures Caused by Fiber Spacers (Log No. 89-155)

Torque switch failures at the Clinton Nuclear Power Station and the Enrico Fermi 2 Generating Station resulted in the issuance of a 10 CFR Part 21 report on September 29, 1989. The failures occurred when stationary contact screws had fiber spacers become loose. These screws are located on the side of the torque switch. LC engineering personnel determined the root cause of this deficiency to be a seating effect of the fiber spacers. Once set, the spacers would release pre-load from the contact screws, thus allowing the screws to loosen. The resultant failure would be an elimination of electrical continuity or an increase in spring pack compression before the electrical contacts would open.

To resolve this concern, the Part 21 report recommends that actuators with cam-type torque switches containing fiber spacers be replaced. Additionally, LC indicated that SMB-00 and SMB-000 torque switch designs were modified to eliminate the use of fiber spacers.

LC Drawing 01-474-056-4 provided basic details for assembly of the torque switch. The initial version of this drawing showed a contact bridge and bridge spacer designated as pieces number 2 and 41, respectively. A 1977 drawing revision "D" changed the bridge spacer from 1 to 2 pieces. Drawing revision "F" issued on October 2, 1980, deleted piece #41 altogether and specifies an increase in the quantity of piece #2 from 2 to 4. Consequently, the LC design was modified to eliminate the use of fiber spacers and replace this material with the hard brass plate used in the contact bridge. A sample of torque switch assemblies stored in the manufacturing facility were examined; each had the required brass spacers under the contact bridge. No additional deficiencies were noted; this issue is closed.

3.1.8 Surface Cracks On Limit Switch Rotors (Log No. 90-88)

Detroit Edison issued a 10 CFR Part 21 report on July 24, 1990, documenting deficiencies in the configuration and material condition of limit switch rotors supplied for SMB-000 valve actuators at the Enrico Fermi 2 Nuclear Generating Station. The specific condition involved rotors supplied with a 3-and-1 electrical contact configuration instead of the 2-and-2 configuration required by plant design and purchase order. Cracking of rotor fibrous material also was noted near the rotor roll pin location.

Detroit Edison initiated an investigation of these concerns at the LC manufacturing facility and concluded that cracks on the rotors "went undetected because of marginal lighting in the inspection area" and that rotor configuration deficiencies resulted when LC stock personnel delivered the wrong parts to the assembly area. These parts were inadvertently assembled and shipped.

Although LC engineering staff indicated it had not received notification of this Part 21 report, specific actions were taken to resolve the concerns: lighting in the nuclear inspection station area was enhanced to facilitate a more detailed examination of components, and LC Inspection Plans No. 38, "Molded Nonmetallic Parts," and No. 99, "2-Train and 4-Train Geared Limit Switch Assembly," contained sufficient detail to ensure components that may exhibit cracking of fibrous materials will be inspected on a sampling basis.

LC also, per memorandum dated July 9, 1990, documented a meeting to discuss surface cracks propagating from or near the roll pin on Fiberite rotors. LC concluded that the defects noted were not cause for rejection by either LC or its customers for the following reasons:

- The Fiberite material is fibrous which tends to prevent crack propagation.

- One-side pin testing substantiated a sufficient strength was available to allow proper actuation of the rotor with one half of the roll pin engaged, thereby simulating a cracked/broken opposite-side failure. This test had been conducted to demonstrate that double drilled rotors had no effect on operation.

- Rotors with cracks were sectioned and examined, revealing the cracks did not propagate below the surface.

- Cracks are an anticipated by-product of the molding process.

- Cracks resulting from drill breakout also are acceptable.

Although LC engineering personnel indicated that an appropriate investigative methodology had been applied to resolve these concerns, it was not detailed in the July 9 memorandum. LC committed to revise this document to reflect the precise steps taken during the investigation. No additional deficiencies were identified; this issue is closed.

3.1.9 Oversized Lugs for Motor Operators (Log No. 90-124)

Alabama Power submitted a 10 CFR Part 21 report on October 19, 1990, concerning loose motor lead connections on LC motor operators that were supplied to the Joseph M. Farley Nuclear Plant.

LC used Thomas and Betts (T&B) terminal lugs as its standard part for motor lead connections and installed the lugs per installation instruction, "Limitorque Wiring Standard," 21-497-0018-3, Revision G, dated December 11, 1990. Alabama Power Purchase Order QP-3209, dated December 2, 1988, paragraph A.6.C of the documentation section, required that Burndy Hylug connectors be installed on motor lead ends. Although SMB Manufacturing Form L-279B, "Special Parts and Instructions," Section A, "Parts Section," did not list Burndy Hylug connectors, Section B, "Remarks Section," stated that Burndy Hylug connectors were to be used on motor ends. LC indicated that no wiring standard or installation instructions were used to install the nonstandard connectors and that LC now encourages its customers to use LC standard T&B connectors.

To prevent recurrence of problems experienced when supplying nonstandard connectors, LC developed an inter-office memorandum dated June 4, 1991, between the Nuclear Projects and the Power Department (sales application). It stated the following concerning nonstandard connectors:

- LC will advise customers that environmental qualification, commercial-grade component dedication, and 10 CFR Part 21 requirements are the customers' responsibility.
- Electrical Engineering shall generate required assembly instructions for manufacturing that will be included in the bill of materials.
- Quality Assurance shall develop the required inspection procedure in conjunction with Quality Control to verify installation.

The minutes of two 10 CFR Part 21 Committee meetings dated October 17, 1990, and May 28, 1991, indicated that this was an isolated incident. In addition, LC stated that no other orders for nonstandard connectors had been shipped to customers since the Alabama Power incident. LC's corrective actions are adequate; this issue is closed.

3.1.10 Worm Shaft Clutch Gear Failure (Log No. 89-91)

Washington Public Power Supply System (WPPSS) submitted a 10 CFR Part 21 report on April 26, 1989, concerning a "soft" worm shaft clutch gear assembly for an SMB-2 valve motor operator that was supplied without a split spacer. WPPSS stated the root cause was improper assembly at the LC manufacturing facility. An LC telephone conversation with WPPSS on February 14, 1989, indicated previous failures of this type had not been experienced. In addition, WPPSS surveyed the Institute of Nuclear Power Operations' nuclear reliability data system and found no failures of this type.

WPPSS purchased a new worm shaft clutch gear assembly from LC and discovered that the set screws were not staked properly. Two of the stakes completely missed the set screws. WPPSS inspected

another worm shaft clutch gear assembly that had been purchased for another SMB-2 motor operator and discovered that none of the set screws were staked.

Staking is a process that prevents the set screws from backing out of their original position. Two methods of staking had been used by LC when assembling worm shaft clutch gears. The staking method used before 1978 was by positioning a punch on the set screw and making an indention at two points by applying force with a hammer. This method was used because the material was induction hardened. After 1978 Loctite 271 was used as the staking method because the material was vacuum carbonized, which is harder than induction hardened material.

LC assembly Procedure 14-608-0111-2, Revision F, dated May 2, 1990, instructed manufacturing personnel on how to assemble worm shaft clutch gear assemblies. LC stated that worm shaft clutch gear assemblies that were processed by the old staking method (before 1978) could have been shipped to customers through 1985.

The inspectors concurred that the root cause of the WPPSS incident was the missing split spacer which appeared to be an isolated case and that LC had appropriate procedures in place to prevent recurrence; this issue is closed.

3.1.11 Missing Dowel Pin (Log No. 90-32)

A 10 CFR Part 21 report, dated February 27, 1991, was issued when an SMB-00-25 actuator failed during preoperational testing at the Palisades Nuclear Power Plant. The failure was caused by a missing dowel pin, which holds the geared limit switch hypoloid in place on the drive sleeve. Without the pin, the hypoloid gear did not turn as the drive sleeve turned and the limit switch was not actuated. The licensee inspected the second block valve with an LC actuator received from Edward Valves Inc. and verified that the pin was in place.

The LC Part 21 Committee carried out an investigation and identified the assembler who was retrained. Quality assurance documented the performance of the training and manufacturing personnel checked all actuators that were assembled within the same timeframe. No other failures were reported. LC also noted that in the past 10 years there had not been a report of a similar failure.

This failure appeared to be an isolated occurrence; this issue is closed.

3.1.12 Excessive Keyway Depth (Log No. 89-196)

This deficiency was originally reported to the NRC in October 1989 and pertains to the failure of an SB-0 actuator at the Watts Bar Nuclear Plant. The failure was caused by the excessive keyway depth in the motor pinion gear. The depth of the motor pinion gear keyway measured 0.111 to 0.106 inch. The key, which connects the motor pinion to the motor shaft, measured 0.125 inch square by 0.875 inch long. Thus, only 0.014 to 0.019 inch of key interference remained to prevent the gear from rotating on the motor shaft. This inadequate interference resulted in key failure and subsequent gear rotation. The motor pinion gear set screw galled the motor shaft, temporarily preventing further gear rotation. The actuator on the opposite train component had a similar motor pinion gear keyway depth. Although this key had not yet failed, indentations along the length of the key indicated impending failure. Because there had been no modifications on the two gears by the Tennessee Valley Authority (TVA) or Westinghouse, the manufacturer was responsible for the defective motor pinion gears.

LC ascertained that eight units were supplied to Westinghouse under the same order in the 1975 timeframe. The affected motor pinion was a 41-tooth motor pinion used in SMB, SB, and SBD actuators. To be certain that all actuators manufactured during this timeframe were inspected, LC notified the utilities that had received actuators with serial numbers 193652 through 279518 manufactured between August 1974 and August 1978. This was done in accordance with the requirements of 10 CFR Part 21.

LC no longer manufactures the keyways in the same manner. In 1978 LC began broaching the keyways, thus reducing the possibility of cutting the keyway incorrectly. LC's actions were sufficient to prevent recurrence of this defect because of the improved manufacturing technique. This issue is closed.

3.2 TECHNICAL SERVICES

The LC Nuclear Support Group performs engineering services for many commercial license holders. Services range from simple assistance in determining applicable industry codes and standards to detailed analysis of client service conditions relating to actuator performance. The inspectors reviewed this process to determine the adequacy of LC engineering services. The review was initiated in part by concerns identified in an LC 10 CFR Part 21 report dated October 20, 1989 (discussed in Section 3.1.6 of this report). Particular emphasis was placed on the design review process and post-design verification of calculations or engineering data sheets. The inspectors selected a sample of purchase orders requesting LC to verify actuator performance.

The Nuclear Support Group performed the following steps for each purchase order:

- Obtain the necessary Limitorque master files and the original bill of material or manufacturing form.

- Review existing sizing and component assignment.

- Evaluate the originally supplied torque switch setting, torque, thrust, output rpm and reduced voltage characteristics.

- Confirm that the above calculated results fall within the supplied spring pack curves requested by the licensee.

- Confirm thrust and torque values against licensee requirements (original and new).

- Where reduced or elevated voltage requirements exist, confirm the data by performing new calculations.

- Compare the as-built supply data with the requirements of the current customer purchase order. If the supplied actuator fails to meet the new performance characteristics, the discrepancies shall be clearly noted. Each noted performance characteristic shall be evaluated and a recommendation for modification to meet new performance requirements made and documented.

The maximum pullout torque is the calculated nominal output torque developed by the actuator at 80 percent of the motor rated voltage. It is needed to provide the actuator torque switch settings. Once obtained, recommended and maximum torque switch settings were recorded on the data sheet. The maximum setting of the torque switch was determined by the lowest of the following three limitations: output of the motor at a given reduced voltage, spring pack maximum deflection, and maximum gear rating.

The inspectors reviewed data sheets for several purchase orders to determine the accuracy of the information provided and compliance with requirements of, QCP-33, "Actuator Performance Data Verification Procedure," which was one of the implementing procedures to meet the requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. Engineering services had been performed as required and resultant data sheets accurately depicted equipment information and calculated values. Data sheets were consistent in the identification of discrepancies in performance characteristics and gave clear warning when calculations determined that an actuator may not be capable of meeting required valve torque. Each of the packages contained a statement emphasizing that final calculations were based on original bill of materials information and did not reflect any changes made following shipment from LC. This statement is considered critical to any interpretation of calculated performance characteristics because licensee-initiated changes to items such as motors, torque springs, worm shaft gears, and motor pinions, may dramatically affect actuator performance and these calculations.

QCP-33, Section 33.D, requires that an independent reviewer perform an evaluation of the engineering process by performing spot checks of both retrieved and calculated data. The procedure states: "The independent reviewer shall indicate which items have been verified by initialing and dating next to the item verified." Contrary to this requirement, the valve data sheets for LC Order Numbers 176501 to Texas Utilities, 166750 to Virginia Power, and 174092 to Florida Power and Light contained only limited reference to the initials and dating required by the implementing procedure and, where present, did not indicate which aspects of the calculation had been verified (see Nonconformance 99900100/91-01-01).

In response to this deficiency, the LC quality assurance department issued a nonconformance response on June 6, 1991, stating that the root cause of the deficiency was improper implementation of the procedure by the Nuclear Support Group. To prevent recurrence of this deficiency, the quality assurance Manager conducted and documented a special training session with the three individuals of the Nuclear Support Group. The training session emphasized the review process for valve data sheets. These actions are adequate to close Nonconformance 99900100/91-01-01.

Actuator sizing data sheets for Texas Utilities and Florida Power and Light indicated that inappropriate data may have been transmitted to the utility. Multiple actuators were detailed in a single data sheet under LC Order Numbers 3A2956B, 3B9375B, 3G0861A, 3A3122E, and 3C6720G. Each of these actuators had been originally subjected to thrust testing. Consequently, each actuator should have been assigned a unique data sheet detailing the serial number and appropriate thrust values. Additionally, the recommended torque switch setting on the data sheet did not match the as-shipped setting specified on the original Westinghouse data sheet. Finally, torque instead of thrust values were provided for the thrust at torque switch trip point. In response to this issue, LC issued a memorandum detailing these concerns and instructing the engineering department to:

- Review all previously transmitted data packages for similar occurrences. If found, advise the customer that this data is incorrect and will be revised and retransmitted.

* Conduct a training session to ensure that responsible parties understand this methodology and that future data transmittals are processed accordingly.

The inspectors believe that a detailed independent review of this package would have identified these data deficiencies. In connection with the previously described issue involving independent review, it would appear that a more detailed approach to design review may be merited. However, the data deficiencies identified in this package appeared limited to a unique class of actuators originally thrust tested by Westinghouse and thus represented design considerations not common to the standard actuator sizing validation effort.

3.3 DEDICATION PROGRAM

LC defined dedication as "the process by which a commercial-grade item is inspected and or tested to assure compliance with an item's engineered design requirements necessary to assure its function." With the exception of some safety-related actuator motors and control wire, everything that LC sells as safety-related was purchased as a commercial-grade item and dedicated by LC. This section provides an overview of LC's part classification philosophy and dedication process as well as some examples of actual dedications reviewed during the inspection.

LC analyzed all of the parts that make up the actuators that it sells for safety-related applications and classified them as either critical or noncritical. These parts are cataloged in engineering document ECC-0001, "Safety Related Actuator Critical Components Evaluation and Listing." LC's analysis determined whether each part was critical by assuming that a critical part is one that is required to function either actively or in a changed state to ensure that the operator can remain in position, disengage from emergency hand operation, reposition under motor power to either a fully opened or closed position, or perform cycling operation within the designed motor and actuator duty cycle. In addition, a critical part is defined as one that receives a stress approaching design or material limitations during the completion of a safety function, or one that could reasonably result in actuator failure if it failed to function or one that is essential for motor operation or to shift into motor operation.

All products sold by LC were treated identically until after the final inspection was complete and the purchaser was known. If products were sold as safety-related parts additional inspections were done to verify that the parts were acceptable. No audits were done on any commercial-grade suppliers; therefore, LC relied totally on receipt inspection and testing to dedicate the items.

The dedication process relied heavily on the normal receipt, in-process, and final inspections. Receipt inspection was the first step in the process and was governed by QCP-3, "Receipt Inspection Procedure." The inspection of items was divided into three categories: raw material, semi-finished, and finished material. Raw material was defined as "material used in the fabrication of a product, such as forgings, castings, bar stock, tubing, etc." Semi-finished material was defined as "items received in the partially completed condition and do require additional processing." Finally, finished material was defined as "items received in the completed condition and do not require additional processing."

All materials were inspected in accordance with a sample plan that was based on MIL-STD-105D and instructed the inspector as to how many pieces need to be inspected. QCP-3 provides general guidance on how the inspection should be performed, including what attributes should be checked and what data needs to be recorded. The attributes to be checked may include material verification, geometric verification of dimensions, hardness, and functional testing. In addition, the majority of the items making up an actuator that could be used in a safety-related application were covered by their own inspection plan. These inspection plans provided more detailed instructions on what to check for each item and use the same sample plan as QCP-3.

Because no audits were performed on commercial-grade suppliers, LC had no basis for accepting certification from the supplier regarding homogeneity of lots or heats of material. LC verified material certifications from suppliers by testing samples on a varying basis, depending mostly on the capability of its test equipment. For example, some alloy steel bar stock was tested on a once-per-heat basis while other bar stock that cannot be tested in house was tested on a once-per-year-per-supplier basis. Safety-related fasteners are checked for material on a once-per-year-per-supplier basis, configuration (making sure that the part looks like the right part), and the number of threads per inch. Greases used in safety-related actuators were only tested on a once-per-year-per-supplier basis. The only checks performed on bearings during inspections were dimensional configuration and part number (see Nonconformance 99900100/91-01-02).

Once an item was receipt-inspected, it was placed in stock until it was needed to fill a work order. In the case of raw or semi-finished material, the items were run through the machining processes required by the work order. The parts being manufactured were kept together and were always accompanied by the work order. In-process, visual and dimensional, inspections were performed after each department in the manufacturing process was finished with the parts. The sample plan for these inspections calls for the inspection of five pieces or 10 percent of the order, which ever was greater.

Completed parts were sent to a final inspection station for a last check to verify that they had been machined properly and that all of the in-process inspections were performed and documented properly. The final inspection was governed by QCP-35 "Final Inspection," and again the sample plan was based on MIL-STD-105D. After final inspection, the parts were placed in a storage area until needed.

When an order was received for a safety-related replacement part or complete actuator, the parts were pulled from the storage area, given a special routing sheet, and brought to the nuclear inspection station, where the dedication process was completed and the items were designated as suitable for use in safety-related applications. The final dedication process was governed by QCP-38, "Inspection of Safety Related Nuclear Service Units and Parts Orders," and three inspection plans (IPs): IP 38 for geared limit switch assemblies, IP 39 for torque switch assemblies, and IP 104 for miscellaneous parts and hardware.

During a tour of the nuclear inspection station, a quality control inspector was verifying Belleville washer thickness in accordance with QCP-38, Revision 0, Step D.3.6. The inspectors questioned why the thickness tolerance the quality control inspector was using was different from that reflected on LC Drawing No. 60-600-0070-1, "Belleville Spring," Revision A. The inspectors were told that the quality control inspector should have been using Revision B of the drawing which reflects the currently used tolerances (see Nonconformance 99900100/91-01-03). In response to this deficiency, the LC quality assurance department issued a nonconformance response on June 6, 1991, stating that the root cause of the deficiency was twofold. First, the procedure lacked adequate direction to the quality control inspector, and second, the quality control inspector was unaware that the proper drawing revision could be verified on a main frame terminal that was available in the inspection area. In order to prevent recurrence of this deficiency, LC issued an immediate revision notice to define responsibility for ensuring the latest revision of the drawing was being used in quality verification activities. In addition, quality control personnel received training on the revised procedures and how to access the current revision of a drawing using LC's computer system. These actions were sufficient to close Nonconformance 99900100/91-01-03.

LC did not have a separate document listing critical characteristics for commercial-grade parts that were to be dedicated. QCP-38 and the associated IPs did, however, contain specific inspections and tests to be performed on 100 percent of the parts that were dedicated to verify what LC considers to be critical attributes. For a complete actuator assembly these tests would include the following: using dye penetrant to inspect the worm; verifying that viton seals, O-rings, quad rings, and gaskets had not exceeded their shelf life; checking the thickness of Belleville springs; measuring the run-out datum of the rotor; hardness testing of the worm, worm shaft gear, motor pinion, clutch, clutch sleeve, motor pinion key, and intermediate gear key; checking proper staking of worm locknut and bearing cartridge locknut; visually inspecting motor; checking acceptability of worm and worm gear contact; and inspecting geared limit and torque switches per the applicable inspection plan. Inspection of individual part orders followed basically the same tests as specified for a complete unit, where applicable, although many parts received only a cursory visual inspection.

3.3.2 Dedication of Worm Gear

The worm gear, P/N P60-410-0098-3, for an SMB-2 actuator was machined from a worm gear blank casting that was supplied by Wisconsin Centrifugal, Inc. A sample of the castings supplied by Wisconsin Centrifugal was tested for physical and chemical properties on an annual basis, therefore, no testing was done on any of the blanks in this lot (see Nonconformance 91-01-02). The receipt inspection was conducted in accordance with IP 56 and consisted of checking specified dimensions, visually checking for porosity and finish, and checking the certified material test report sent with the castings. If these worm gears were to be sold as safety-related parts, the next step of the process would be the nuclear inspection station. In accordance with QCP-38, 100 percent of the worm gears would have been visually inspected to ensure that they were properly tagged, cleaned, and deburred.

3.3.3 Dedication of Worm Shaft Clutch Gear

Each part listed on the bill of materials for the worm shaft clutch gear assembly for an SMB-2 actuator was reviewed by LC's quality engineer and chief engineer for part function, part failure mode, effect (consequence) of failure on actuator function, actuator function affected, and part classification to determine if the part was critical or noncritical. All of the above information was translated to a critical and noncritical justification sheet. The evaluation cover sheet for each critical and noncritical sheet for the worm shaft clutch gear assembly was approved by applicable personnel.

The inspectors reviewed four critical parts of the worm shaft clutch gear assembly to determine what critical attributes were invoked in special inspection plans by LC quality assurance personnel. LC quality assurance personnel developed Special Inspection Plan 023, Revision 4, dated May 7, 1991, for bar stock, tubing, and plate material. Receipt inspection used special inspection plans that identified the critical attributes to be verified and acceptance criteria associated with each attribute. Chemical composition for the material of three of the four critical parts were verified once per heat per shipment using spectrographic analysis and the other critical part was verified once per calendar year per supplier by laboratory analysis. LC did not maintain traceability by heat number; therefore, the inspectors were concerned that some materials were only sampled for verification once-per-calendar-year-per-supplier (see Nonconformance 99900100/91-01-02). The vendor material certification showed that LC verified the validity of the material certification by spectrographic analysis and that the test results were approved by applicable personnel. In addition, hardness was inspected in accordance with QCP-38, "Inspection of Safety-Related Nuclear Service Units and Parts Orders," Revision 0, dated December 5, 1990. Hardness acceptance criteria was on the applicable drawing for the worm shaft clutch gear. Hardness measurements were performed with appropriate equipment and recorded on Inspection Sheet Form L-613 for the worm shaft clutch gear.

3.4 PROCUREMENT OF PEERLESS-WINSMITH DC MOTORS

LC Purchase Order 28393, dated May 1, 1991, to Peerless-Winsmith for the purchase of SMB-2 motors was reviewed by the inspectors. LC invoked Peerless-Winsmith's Quality Control Procedure; LC specification Electrical Quality Control Document-1, Revision H; specifications for DC Containment Chamber Motor, Drawing No. 21-497-0014-1, Revision G; and 10 CFR Part 21. These documents provided technical and quality requirements such as: Peerless-Winsmith's Quality Assurance Program, insulation type, equipment qualification, and electrical performance.

LC quality assurance personnel had audited Peerless-Winsmith recently and found its quality assurance program inadequate to provide safety-related parts. The LC auditors specifically noted deficiencies in Peerless-Winsmith's design control measures, measuring and test equipment controls, and material testing program.

On the basis of its last audit of Peerless-Winsmith, LC has incorporated measures to verify materials for the critical parts and assemblies used in manufacturing its motors. During the audit, LC and Peerless-Winsmith performed a component review to establish the criticality of components within the motor. This review was documented on a critical and noncritical component justification sheet. LC selected a sample of critical parts from the Peerless-Winsmith stockroom and furnished the parts to an LC-approved laboratory for material analysis. LC was establishing a baseline for the parts and planned to pass the requirement of certifying materials to Peerless-Winsmith on future orders. Peerless-Winsmith was responsible for the performance of the DC motors and LC is responsible for the dedication of critical materials used within the motors. In addition, during receipt inspection LC quality assurance personnel reviewed motor test data submitted by Peerless-Winsmith with each motor order.

These additional checks on the material used by Peerless-Winsmith to manufacture LC motors were not reflected in any quality assurance procedures or instructions. In fact, LC had rated Peerless-Winsmith higher on its approved vendors list (AVL) than its other motor supplier who does have an LC-approved quality assurance program. LC explained that the AVL ratings were based on the rejection rate of parts during receipt inspection. LC further explained that everyone who dealt with Peerless-Winsmith understood the situation. LC believed the audit report was sufficient to document its dedication process. The inspectors did not agree that an audit report was an acceptable method to control the dedication of the motors because an audit report was not an official quality assurance procedure, instruction, or drawing but rather a supporting document. In addition, the audit report provides no guidance on what materials from Peerless-Winsmith should be tested, how often they should be tested, or where they should be tested (see Nonconformance 99900100/91-01-04). However, during the inspection, LC presented a formal response to the nonconformance and committed to create a procedure for the dedication of Peerless-Winsmith motors.

3.5 EXIT INTERVIEWS

On June 7, 1991, the inspection team conducted an exit interview with the persons indicated in the list below.

4 PERSONS CONTACTED

*	T. S. Mignogna	President, Limitorque Corporation
*	R. J. Kornsey	Executive Vice President
+	R. Tyre	Vice President, Manufacturing
*	I. E. Wilkinson	Vice President, Engineering
+	W. J. Miluszusky	Quality Control Manager
+*	P. G. McQuillan	Nuclear Project Manager
+*	R. D. Segen	Quality Assurance Manager
	R. M. Bailey	Sales Support Manager
	R. G. Pence	Assistant Chief Engineer
+	F. J. Napoli	Quality Assurance Engineer
	M. B. Bailey	Nuclear Support Group

\+ Attended entrance meeting on June 3, 1991
* Attended exit meeting on June 7, 1991

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555

October 10, 1991

Docket No. 99900094

Mr. Jerry T. Bashe, General Manager
and Vice President
Masoneilan North American Operations
Dresser Valve and Controls Division
Dresser Industries, Incorporated
85 Bodwell Street
Avon, Massachusetts 02322

Dear Mr. Bashe:

SUBJECT: NOTICE OF VIOLATION
(NRC INSPECTION REPORT NO. 999000°4/91-01)

This letter addresses the inspection of your facilities at Avon and Canton, Massachusetts, led by Mr. J. J. Petrosino of my staff on June 3-7, 1991, and the discussions of his findings with Mr. W. T. Allen III, and other members of your staff at the conclusion of the inspection.

The U.S. Nuclear Regulatory Commission (NRC) staff conducted the inspection to review a matter identified by the Wolf Creek Nuclear Operating Corporation (WCNOC) in a report of August 29, 1989, that was submitted in accordance with Part 21 of Title 10 of the Code of Federal Regulations (10 CFR Part 21). The WCNOC report questioned the validity of Masoneilan-Dresser Industries (MD) certificates of conformance (CoC) that accompanied safety-related valve parts. The enclosed report discusses the areas examined during this inspection and our findings. This inspection consisted of an examination of procedures and representative records, interviews with personnel, and observations by the NRC inspection team.

During this inspection, it was found that the implementation of your quality assurance (QA) program failed to meet certain NRC requirements. The most significant inspection finding was that MD failed to adopt appropriate procedures to implement the requirements of 10 CFR Part 21. As a result, MD neither evaluated nor informed its customers in accordance with 10 CFR Part 21 regarding multiple deviations that it had recognized in May of 1989 regarding its CoCs. MD had supplied these CoCs with non-pressure boundary nuclear valve parts and accessories. Prior to May 1989, MD had typically supplied valve parts and accessories with CoCs which indicated that parts and accessories were controlled in accordance with Appendix B to 10 CFR Part 50 and 10 CFR Part 21. However, MD did not control the parts and accessories under an Appendix B QA program and did not consider 10 CFR Part 21 in its activities. Therefore, during the inspection your staff committed to develop and issue a letter to your customers informing them of the deviations in accordance with 10 CFR Part 21.

However, on August 12, 1991, your staff informed the NRC team leader that Dresser Industries (DI) legal staff advised MD to not inform the NRC licensees of the deviation until after DI staff received and reviewed this inspection report. In the opinion of NRC staff this constitutes an additional failure to comply with your 10 CFR Part 21 responsibilities in a timely manner, especially after your June 7, 1991 commitment to the NRC inspection team, to expeditiously inform your customers. Consequently, this matter will be reviewed further by NRC staff. We do, however, understand that MD did inform its customers on October 7, 1991.

You are required to respond to this letter and should follow the instructions specified in the enclosed Notice of Violation (Notice) when preparing your response. In your response, you should document the specific actions taken and any additional actions you plan to prevent recurrence. After reviewing your response to this Notice, including your proposed corrective actions and the results of future inspections, the NRC will determine whether further NRC enforcement action is necessary to ensure compliance with NRC regulatory requirements.

The response requested by this letter is not subject to the clearance procedures of the Office of Management and Budget as required by the Paperwork Reduction Act of 1980, Public Law No. 96-511. In accordance with 10 CFR Part 2.790 of the NRC regulations, a copy of this letter and the enclosed inspection report will be placed in the NRC's Public Document Room.

If you have any questions concerning this inspection, we will be pleased to discuss them with you.

Sincerely,

Leif J. Norrholm

Leif J. Norrholm, Chief
Vendor Inspection Branch
Division of Reactor Inspection
and Safeguards
Office of Nuclear Reactor Regulation

Enclosures:
Notice of Violation
Inspection Report No. 99900094/91-01

NOTICE OF VIOLATION

Masoneilan-Dresser Industries
Avon, Massachusetts

Docket No. 99900094
Report No. 91-01

During an inspection conducted at the Masoneilan-Dresser Industries (MD) facilities in Avon and Canton, Massachusetts on June 3 to 7, 1991, the staff identified violations of the U.S. Nuclear Regulatory Commission (NRC) requirements. In accordance with the "General Statement of Policy and Procedures for NRC Enforcement Actions," 10 CFR Part 2, Appendix C (1991) to Part 2 of Title 10 of the Code of Federal Regulations (10 CFR Part 2), the violations are listed below:

A. Section 21.21, "Notification of failure to comply or existence of a defect," of 10 CFR Part 21 requires, in part, that each individual or other entity subject to 10 CFR Part 21 adopt procedures that appropriately provide for: evaluating deviations to procurement documents, or inform applicable licensees or purchasers in order that the licensee or purchaser may cause deviations to be evaluated.

   Contrary to the above, MD Procedure QAS 1.4, "Reporting Requirements Concerning Defects and Noncompliance-10 CFR Part 21," Revision 0, of March 1, 1990, was not adequate to ensure that MD performed an evaluation or informed the customer in accordance with 10 CFR Part 21 of all past MD certificates of conformance (CoCs) which expressed certification of safety-related components even though the components were commercial-grade. Examples of ambiguous certifications for nuclear safety-related orders are as follows: (91-01-01)

   * MD CoC, of March 18, 1986 for 64 NAMCO limit switches Model EA170-11100 for Kansas Gas and Electric (KG&E) Company purchase order (PO) 512092, February 5, 1986. The PO imposed Appendix B to 10 CFR Part 50 (Appendix B), 10 CFR Part 21 (Part 21) and an architect-engineer (AE) equipment specification that required qualification to certain portions of the Institute of Electrical and Electronics Engineers (IEEE) Standards 323 and 344. The MD CoC stated conformance to PO 512092 and the AE equipment specification. However, the 64 limit switches were not processed, supplied, or qualified to the PO requirements.

* MD CoC, of June 12, 1986, for 24 MD air sets, Model 74-202, for KG&E PO 512092. The PO imposed the same requirements as above. However, this is an MD-manufactured product, and was not controlled, supplied, or qualified to the PO requirements, even though the MD CoC included the statement: "Made in Accordance with Bechtel Specification 10466-J-601A...10 CFR Part 21...10 CFR Part 50 Appendix B."

* MD CoC, of April 30, 1987, for an electro-hydraulic safety-related valve actuator, Part 976015-049 for New York Power Authority, Fitzpatrick PO 86-2820, August 13, 1986, imposed the requirements of Appendix B to 10 CFR Part 50, 10 CFR Part 21, and ASME/ANSI N45.2 QA program. However, this MD manufactured product was not controlled or supplied in accordance with the PO requirements, even though the MD CoC stated that the component conformed to the PO requirements.

* MD CoC, of September 1, 1989, for a safety-related MD valve assembly, valve serial 35-35112, with MD Model 4612 valve positioner and MD Model 77-4 air set, for Northeast Utilities PO No. 912663, June 6, 1988. The PO imposed the following: 10 CFR Part 21, safety-related application, and the requirement to be equal to or better than the original items. However, neither the positioner nor the air set were controlled, manufactured, or supplied in accordance with the PO requirements.

* MD CoC's, of June 9, 1988, and June 10 1988, for safety-related MD Model 8012-3-C valve positioners for Louisiana Power and Light PO 17222 of March 26, 1988. The PO imposed safety-related application, 10 CFR Part 21 and the "equal to or better than original items" clause. However, the positioner was not controlled, manufactured, or supplied in accordance with the PO requirements.

This is a Severity Level IV Violation (Supplement VII).

B. Section 21.6, "Posting requirements," of 10 CFR Part 21 requires, in part, that each individual or other entity subject to 10 CFR Part 21 post "(1) the regulations in this part, (2) Section 206 of the Energy Reorganization Act of 1974, and (3) procedures adopted pursuant to the regulations in this part."

Contrary to the above, MD failed to post copies of Section 206 of the Energy Reorganization Act of 1974 with its 10 CFR Part 21 postings. (91-01-02)

This is a Severity Level V violation (Supplement VII).

In accordance with the provisions of 10 CFR 2.201, Masoneilan-Dresser is hereby required to submit a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C. 20555 with a copy to the Chief, Vendor Inspection Branch, Division of Reactor Inspection and Safeguards, Office of Nuclear Reactor Regulation, within 30 days of the date of the letter transmitting this Notice of Violation. This reply should be clearly marked as a "Reply to a Notice of Violation" and should include the following for each of the violations:

1. The reasons for the violation, or, if contested, the basis for disputing the violation,
2. The corrective steps that have, or will be taken, and the results achieved,
3. The corrective steps that have, or will be taken, to avoid further violation, and
4. The date when full compliance will be achieved.

Where good cause is shown, the staff will consider extending the response time.

Dated at Rockville, Maryland
This 10th day of October 1991

ORGANIZATION:	Masoneilan North American Operations Dresser Valve and Controls Division Dresser Industries, Incorporated Avon, Massachusetts
REPORT NO.:	99900094/91-01
ORGANIZATIONAL CONTACT:	Mr. John Kerr, QA Manager for Massachusetts (508) 941-5430
NUCLEAR INDUSTRY ACTIVITY:	Manufactures and supplies valves, valve parts, and supplies material that conforms to the American Society of Mechanical Engineers (ASME), Boiler and Pressure Vessel Code (Code) Section III. Masoneilan-Dresser is a current holder of the ASME Code N stamp and NPT stamp certificates.
INSPECTION CONDUCTED:	June 3 to 7, 1991
LEAD INSPECTOR:	Joseph J. Petrosino, Team Leader — Date Reactive Inspection Section No. 1 (RIS-1) Vendor Inspection Branch (VIB)
OTHER INSPECTORS:	K. Sullivan, Brookhaven National Laboratory T. Tinkel, Brookhaven National Laboratory
APPROVED BY:	Uldis Potapovs — 9-23-91 Uldis Potapovs, Section Chief, — Date RIS-1, VIB, Division of Reactor Inspection and Safeguards
INSPECTION BASES:	10 CFR Part 21 and Appendix B to 10 CFR Part 50
INSPECTION SCOPE:	To review the circumstances surrounding an August 29, 1989, 10 CFR Part 21 report submitted to the NRC from Wolf Creek Nuclear Operating Corporation regarding lack of objective evidence to support Masoneilan-Dresser certificates of compliance received with safety-related components.
PLANTS AFFECTED:	Multiple

1 SUMMARY

1.1 Violations

1.1.1 Contrary to Section 21.21, "Notification of failure to comply or existence of a defect," of 10 CFR Part 21, Masoneilan-Dresser (MD) failed to adopt procedures that were appropriate to provide for evaluating deviations or informing the licensee or purchaser of the deviation in order that the licensee or purchaser could cause the deviation to be evaluated. The inspectors identified several examples of MD's past practices of issuing certificates of compliance (CoC) (before May 1989) that were ambiguously written and could be interpreted as providing safety-related basic components, when in fact the CoC's accompanied commercial-grade components, for example: (91-01-01)

- March 18, 1986, MD CoC to Kansas Gas and Electric Company (KG&E) for 64 NAMCO limit switches, Model EA-170-11100, KG&E PO 512092.

- June 12, 1986, MD CoC to KG&E for 24 MD Model 74-202 air sets, KG&E PO 512092

- April 30, 1987, MD CoC to New York Power Authority (NYPA) for an MD electro-hydraulic valve actuator, Part 976015-049, NYPA PO 86-28020.

- September 1, 1989, MD CoC to Northeast Utilities (NU) for an MD Model 4612 valve positioner and MD Model 77-14 air set, for NU PO 912663.

- June 9, 1988, and June 10, 1988, CoC to Louisiana Power and Light (LP&L) for MD valve positioners Model 8012-3-C, for LP&L PO 17222.

1.1.2 Contrary to Section 21.6, "Posting requirement," of 10 CFR Part 21, MD failed to include a copy of Section 206 of the Energy Reorganization Act of 1974, with its posted documents as required. (91-01-02)

2 STATUS OF PREVIOUS INSPECTION FINDINGS

2.1 (Closed) Notice of Violation-Report 99900094/83-01

The 1983 U.S. Nuclear Regulatory Commission (NRC) inspection report indicated that MD had failed to establish procedures in accordance with 10 CFR Part 21.21. The NRC inspector verified that MD established MD Procedure 236-M-174 in 1983 to address the provisions of 10 CFR Part 21. However, the procedure was not adequate and resulted in identification of violation 91-01-01.

2.2 <u>(Closed) Notice of Nonconformance - Report 99900094/83-01</u>

The 1983 inspection report indicates that the NRC inspector found that MD was implementing shop changes and revisions to its production orders without receiving the approval of quality assurance (QA) personnel or being presented to the authorized nuclear inspector to establish hold points. The NRC inspector reviewed the applicable portions of the MD QA program manual. This manual addresses ASME and Appendix B to 10 CFR Part 50 requirements. The manual was titled: "QA Manual for Valve and Valve Parts," Revision 1, Second Issue, dated April 15, 1990. MD adopted a procedural process control that appears to adequately address this nonconformance.

2.3 <u>(Closed) Notice of Violation-Report 99900094/88-01</u>

Violation 88-01-01 identified that MD Procedure 236-M-174, Revision B, adopted to address the provisions of 10 CFR Part 21, required individual MD employees to notify their supervisors of deviations or nonconformances only after the individual employees determined a substantial safety hazard. The NRC inspector reviewed the current MD 10 CFR Part 21 procedure, Procedure QAS 1.4, "Reporting Requirements Concerning Defects and Noncompliance - 10 CFR Part 21," Revision 0, and verified that the procedure satisfactorily resolved previous NRC concerns.

However, during this inspection the inspector identified that Procedure QAS 1.4 did not establish adequate requirements to ensure that all deviations are either evaluated or passed on to the licensee. Violation 91-01-01 addresses this concern.

2.4 <u>(Closed) Notice of Nonconformance-Report 99900094/88-01</u>

Nonconformance 88-01-02 identified two instances in which MD was not in full compliance with Criterion IV, "Procurement Document Control," of Appendix B to 10 CFR Part 50. In the first instance, MD failed to pass on to sub-tier manufacturers and suppliers the safety-related QA requirements that were imposed on MD by the licensee POs. In the second instance MD ordered material that it used on licensee-specified safety-related orders, from material suppliers that it had not audited and approved.

This nonconformance resulted from MD's practice of treating all non-ASME Code parts as commercial-grade (CG) components. The ASME/Appendix B QA manual that was in effect during the 1988 NRC inspection stated that non-ASME Code parts would be processed under MD's commercial-grade QA program. However, during this inspection (1991), the NRC inspectors identified that the MD certificates of conformance indicated that the non-ASME Code CG items either met the requirements in the licensee's purchase order (safety-related), or were under a QA program in accordance with Appendix B to 10 CFR Part 50. Since this matter was identified in Violation 91-01-01, Nonconformance 88-01-02 is closed. See Section 3.5 for additional background and discussion of this issue.

2.5 (Closed) Unresolved Item 88-01-03

This unresolved issue identified that MD failed to correctly implement its ANSI N45.2 and Appendix B to 10 CFR Part 50 QA program controls for parts and components that are exempt or outside the scope of Section III of the ASME Code. Violation 91-01-02 substantiates that MD failed to correctly implement its QA program; therefore, this issue will be resolved by MD's corrective actions to Violation 91-01-01.

2.6 (Closed) Unresolved Item 88-01-04

The NRC inspectors expressed concern regarding the methodology by which MD sized its automatic valve actuators. The NRC questioned the MD actuator sizing methodology because of a problem identified by Fisher Controls International, Incorporated, regarding valve stem friction force. The NRC addressed this issue in NRC Information Notice (IN) 88-94, "Potentially Undersized Valve Actuators."

The NRC inspectors discussed the matter during this inspection and found that MD has used two basic methods for sizing sliding stem actuators. The NRC inspectors determined that both methods address the actuator loads required to overcome stem friction force. To verify the two basic methods, the NRC inspectors calculated the allowable seat differential pressure for a number of MD 21000 series valves. The NRC inspectors compared these results to valves found in published MD valve specification data sheets and found the valves were in agreement. The inspectors concluded that the NRC stem friction force concern identified in IN 88-94 does not appear to apply to the MD valve assemblies.

3 INSPECTION FINDINGS AND OTHER COMMENTS

3.1 Entrance and Exit Meetings

On June 3, 1991, the NRC inspectors discussed the scope of the inspection with the MD QA manager for Massachusetts, and his staff at the Avon, Massachusetts facility. At the conclusion of the entrance meeting, the NRC inspectors were taken on a tour of the Avon facilities. During the exit meeting at the conclusion of the inspection on June 7, 1991, the NRC team leader summarized his conclusions, findings, and concerns identified during the inspection to the MD staff. At this meeting, MD senior management representatives committed to the NRC team leader that they would expeditiously generate a letter to inform NRC licensees of a deviation that had not been evaluated or passed on to the licensees (see Violation 91-01-01).

3.2 10 CFR Part 21

3.2.1 Section 21.6: During this inspection the NRC inspectors requested to be shown the actual posted documentation in the posted location, as required. Section 21.6 of 10 CFR Part 21 (Part 21) requires that in addition to posting the procedures adopted pursuant to Part 21, each licensee or supplier shall post a copy of Part 21 and Section 206 of the Energy Reorganization Act of 1974. However, contrary to the requirement, MD had not known its responsibility to post Section 206; therefore, Section 206 was not posted with the Part 21 required posting. Violation 91-01-02 was identified in this area.

3.2.2 Section 21.21: Section 21.21 of 10 CFR Part 21 requires in part that the entity establish procedures that will adequately ensure that deviations to procurement documents are either evaluated by the entity or that the deviation is passed up to the purchaser or licensee so that they may cause it to be evaluated in accordance with Part 21.

During this inspection, the NRC inspectors reviewed the licensee POs and associated documentation to evaluate the adequacy of the MD activities which would substantiate its CoC's provided to licensees with licensee-identified safety-related components. As discussed in Section 3.3, the staff identified that before May of 1989, MD provided commercial-grade components with CoCs indicating that the order complied with unique requirements that were specified in the licensee PO's, such as, 10 CFR Part 50. For example, one MD CoC for KG&E PO 512092, supplying 24 safety-related MD air regulators (air sets), Model 74-202 stated the following:

> We hereby certify that the material covered by our reference P40157-900, has been inspected and conforms to the quantities, sizes, materials, and specifications shown on Kansas Gas & Electric Company PO No. 512092 and to our specifications. 24 Part No. 972049-055-088, Air Set, Model 74-202, O-30PSI. Made In Accordance With: Bechtel Specification 10466-J-601A Revision 15, 10 CFR Part 21, 10 CFR Part 50 Appendix B.

During discussions with the inspectors, MD personnel identified that in December 1988, MD started to question its methodology of issuing CoCs to licensees which indicated that a non-code commercial-grade part was controlled in accordance with Appendix B to 10 CFR Part 50, or indicated compliance with a safety-related purchase order, when in fact it was not. Since MD did not always document that the component was not controlled under the provisions of the licensee's safety-related purchase order, the applicable licensees could presume that the item was safety-related, based on the accompanying CoC. The inspectors identified several CoC examples as delineated in the notice of violation. Violation 91-01-01 was identified in this area.

3.3 Wolf Creek 10 CFR Part 21 Report

On August 29, 1989, the Wolf Creek Nuclear Operating Corporation (WCNOC) transmitted a 10 CFR Part 21 report to the NRC regarding the validity of MD certificates of conformance it had received with safety-related NAMCO limit switches. The WCNOC report stated that MD could not provide a basis for certifying the conformance to WCNOC purchase order requirements for spare or replacement electrical parts for nuclear safety-related control valves. The WCNOC report also stated the following: that although, during contract negotiations, Masoneilan indicated the switches were commercial-grade items, MD certified the switches as qualified per IEEE 323 and 344. Furthermore, this certification was to the purchase orders, which also invoked 10 CFR Part 50 Appendix B, and 10 CFR Part 21. WCNOC also stated that, based on the results of a review it had performed, it had determined that past Masoneilan certification of NAMCO Model EA170-11100 limit switches supplied as spares were in error.

During their review, the NRC inspectors determined that during construction phase at Wolf Creek, several control valves were procured by Bechtel Power Corporation (Bechtel) from MD for use in safety-related systems at Wolf Creek. These valves were ordered as complete assemblies in accordance with Bechtel PO 10466-SPJ-601A-1. The Bechtel PO imposed Bechtel Specification No. 10466-J-601A, "Design Specification for Nuclear Service Control Valves for the Standardized Nuclear Power Plant Systems (SNUPPS)," Revision 15. The NRC inspectors identified that the PO documentation and specification imposed the following upon MD: 10 CFR Part 21, 10 CFR Part 50 Appendix B, and environmental and seismic qualification of Institute of Electrical and Electronics Engineers (IEEE) Standards 323 and 344. To comply with the Bechtel PO, MD tested its subject valve actuator and valve accessories, as shown in CYGNA Report 81041-RN002, "Seismic and Environmental Qualification Test Report For Masoneilan No. 11 Reverse Actuator and Accessories for Bechtel Power Corporation PO No. 10466-SPJ-601A-1, Specification No. 10466-J-601A," Revision C, dated April 9, 1982. In the test report, CYGNA concluded that, "the test program demonstrates that the environmental and seismic qualification requirements of Bechtel Specification 10466-J-601A have been met." The NRC inspection team reviewed the CYGNA test report and did not identify any anomalies related to the environmental qualification testing that would refute this statement. The inspectors noted that a commercial-grade NAMCO limit switch, Model EA170-11100, was one of the accessories tested.

After Bechtel procured the valves as discussed herein, WCNOC ordered additional spare and/or replacement valve accessory components for use in safety-related applications. MD provided these components along with certificates of conformance to the new PO requirements. The inspection team identified and evaluated the following example of such a procurement. KG&E PO 512092, dated February 5, 1986 procured several safety-related valve accessories, including the following: 64 NAMCO limit switches, Model EA 170-11100, MD Part 971961-005-888; and 24 MD air sets, Model 75-202, MD Part 972049-55-888. In addition to invoking 10 CFR Part 50 Appendix B and 10 CFR Part 21, this KG&E PO also included the following clarification clauses related to its technical and QA requirements:

3.3.1 <u>Technical Requirements</u>

(1) The items specified in this purchase order shall be supplied in strict accordance with the technical requirements of Bechtel Specification No. 10466-J-601A, Revision 15, that are applicable to the items supplied under this purchase order.

(2) The items ordered herein shall be reviewed to ensure that there has been no change in materials, manufacturing processes, fit, or functional properties from those originally supplied under Bechtel Specification No. 10466-J-601A.

(3) If changes have occurred, the supplier shall provide a written description of the change and certify in the Certificate of Conformance that the items provided are equal to or better than those originally supplied. The supplier shall also certify that the change does not affect the original qualification of the item nor does the change preclude the item from performing its original design function.

(4) If the replacement materials or parts cannot be certified to meet the above requirements, the supplier shall document the deviation in writing to Kansas Gas and Electric Company.

3.3.2 <u>Quality Assurance Requirements</u>

(1) The supplier shall implement a quality program in accordance with the applicable requirements of Appendix B to 10 CFR Part 50.

(2) The supplier is responsible for assuring that all procurement documents issued to suppliers contain or reference applicable requirements, material

specifications, tests or inspections necessary for the sub-tier supplier to fulfill the requirements of this purchase order.

(3) The supplier shall comply with the reporting requirements of 10 CFR Part 21 as applicable.

The NRC inspectors determined that MD had supplied the requested NAMCO limit switches and MD air sets to KG&E along with CoCs, of March 18, 1986 and June 12, 1986 respectively. The NRC inspectors reviewed the March 18 CoC for the NAMCO limit switches and found that the CoC expressed conformance to KG&E PO 512092. The June 12 CoC for the air sets expressed that the air sets were "Made In Accordance With Bechtel Specification 10466-J-601A, Revision 15, 10 CFR Part 21, 10 CFR Part 50 Appendix B." However, the NRC inspectors received no adequate objective evidence to substantiate any of the KG&E PO requirements of any of the MD CoC statements. The inspection team characterized these problems as deviations to the KG&E procurement documents and identified then as Violation 91-01-01 above.

3.4 Valve Accessory Parts

Certain valve accessory components, such as the MD manufactured air sets, are produced by MD under a CG QA program using CG subparts. The KG&E PO requirements discussed in Section 3.3 above require several controls, such as ensuring that replacement parts are identical to those originally qualified. In response to this NRC concern, MD provided the inspectors with a documented evaluation of all design revisions performed on MD air set Model 74-209. MD transmitted this evaluation of August 3, 1989, by an MD internal memorandum. The inspection team reviewed this report and found the following statement:

> Careful consideration has been taken to determine whether these changes would affect the qualification of this regulator. Due to the fact that there was no material change [base material] or structural change, I feel that these revisions did not affect the regulator's qualification.

MD revisions performed on the air set assembly may not have affected the critical characteristics of the original design. However, this evaluation did not provide sufficient detail for the inspection team to establish assurance that the materials or quality of the numerous sub-assemblies have not changed. MD procures these subparts from subtier vendors as commercial-grade items. Therefore, MD's design controls were not sufficient to ensure that the air set regulators supplied to Wolf Creek under PO 512092 were like-for-like replacements for those components originally qualified under the Bechtel PO discussed in Section 3.3.

3.5 Notice of Nonconformance 88-01-02

Nonconformance 88-01-02 in NRC Inspection Report 99900094/88-01 identified MD's failure to process licensee-identified safety-related non-ASME Code parts in accordance with its safety-related QA program controls that would meet Appendix B to 10 CFR Part 50 requirements. ASME parts do not include any valve assembly parts other than valve body, valve bonnet, plug/disc, and body to bonnet bolting. MD's ASME Code QA Manual (ASME-QAM) stated that all non-ASME Code parts would be processed under commercial-grade component controls. However, as discussed in this section, the inspection team reviewed the MD certificates of conformance and the licensee's purchase order requirements, specifications, and MD shipping invoices and found that the components were processed as commercial-grade components even though the MD CoC's indicated that the components were processed as safety-related.

In its letter of February 27, 1990, addressing Nonconformance 88-01-02, MD stated the following:

> For Code and non-Code safety-related material, (defined by Masoneilan as the body, bonnet, plug, and body to bonnet bolting), Masoneilan accepts the requirements of 10 CFR Part 21 and Appendix B to 10 CFR Part 50. All other parts of the valve are commercial-grade, (as defined in 10 CFR Part 21; Section 21.3) and Masoneilan takes exception to the 10 CFR requirements. This exception by Masoneilan is taken during the quotation stage and must be a part of our customers purchase order, before Masoneilan will process the material.

During the 1991 inspection the NRC inspectors identified that MD CoCs before May 1989, would typically indicate that the MD non-ASME-Code supplied parts met the requirements of a licensee's safety-related PO, even though they were not controlled under an Appendix B to 10 CFR Part 50 program. Consequently, before May 1989, MD supplied parts to NRC-licensed facilities that would appear to have been supplied and controlled as safety-related parts, when actually they were not. Therefore, MD has committed to inform all applicable purchasers in accordance to 10 CFR Part 21. On the basis that licensees will be informed of this matter, and that MD has established additional internal controls and policies to prevent recurrence, Nonconformance 88-01-02 is closed. Violation 91-01-01 was identified in this area.

3.6 Ambiguous Certification Documentation for Safety-Related Orders

While reviewing licensees' documentation packages, the inspection team observed that on some past safety-related orders, MD had provided one or more items as commercial-grade, while certification documentation provided for the entire order indicated safety-related. The inspectors believed that this concern could be serious because nuclear licensees receiving the material may have installed commercial-grade items of indeterminate quality in safety-related applications based solely on the safety-related documentation that MD provided for the order. The inspection team also expressed concern that normal nuclear plant audits and inspections conducted by licensees or the NRC would probably not identify a concern with these items because of the safety-related certification provided by MD. The following are examples of licensees' safety-related orders to MD supplied with safety-related certification that contained one or more commercial-grade items:

a. New York Power Authority (Fitzpatrick) PO 86-2820 of August 13, 1986 ordered a temperature control valve and actuator assembly (Serial H56236-129-1). This order was safety-related and invoked 10 CFR Part 50, Appendix B, ANSI N45.2, and 10 CFR Part 21.

   (1) MD CoC dated April 30, 1987, for PO 86-2820 certified conformance to specifications cited in the PO.

   (2) The electro-hydraulic actuator (Drawing 976015-049-A, Revision B) provided on the order was part number (P/N) 976015-049. The MD part number indicates that MD supplied and controlled the item as commercial-grade.

b. Northeast Utilities PO 912663 of June 7, 1988, ordered a replacement assembly consisting of the following:

   - Valve, Serial 35-35112
   - Model 4612 Positioner
   - Model 77-4 Air Set

   The order was safety-related and invoked 10 CFR Part 21 and the MD Near-Nuclear QA Program and required the items to be equal to or better than the original items.

   (1) MD CoC of September 1, 1989, for PO 912663 certified that the items supplied to the purchase order requirements were equal to or better than the original items.

   (2) Both the 4612 positioner and the 77-4 air set are commercial-grade items manufactured by MD.

c. Louisiana Power and Light PO 17222 of March 26, 1988, ordered a 8012-3-C electropneumatic positioner. The order was safety-related and invoked 10 CFR Part 21 and the requirement for the items to be equal to or better than the original items.

(1) MD CoCs of June 9, 1988, and June 10, 1988, for PO 17222 certified compliance to the purchase order and stated that the items were equal to or better than the original items.

(2) The original design was environmentally qualified. The documentation did not provide the basis by which MD determined that the replacement item was identical to the original item.

3.7 Masoneilan Quality Assurance Programs

MD maintains two QA manuals. The MD Valve and Valve Part QA Manual is used for ASME Code safety-related orders and for Non-code safety-related orders. The MD Commercial QA Manual is used for commercial orders. MD personnel refer to the ASME Code QA program as the Nuclear Quality Assurance Program and the Non-Code QA program as the Near-Nuclear Quality Assurance Program.

3.7.1 Quality assurance manual policy concerning safety-related orders

The introduction to the Masoneilan Quality Assurance Manual, Revision 1, Second Issue, of April 16, 1990, states the following:

a. This manual describes the Quality Assurance Program required to assure compliance with the ASME Boiler and Pressure Vessel Code, Section III, Division 1. This program outlines controls for the construction of valve and valve parts in accordance with ASME Section III of the ASME Code. Non-Code non-safety related materials are produced and controlled by the Commercial Quality Assurance Program.

b. Non-Code safety related applications to the requirements of 10 CFR Part 50, Appendix B or ANSI/ASME NQA-1 are supplied in accordance with this manual less ASME Code specific items as mutually agreed between Masoneilan and the customer.

3.7.2 Summary of discussions with MD representatives concerning policy for safety-related orders

During various discussions with the NRC inspection team, the MD QA Program Manager and other MD representatives provided an explanation of MD's past policy and practice concerning supplying items in response to a licensee's safety-related order. The following is a summary of that explanation:

a. MD stated its policy in the QA manual for its nuclear program. Safety-related orders for components or parts that are designated safety-related by the ASME Code (that is, pressure boundary parts such as body, bonnet, plug, and bonnet bolts) are processed as safety-related in accordance with the Masoneilan Nuclear Quality Assurance Program and the Code. The remaining parts of the assembly are processed in accordance with the Masoneilan commercial QA Program.

b. On certain orders as agreed to with the customer, MD processes some non-code parts in accordance with the nuclear quality assurance program, except for items specified in the Code such as the authorized nuclear inspector (ANI) checks. Parts processed in this manner include valve stems or seat rings that may be designated safety-related by the customer. MD stated that it has never considered parts of an assembly such as actuators, position indicators, or limit switches to be safety-related, even though they were supplied on a safety-related purchase order.

c. The NRC team asked MD to explain how it justified supplying undedicated commercial-grade parts with safety-related certification in response to customer purchase orders invoking 10 CFR Part 21 and nuclear safety-related quality standards such as 10 CFR Part 50, Appendix B. The MD manager stated MD believed this to be acceptable because, in accepting and certifying to 10 CFR Part 21, MD also accepted and were entitled to use the commercial-grade exclusion stated in 10 CFR Part 21.3(a-1) for the commercial-grade parts it provided on a safety-related order. The entire explanation is their understanding that the provisions of 10 CFR Part 21 did not apply for commercial-grade items supplied on a safety-related order. MD believed it did not have to process these items under a safety-related QA program.

d. The NRC team stated that an original valve assembly design or item design is often initially qualified using a special test program such as those found in many original procurement documents. Typically, if testing is required to environmentally qualify a valve assembly to IEEE 323 and/or IEEE 344, commercial-grade items in the assembly are tested to qualify the design of the assembly and the design of all parts used in the assembly, including the commercial-grade parts that are now conditioned by the qualification testing. The qualification testing is then used as a basis, and possibly the only basis, for dedicating of the commercial-grade parts for safety-related applications. These qualified commercial parts for the assembly are now safety-related parts, not commercial-grade parts. The MD QA manager acknowledged the NRC team's position on this matter. ever, he indicated that this position differed from MD's previous position that commercial parts tested in an assembly are still commercial parts.

e. The MD QA manager stated that following the December 1988 NRC inspection, MD recognized that its position regarding commercial-grade items on safety-related orders could lead to confusion. As a result, MD modified its policy for nuclear licensee orders to ensure that either the customer purchase order, the MD quotation, or the MD certification documentation clearly identified any items being supplied as commercial-grade. The NRC team indicated that the safest way to avoid confusion was to ensure that this clarification was evident on the order's certification documentation. The MD QA manager stated that, MD will now only provide safety-related certification for the following type of items:

   (1) Manufactured as safety-related under MD's nuclear quality (Appendix B) program

   (2) Procured as safety-related under MD's nuclear quality (Appendix B) program

   (3) Manufactured or procured commercial-grade and subsequently upgraded to a safety-related status using an MD dedication program. The MD QA manager stated that MD is developing this dedication program.

To avoid future confusion on nuclear licensee orders for commercial parts, MD began to include an explicit statement on commercial certificates of conformance that 10 CFR Part 21 and 10 CFR Part 50, Appendix B, do not apply. MD believes this will ensure that all parties understand that the licensee is responsible for any subsequent dedication of these commercial-grade items for a safety-related application. Section 3.6 provides a detailed discussion of this matter.

4.0 PERSONNEL CONTACTED at MD:

Name	Title
John Kerr	QA Manager-Massachusetts Operations
Willia[illegible] Come[illegible]	Quality Engineer
Joseph [illegible]	Quality Engineer
Joe Cal[illegible]	Applications Engineer
Frank Volpe	Applications Engineering Manager
Ernie Kramer	Product Engineer
Brenda Pacheco	Nuclear Order Administrator
W.T. Allen III	Quality Manager-North American Operations

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555

NOV 05 1991

Docket Nos. 50-245
50-336
50-423

Mr. John F. Opeka
Executive Vice President - Nuclear
Connecticut Yankee Atomic Power Company
Northeast Nuclear Energy Company
Post Office Box 270
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Dear Mr. Opeka:

SUBJECT: ASSESSMENT OF THE PROCUREMENT AND COMMERCIAL-GRADE DEDICATION PROGRAMS AT THE MILLSTONE NUCLEAR POWER STATION, UNITS 1, 2, AND 3 REPORT NOS. 50-245/91-201, 50-336/91-201, AND 50-423/91-201

This letter transmits the report of the assessment performed June 3 through 7, 1991, at the Northeast Nuclear Energy Company's (NNECO's) Millstone Nuclear Power Station (MNPS), Units 1, 2, and 3, and at the Northeast Utilities Service Company's Berlin Office, by R.P. McIntyre, K.R. Naidu, B.H. Rogers, and L.L. Campbell of the U.S. Nuclear Regulatory Commission's (NRC's) Vendor Inspection Branch and D.L. Caphton of NRC Region 1. At the conclusion of the assessment, we discussed our findings with Stephen E. Scace, Director, Millstone Station, and the members of your staff identified in the Appendix to the enclosed report.

The assessment was performed to review NNECO's program for the procurement and dedication of commercial-grade items used in safety-related applications at MNPS in accordance with Appendix B to Part 50 of Title 10 of the Code of Federal Regulations (10 CFR Part 50) and to determine the extent of the implementation of the Nuclear Management and Resources Council (NUMARC) initiatives in this area.

NNECO had made a significant effort to strengthen its commercial-grade dedication program and its overall program description was generally consistent with the dedication approaches described in Electric Power Research Institute (EPRI) Report NP-5652, "Guideline for the Utilization of Commercial Grade Items in Nuclear Safety Related Applications (NCIG-07)." However, the program description did not completely address the issues contained in NRC Generic Letter 89-02, "Actions to Improve the Detection of Counterfeit and Fraudulently Marketed Products," dated March 21, 1989, which specifies certain restrictions or conditions concerning the use of EPRI NP-5652 dedication methods to achieve compliance with Appendix B to 10 CFR Part 50. With appropriate modifications to address this concern, the program, if properly implemented, should provide adequate control over the commercial-grade procurement process. Specific strengths and weaknesses are discussed in detail in the enclosed report.

NNECO had made good progress with respect to its review and assessment of the comprehensive procurement initiative improvements suggested in NUMARC 90-13, "Nuclear Procurement Program Improvements," dated October 1990. The initiative calls for licensee review to be completed by July 1, 1991, and implementation actions to be completed by July 1, 1992. Your progress in this area should enable NNECO to meet these dates.

NNECO's implementation of the commercial-grade dedication program was the most significant area requiring increased attention. The assessment team identified several procedural weaknesses, as well as implementation weaknesses, concerning the improper identification of appropriate design criteria, safety functions, critical characteristics, and methods for verifying the critical characteristics as part of the dedication process. These dedication activities were performed by outside contractors working for the MNPS Procurement Engineering Group. Implementation weaknesses appeared to be the result of a lack of adequate training to MNPS program requirements, combined with a lack of applicable technical background experience related to current industry procurement and commercial-grade dedication practices.

In accordance with 10 CFR 2.790(a), a copy of this letter and the enclosures will be placed in the NRC Public Document Room.

Although no response to this report is required, we expect you to consider the concerns raised herein and to take appropriate measures. Should you have any questions concerning this assessment, we will be pleased to discuss them with you. Thank you for your cooperation in this assessment process.

Sincerely,

José A. Calvo for

Steven A. Varga, Director
Division of Reactor Projects I/II
Office of Nuclear Reactor Regulation

Enclosure: Assessment Report 50-245/91-201, 50-336/91-201
and 50-423/91-201

cc: See next page

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U.S. NUCLEAR REGULATORY COMMISSION
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Report Nos.:	50-245/91-201, 50-336/91-201, and 50-423/91-201
Docket Nos.:	50-245, 50-336, and 50-423
License Nos.:	DPR-21, DPR-65, and NPF-49
Licensee:	Northeast Nuclear Energy Company Post Office Box 270 Hartford, Connecticut 06141-0270
Facility Name:	Millstone Nuclear Power Station, Units 1, 2, and 3
Assessment at:	Berlin and Waterford, Connecticut
Assessment Conducted:	June 3 through 7, 1991

Richard P McIntyre 10/8/91

Richard P. McIntyre, Team Leader — Date
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Approved by: 11/4/91

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Vendor Inspection Branch
Division of Reactor Inspection
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Office of Nuclear Reactor Regulation

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Between June 3 and 7, 1991, the Nuclear Regulatory Commission's (NRC's) Vendor Inspection Branch conducted an assessment of Northeast Nuclear Energy Company's (NNECO) activities related to the procurement and dedication of commercial-grade items (CGIs) used in safety-related applications at the Millstone Nuclear Power Station (MNPS), Units 1, 2, and 3. The assessment team reviewed NNECO's procurement program in order to assess the company's compliance with the quality assurance (QA) requirements of Appendix B to Part 50 of Title 10 of the Code of Federal Regulations (10 CFR Part 50) and to assess the status of NNECO's implementation of the Nuclear Management and Resources Council (NUMARC) initiatives on procurement and commercial-grade dedication.

The NUMARC Board of Directors has approved the procurement initiatives as described in NUMARC 90-13, "Nuclear Procurement Program Improvements," dated October 1990, which commit licensees to assess their procurement programs and take specific action to strengthen inadequate programs. The first phase of these initiatives addresses the dedication of CGIs and was scheduled to be implemented by [illegible]ary 1, 1990. Licensees are to meet the intent of the guidance provided [illegible]ric Power Research Institute (EPRI) Report NP-5652, "Guideline for [illegible]lization of Commercial Grade Items in Nuclear Safety [illegible]lated Appl[illegible] NCIG-07)," dated June 1988. The NRC has conditionally endorsed th[illegible] [illegible]deline in Generic Letter (GL) 89-02, "Actions To Improve the Detection [illegible] [illegible]erfeit and Fraudulently Marketed Products," dated March 21, 1989. [illegible] second phase of the initiatives is identified as the comprehensive [illegible]ment initiative and addresses vendor audits, tests and/or inspections, obsolescence, informa[illegible]n exchange, and general procurement. Licensees are to review their programs by July 1, 1991, to determine, on the basis of guidance in NUMARC 90-13, if improvements are needed in the above areas, and to complete such improvements by July 1, 19[illegible]

This assessment was performed to determine the current status of the activities to improve the procureme[illegible] program in relation to the industry commitments discussed above and NRC re[illegible]ements in this area. The assessment focused on a review of procedures a[illegible]resentative records; interviews with NNECO staff, including senior ma[illegible] and observations by the assessment team members. The NRC assessment te[illegible] held meetings with NNECO's corporate and plant management to discuss [illegible]vant aspects of commercial-grade dedication and to identify areas requiring additional information. The assessment team discussed its observations with NNECO representatives and senior management at the exit meeting on June 7, 1991.

NNECO has made a significant effort to strengthen its commercial-grade dedication program and, currently, its overall program description is generally consistent with the dedication philosophy described in EPRI NP-5652. However, the program including many of the pertinent implementing procedures did not completely address the issues contained in NRC GL 89-02 which specified certain restrictions or conditions in using EPRI NP-5652 dedication methods to achieve compliance with Appendix B to 10 CFR Part 50. With appropriate modifications to address the concerns noted herein, the existing program, if properly implemented, should provide adequate controls over the NNECO procurement and dedication process. Two areas of weakness were identified:

- The most significant weakness concerned inadequate implementation of the dedication process as described in Administrative Control Procedure ACP-QA-4.03A, "Upgrading Spare Parts for Use in QA Application - Commercial Grade Item Procurement and Dedication," and documented on the Commercial Grade Dedication Form (CGDF). Specifically, design criteria, safety function(s), critical characteristics, and the verification methods for the critical characteristics were improperly identified. In many cases these attributes were being used interchangeably, which indicated a lack of understanding of overall programmatic requirements as well as the dedication process in general.

  The team attributed this weakness to a lack of formal training to program requirements combined with a lack of applicable technical background experience related to current industry procurement and commercial-grade dedication practices. These dedication activities were being performed by outside contractors working for the Millstone Procurement Engineering Group.

  In addition, Procedure ACP-QA-4.03 did not include provision and guidance for the dedication of services although MNPS was currently dedicating commercial-grade services.

- Of several procedural weaknesses and inconsistencies, the most significant was that the procedures did not address the GL 89-02 issue concerning traceability of commercial-grade items to the original equipment manufacturer (OEM) when Method 1 alone cannot demonstrate suitability and manufacturer certifications were used as part of the dedication process. Also, procedures did not include provisions to address the detection of fraudulent products.

A significant strength in the development and improvement of the NNECO procurement and commercial-grade dedication program was the involvement of Assessment Services and its audits of procurement activities and the commercial-grade dedication program at MNPS. Also, the Combined Utility Assessment Group's findings and observations of the commercial-grade program for NNECO aided the program development. These audits and assessments directly led to many improvements and revisions to both the dedication program and the implementing procedures and have been an ongoing activity during program evolution.

NNECO's mechanical and metallurgical testing facilities at Berlin, Connecticut, and at the MNPS site were well equipped and staffed. These capabilities should provide in-depth and accurate testing for EPRI Method 1 acceptance activities (special tests and inspections) for its commercial-grade dedication program and should help to detect and screen the receipt of fraudulent or misrepresented items.

NNECO provided management support and sufficient resources to improve its commercial-grade dedication program. The NNECO staff displayed a great deal of interest in the NRC team's assessment effort, and site and corporate management were available for consultation during the assessment.

NNECO's implementation of the NUMARC comprehensive procurement initiative should enable it to meet the July 1, 1991, review date established in NUMARC 90-13. NNECO had completed its review and had developed a draft report containing its recommendations. The final report was scheduled to be presented to senior management by the end of June 1991.

1 INTRODUCTION

The NRC's Vendor Inspection Branch assessed Northeast Nuclear Energy Company's (NNECO's) efforts to improve programs for procuring and dedicating commercial-grade items (CGIs) used in safety-related applications. The NRC assessment team (team) reviewed the NNECo program to assess its compliance with Appendix B to 10 CFR Part 50 and to assess the status of implementation of the Nuclear Management and Resources Council (NUMARC) procurement initiatives for the Millstone Nuclear Power Station (MNPS), Units 1, 2 and 3. The assessment was performed between June 3 and 7, 1991. The assessment methodology included observations, discussions with licensee managers and site and corporate personnel, and a review of records and procedures associated with the licensee's procurement and dedication program.

The NRC staff is presently conducting assessments at selected licensees' facilities to review their implementation of improved programs for dedicating CGIs and to assess the improvements made in the areas covered by the NUMARC comprehensive procurement initiative program. This initiative, approved on June 28, 1990, by the NUMARC Board of Directors, directed licensees to adhere to the guidance provided in Electric Power Research Institute (EPRI) NP-5652, and to review and strengthen their procurement programs in accordance with specific guidance provided in NUMARC 90-13.

The specific areas reviewed and the team's observations are described in Sections 2 through 4 of this report. The conclusions, strengths and weaknesses are summarized in Section 5. Section 6 addresses the exit meeting, and persons contacted during the assessment are listed in the Appendix.

2 COMMERCIAL-GRADE DEDICATION PROGRAM REVIEW

2.1 Procurement Program Overview

The team reviewed NNECO's programs and related commitments associated with the implementation of the NUMARC initiatives to assess the program for procurement and dedication of CGIs in safety-related applications at MNPS. "Dedication" is generally understood to mean the process by which an item, not manufactured and supplied under an approved 10 CFR Part 50 Appendix B, quality assurance (QA) program, is verified to be suitable for use in a nuclear safety-related application.

Criteria III and VII of 10 CFR Part 50 Appendix B are fundamentally applicable to the actual process of dedication for CGIs because that process is the means of satisfying the review for suitability requirement and the requirements for design review and verification (such as by a suitable testing program) of Criterion III, "Design Control." The dedication process also is used to satisfy the requirements of Criterion VII, "Control of Purchased Material, Equipment and Services," by ensuring that purchased materials for safety-related applications conform to the procurement documents.

In the current organization at the MNPS, site dedication activities are coordinated by the Procurement Engineering Group (PEG) of the MNPS with technical assistance, when requested, from the Unit Engineering Department (UED), and quality assurance coverage from Procurement Quality Services (PQS). The Northeast Utilities Services Company (NUSCO) Nuclear Plant Operating Company (NUPOC) Engineering Department located in Berlin, Connecticut, supported MNPS commercial-grade procurement activities primarily associated with plant modifications. NUPOC engineering activities were similar to those performed by PEG and UED. Procedures used by both UED and PEG personnel for dedication activities generally were consistent with the requirements contained in the NUPOC procedures. The team, however, identified some instances in which site procedures had not been revised to incorporate new and improved requirements contained in the NUPOC corporate level procedures.

2.1.1 Commercial-Grade Dedication Evolution

Before June 1987 CGIs were purchased and receipt inspected with the acceptance criteria primarily based on verification of the correct part number. NUSCO corporate level Nuclear Engineering and Operations Procedure NEO 6.11, "Commercial-Grade Items," Revision 0, and the MNPS site Administrative Control Procedure ACP-QA-4.03A, "Upgrading Spare Parts For Use In QA Application-Commercial Grade Item Procurement and Dedication," Revision 5, became effective June 1989 and incorporated the guidance provided in EPRI NP-5652, "Guidelines for the Utilization of Commercial Grade Items in Nuclear Safety-Related Applications (NCIG-07)," June 1988. These procedures identified the actions required before a CGI was used in a safety-related application. The procedures addressed such elements of the dedication process as identifying the characteristics that an item must have to perform its safety function, methods that may be chosen to verify those characteristics, and the point at which the item was dedicated for safety-related application. In June 1990, Revision 6 of ACP-QA-4.03A was implemented to provide additional guidance on performing inspections and tests associated with the dedication process, to provide improved guidance on upgrading items for safety-related applications, and to provide new definitions for several terms used in the dedication process. In October 1990, Revision 1 of NEO 6.11 was implemented to incorporate lessons learned from the initial implementation activities and to utilize one common dedication form for all NUSCO plants. Revision 1 of NEO 6.11 also incorporated the NRC exceptions to EPRI NP-5652 identified in NRC Generic Letter (GL) 89-02, "Actions to Improve the Detection of Counterfeit and Fraudulently Marketed Products," dated March 21, 1989 and added guidance on using the fourth EPRI Acceptance Method, "Acceptable Supplier/Item Performance Record," and a provision for dedicating a commercial-grade service. In November 1990, shortly after Revision 1 of NEO 6.11 was issued, Revision 7 of ACP-QA-4.03A was implemented to incorporate the requirements of NEO 6.11 and to add a requirement to document and attach a brief description of the rationale used in the evaluation process, including safety function(s), critical characteristics, acceptance method criteria, and any additional pertinent technical information.

2.1.2 The Commercial-Grade Dedication Process

Various departments and groups at MNPS initiated purchase requisitions and PEG processed them in accordance with ACP-QA-4.02C, "Preparation and Review of

Purchase Requisitions," Revision 6. If the purchase requisition was for an item that was not required to perform a safety-related function or was a safety-related item that will be purchased from an Appendix B supplier that accepts Part 21 reportability responsibility, the requisition was processed in accordance with the requirements of ACP-QA-4.02C. ACP-QA-4.03B, "Material, Equipment and Parts Lists for Inservice Generation Facilities," Revision 3, dated April 8, 1989, and corporate procedure NEO 6.01, "Material, Equipment, and Parts Lists for Inservice Generation Facilities," Revision 4, dated April 10, 1991, provided requirements for determining the safety function(s) and classification of items. The classification of items was not performed by PEG but by Unit Engineering personnel and is further discussed Section 2.4 of this report. If the item performed a safety-related function and met the criteria to be purchased as a CGI and was dedicated for safety-related application, PEG personnel processed the purchase requisition in accordance with the requirements of ACP-QA-4.03A.

Purchase requisitions received by PEG for a CGI normally contained such minimum information as the item description, its application, quality category, and any known technical requirements, with provisions for the initiator to prepare the commercial-grade dedication package. PEG personnel reviewed the purchase requisition and verified the quality category, verified or determined technical requirements, prepared or reviewed the commercial-grade dedication package (including identifying inspection, test and storage requirements), and reviewed other related activities such as the approved supplier list, status of environmental and seismic qualification, and the Nuclear Operations Defective Items List (NODIL).

As a rule, these purchase requisititons for CGIs forwarded to PEG were evaluated as performing a safety-related function and classified as Category 1. PEG used the production maintenance management system (PMMS) data base to determine appropriate quality indicators such as applicable design documents, environmental qualification, seismic qualification, and category for the parent component, which then are passed on to the component part, if the part had been classified as safety-related. PEG identified the safety-function of the item and determined the critical characteristics on the basis of the CGI's application and intended safety function(s). Methods to verify critical characteristics and their acceptance criteria were identified, typically including receipt inspection and test and source verification. Method 2, Commercial-Grade Survey of Supplier, was seldom used for verifying characteristics and Method 4, Acceptable Supplier/Item Performance Record, had not been used to date. The use of commercial-grade surveys, receipt inspection and test and post-installation testing are respectively addressed in Sections 2.5 and 2.6 of this report.

2.2 Procedures Review

The team reviewed the documentation that prescribed the MNPS program for dedication of CGIs for use in safety-related (Class 1E for electrical) applications. The team reviewed, in detail, the following MNPS site procedures and NUSCO and QA corporate procedures in order to assess the MNPS program controls for conducting commercial-grade dedication activities and to determine if MNPS's commercial-grade dedication program for identifying the safety function of CGIs, classifying CGIs, and identifying the CGIs' critical characteristics and methods for verifying those characteristics were consistent with the guidance provided in EPRI NP-5652 as conditionally endorsed by NRC GL 89-02.

- Administrative Control Procedure ACP-QA-4.03A, "Upgrading of Spare Parts For Use In QA Application--Commercial-Grade Item Procurement and Dedication", Revision 7, dated October 23, 1990

- Nuclear Engineering and Operations Procedure NEO 6.11, "Processing, Dedication, Upgrading, and Utilization of Commercial-Grade Items," Revision 1, dated October 8, 1990

- ACP-QA-4.03B, "Material, Equipment, and Parts List for Inservice Nuclear Generation Facilities," Revision 3, dated April 8, 1989

- Quality Services Department Procedure QSD 3.08, "Performance of Receipt Inspection Activities," Revision 5, dated November 12, 1990

- ACP-QA-4.02C, "Preparation and Review of Purchase Requisitions," Revision 6, dated April 4, 1991

- ACP-QA-3.10, "Preparation, Review and Disposition of Plant Design Change Records," Revision 3, dated September 9, 1990

- QSD 3.04, "Performance of Commercial-Grade Periodic Surveys," Revision 1, dated July 10, 1989

Although NNECO had made a significant effort to strengthen its commercial-grade dedication program at MNPS, there were several areas that needed improvement.

Section 4.30 of ACP-QA-4.03A defined a "like-for-like replacement" the same as that for a "direct replacement item" in Section 4.19 of the procedure. A direct replacement item was defined as "an item that is identical to the original item, in that documentation is available to confirm that: The replacement item is the same (model/style/type/series) as the original item and is manufactured using the same controls, materials, and design and the replacement item possesses the same critical characteristics as the original item."

This definition for the most part, was consistent with the definition of a like-for-like replacement provided in NRC GL 91-05, "Licensee Commercial-Grade Procurement and Dedication Programs," dated April 9, 1991. The term "direct replacement item" as used in the text of ACP-QA-4.03A and on Commercial-Grade Dedication Form, SF 1417, implied that the replacement item meets the definition of a like-for-like/direct replacement item. However, when a replacement item was identified on Form 1417 as a direct replacement, there were no procedural requirements to obtain objective evidence and to include documentation in the dedication package to confirm that the replacement item was manufactured using the same controls, material, and design as the item it was replacing.
Section 6.1.2.e of ACP-QA-4.03A not only required the preparer of Form 1417 to determine if the item was a direct replacement, but also to determine if the item had been changed by the manufacturer from the original item supplied by the manufacturer. There were no requirements to document the basis for this determination. The review of several completed dedication packages, as well as discussions with PEG personnel, indicated that the items were being incorrectly identified as direct replacement items on Form 1417 and were actually replacement items of the same model, style, type, and series as the original, which possessed the necessary critical characteristics for the items to perform their intended

safety function(s). The team concluded that the text of ACP-QA-4.03A and the format of Form 1417, incorrectly used the term direct replacement.

The terms "design criteria," "commercial-grade services," and "safety function" were not defined, but were used both in the text of ACP-QA-4.03A and were required to be entered on Form 1417. Although NEO 6.01, "Material, Equipment, and Parts Lists for In-Service Nuclear Generation Facilities," Revision 4, dated April 13, 1991, provided the guidance and methodology for determining the safety function of an item, ACP-QA-4.03A did not. The team concluded that additional guidance should be provided to the preparers of dedication packages in these areas.

Section 6.1.2.F of ACP-QA-4.03A required that the critical characteristics to ensure the original qualification of the component was maintained should be identified if a commercial-grade item was intended for installation in a seismically or environmentally qualified component. UED was responsible for performing and documenting the environmental and seismic reviews for all procurements. However, ACP-QA-4.03A did not specify interface requirements for the UED to perform environmental and seismic reviews and did not require environmental or seismic considerations to be identified as part of the dedication process. Also, Form 1417 provided no signoff to indicate that environmental and seismic qualifications had been evaluated and were considered maintained on the basis of satisfactory acceptance of the critical characteristics.

The scope of ACP-QA-4.03A included the dedication of items and services. However, throughout the text and attachments of this procedure reference was made to item and not to items or services, although the requirements, in many instances, were applicable to items or services being dedicated. The term "commercial-grade service" was not defined nor were any examples of critical characteristics or methods for verifying the service provided in ACP-QA-4.03A. The first page of Form 1417 did not provide for identifying the appropriate considerations associated with dedicating a service and ACP-QA-4.03A did not provide guidance for these activities.

Paragraph 6.1.2.f.2.c and Attachment 8.3 of ACP-QA-4.03A provided guidance for the use of a commercial-grade survey of a supplier as a method to verify critical characteristics. Commercial-grade surveys of suppliers were performed in accordance with Quality Services Department procedure QSD 3.04, "Performance of Commercial-Grade Periodic Surveys," Revision 1, dated July 10, 1989, and results were documented on the Commercial-Grade Suppliers List (CGSL). The CGSL identified those characteristics that were not confirmed during the initial or periodic survey, but did not identify those characteristics confirmed as being controlled. ACP-QA-4.03A provided no guidance on how to determine if a supplier could be used to verify critical characteristics. PEG personnel informed the team that commercial-grade surveys to verify critical characteristics were used very infrequently and required PEG to obtain and review a copy of the survey in order to determine which characteristics the supplier could verify.

Although QSD 3.08, "Performance of Receipt Inspection Activities," Revision 5, dated November 12, 1990, provided for the use of sampling to verify critical characteristics, no guidance on when to apply sampling to verify critical characteristics was provided or referenced in QSD 3.08 or ACP-QA-4.03A.

Justification for sampling may include batch or lot traceability and homogeneity, and confirming the supplier's method for maintaining traceability and homogeneity.

The commercial-grade dedication program did not address the fact that in certain instances EPRI Method 1, inspection and test, may not be sufficient alone to verify all critical characteristics. Some critical characteristics may require verification of traceability to the manufacturer. This is true for instances where suitability for application is based at least to some extent on testing activities or special processes performed by the original equipment manufacturers (OEM). For example, in the case of molded case circuit breakers (MCCBs) manufacturers/UL tests are relied on to ensure adequate interrupting capacity. In order to take credit for such testing being performed on representative samples of equipment, traceability to the OEM must be ensured. This verifiable traceability to the circuit breaker manufacturer, which is necessary to verify the critical characteristics, which the circuit breaker manufacturer relied on (e.g., interupting capacity), may be confirmed by audit/survey and by review of shipping documents and verification of the proper UL label, or other appropriate means.

The team concluded, based on information discussed in the previous paragraphs and numerous minor procedural discrepancies, such as attachments not being referenced in the text of the procedure, lack of definitions and guidance, and inappropriate references to organization (e.g., the lead department), that ACP-QA-4.03A needed improvements in the text, as well as in the forms and attachments used for the dedication process.

2.3 Design Control--Equivalency Evaluation

The team reviewed the following procedures for controlling design activities supporting the commercial-grade procurement and dedication process:

- ACP-QA-4.03A, "Upgrading of Spare Parts for Use in QA Application--Commercial-Grade Item Procurement and Dedication," Revision 7, dated October 23, 1990

- NEO 6.11, "Processing, Dedication, Upgrading, and Utilization of Commercial-Grade Items," Revision 1, dated October 8, 1990

- ACP-QA-3.10, "Preparation, Review and Disposition of Plant Design Change," Revision 3, dated September 9, 1990

- NEO 3.03, "Preparation, Review, and Disposition of Plant Design Change Records," Revision 7, dated August 3, 1990

PEC, during the preparation of the CGI dedication package, determined if the item being procured had been changed by the manufacturer from the original item supplied. If there were any differences between the originally installed item and the item being procured, the item was considered a substitute and required an evaluation to be documented in accordance with ACP-QA-3.10 or NEO 3.03. Normally MNPS Unit Engineering performed the evaluation, however NUPOC and NUSCO also may perform this evaluation. The evaluation was documented on a Plant Design Change Record (PDCR) form with applicable documents and analyses referenced and/or attached. The PDCR process appeared to be in accordance with Criterion III, "Design Control," of Appendix B to 10 CFR Part 50 and addressed the essential elements of design control such as the 10 CFR 50.59 safety evaluation screening, design reviews, design verification, and the update of engineering documents including the generation of drawing change notices (DCNs).

NEO 3.03 required that a DCN be written during the PDCR process for changes that effect specifications or drawings. NEO 5.11 required that the DCN be signed off as the work was completed. This signoff was performed prior to Unit Engineering releasing the substitute item for operations. The DCN was then posted as a completed DCN and was available at controlled drawing stations.

However, PEG was interpreting ACP-QA-4.03A as permitting the commerical-grade dedication process, including preparation of Form 1417, to continue without having a completed PDCR technical evaluation for the substitute replacement item. ACP-QA-4.03A required the evaluation to be completed before the substitute replacement item was accepted during receipt inspection because the evalation could identify additional considerations and verifications required for the substitute item. There were no programmatic controls to require the quality and technical requirements on the purchase order or the design criteria, safety function, critical characteristics, or verification methods identified on Form 1417 be reviewed against the technical evaluation contained in the PDCR. PEG personnel stated they were aware of this weakness and were in process of implementing interim instructions to address deviations and inconsistencies between the PDCR evaluation, the dedication package and the purchase order. In addition, certain portions of Form 1417 needed improvement to address the use of substitute items and to evaluate the need for initiating required revisions to the form as a result of PDCR evaluations for substitute items.

Although there were some areas that needed improvement, the team concluded that the PDCR process, if properly implemented, should provide adequate assurance that an equivalent or substitute replacement item will satisfactorily perform the safety function of the item replaced.

2.4 Parts Classification System

The team reviewed the following procedures applicable for the safety classification of items:

- ACP-QA-4.03B, "Material, Equipment, and Parts Lists For Inservice Nuclear Generation Facilities (NEO 6.01)", Revision 3, dated April 8, 1989

- NEO 6.01, "Material, Equipment, and Parts Lists For In-Service Nuclear Generation Facilities", Revision 4, dated April 13, 1991

NNECO used the Material, Equipment, and Parts List (MEPL) to identify structures, systems, and components to be covered by the NNECO quality assurance program. The MEPL, a combination of paper documents and computer database was controlled at MNPS by ACP-QA-4.03B. When a component or part of a safety-related (Category 1) system was required to be procured, the component and the system were identified and the MEPL was checked to determine if the item was listed and if a quality assurance determination had previously been made as to whether the part was safety-related or non-safety-related.

If a component or part was not identified in the MEPL, steps were taken to determine if the item was safety-related. If the item was bounded by the set of safety-related systems, structures, and components specified in the Category 1 section of Attachment 8.A of ACP-QA-4.03B, the item was safety-related. If the item's safety-related status was undetermined, a failure mode analysis determined what the consequences would be if the item/activity failed to perform as intended or if credit was taken in the safety analyses for this item/activity to perform specific safety function(s). After the safety-related status was determined, a verification was performed by a second individual and the MEPL was changed, as required.

ACP-QA-4.03B was deficient because it did not require a determination of the system function that components support, the component function, the component functional mode, and it had no specific provisions for parts classification. In addition, a failure modes and effects analysis (FMEA) was only required if an item's safety-related status could not be determined by reviewing the system boundaries provided.

However, NEO 6.01 Revision 4, was consistent with industry guidelines provided in EPRI NP-6406 (NCIG-11) and contained instructions to identify system functions that components support, component functions, component functional modes, and had specific provisions for parts. It also required performance of a FMEA for both components and parts. The PEG supervisor indicated that it was normal practice to incorporate the revised NEO procedures into the ACPs and MNPS planned to incorporate NEO 6.01 into ACP-QA-4.03B in the near future.

NNECO started its MEPL in 1981 to provide information on the safety classification of the various components and associated parts installed at MNPS Units 1, 2, and 3. Some items were classified undetermined because NNECO personnel did not need to evaluate the safety significance of that particular item. When a specific system, component, or part thereof was required to be procured, then PEG consulted the MEPL to ensure that the purchase order had the correct classification of the item. If PEG determined that the item was either not listed or listed as undetermined, PEG requested the responsible system engineer from the respective Millstone Unit to determine the quality assurance applicability in accordance with ACP-QA-4.03B and by filling in the attachment (Figure 7.2) to it.

One of the several evaluations performed to determine the classification of items/components installed at MNPS was MP2-CD-947 for the classification of two pressurizer safety valves (2-RC-200 and 2-RC-201) manufactured by Dresser Industries. The evaluation was performed using the Determination of QA Applicability Form from ACP-QA-4.03B, Revision 1, dated May 5, 1986. However, MP2-CD-947 was prepared on May 9 and approved on June 23, 1989, which indicated that ACP-QA-4.03B, Revision 3, effective April 8, 1989, should have controlled the review and approval of the evaluation. In addition ACP-QA-4.03B and MP2-CD-947 indicated several weaknesses in the process for classifying parts.

ACP-QA-4.03B, Revision 3, identified several administrative controls for processing the classification evaluation, but provided minimal guidance and requirements for performing technical activities for the parts classification process. For example, in the area of determining the failure modes and analyzing the effects of the failures, the procedure provided no direction as to the types of failure modes to be considered for piece parts (such as those associated with normal operations, postulated accidents, aging, degradation resulting from radiation, temperature, exposure, material compatibility or the effects of contaminants). The methodology used to determine if any postulated failures of the part being classified would prevent the parent or associated components/systems from performing their safety-related functions was not discussed.

Misleading information contained in an example provided in Appendix B to Attachment 8.A of ACP-QA-4.03B resulted in the inlet and outlet gasket for the pressurizer safety valves being classified without considering the effect of contaminants. The control of contaminants by inspection and testing, which are elements of a basic component as addressed in 10 CFR 21.3(a)(3), requires that the chemical composition be verified as being within allowable limits normally identified in a specification or other engineering documents. If allowable limits for contaminants are identified as being applicable for safety-related systems and their components, verification that the allowable limits have been met should be controlled in accordance with a program that meets Appendix B to 10 CFR Part 50.

ACP-QA-4.03B did not consider the failure effects resulting from the failure of a replacement item on surrounding components or the effects that the failure of surrounding items may have on the parent component if the replacement item failed. For example, items such as O-rings or gaskets were not considered as being required for a safety-related component to perform its safety-related function, thus the failure of these items were not considered as preventing the parent component or system from performing its safety-related function.

The statement in Item 4 of Appendix B to Attachment 8.A of ACP-QA-4.03B that a valve stem is Category I if it is part of pressure boundry in a Category I system was questionable because the disc may form the pressure boundary in some valves, with the stem placing and securing the disc. In the case of active valves, those that must change position to perform their safety function, valve stems that are not part of the pressure boundary may perform a safety function and have to be classified as Category 1 if their failure may cause the valve not to open or close.

Both the text of ACP-QA-4.03B, Revision 3, and Figure 7.2 only required that the failure modes (Section 7 of Figure 7.2) be addressed when the quality determinations supporting the classification process are identified as "undetermined." As such, ACP-QA-4.03B permitted the system engineer to declare an item as non-safety-related without performing a failure analysis. These documents were written for classifying a component and did not address parts classification in which several parts of a component were being classified under one MEPL component.

The team concluded that ACP-QA-4.03B as currently implemented was a program weakness. If, and when, Revision 4 of NEO 6.01 is incorporated in the ACP, it could become a program strength.

2.5 Commercial-Grade Supplier Selection, Qualification, and Survey

The team reviewed the process for selection, qualification, maintenance, and surveys of commercial-grade suppliers used to support MNPS procurements. The team discussed the use of commercial-grade surveys with the Manager of Procurement Quality Services, the Supervisor of Procurement Vendor Services, and the Supervisor of the Procurement Engineering Group. The team also reviewed selected commercial-grade surveys and the following procedures to assess the use of EPRI Method 2, Commercial Grade Survey of Supplier:

- ACP-QA-4.03A, "Upgrading Spare Parts For Use in QA Application-Commercial Grade Item Procurement and Dedication," Revision 7, dated October 23, 1990
- QSD-3.04, "Performance of Commercial Grade Periodic Surveys," Revision 1, dated July 10, 1989
- QSD-3.05, "Issuance and Control of the Approved Suppliers List and Commercial Suppliers List," Revision 2, dated October 6, 1989
- QSD-3.02, "Supplier Evaluations," Revision 3, dated December 20, 1989
- QSD-2.10, "Joint Vendor Audits," Revision 2, dated November 9, 1989
- QSD-2.12, "Performing, Reporting and Follow-up of Procurement Audits," Revision 0, dated July 3, 1989

2.5.1 Supplier Selection

Typically, MNPS procured replacement items from the original equipment manufacturer or authorized distributor whether the item was a direct replacement (like-for-like) or a substitute equivalent item. If the item performed a safety-related function, an attempt was made to purchase the item from a supplier who had a quality assurance program that met the requirements of Appendix B to 10 CFR Part 50 and who accepted 10 CFR Part 21 reportability responsibility. If the item met the definition of a commercial-grade item and the supplier would not accept 10 CFR Part 21 requirements, the item was purchased commercial-grade and dedicated for safety-related application.

2.5.2 Supplier Qualification and Survey

NUSCO Procurement Quality Services (PQS) periodically (at least annually) performed commercial-grade surveys of suppliers to verify that a manufacturer or distributor of commercial-grade items or services controlled the technical and quality characteristics critical for satisfactory performance of specifically designated commercial-grade items or services. The commercial-grade survey of a distributor also included the commercial-grade manufacturer. Commercial-grade surveys of vendors who offer services are performed in a like manner for commercial and nuclear industries in accordance with standards, specifications, or procedures that are not unique to the nuclear industry (e.g., diesel fuel analysis in accordance with an ASTM standard).

Three recently performed commercial-grade surveys were consistent with the guidance provided in EPRI NP-5652 for confirming that the supplier was controlling each critical characteristic of the item to be purchased. This confirmation was accomplished by direct observation, surveillance, record review (when appropriate), or a combination of these activities. The objective evidence for confirming that the supplier was controlling the item's critical characteristic(s) was well documented and clearly identified those characteristics that were not being controlled by the supplier. Although the commercial-grade survey reports were generally good, the process for conducting commercial-grade surveys of suppliers and audits of Appendix B suppliers contained some weaknesses.

PQS performed audits and commercial-grade surveys using a limited amount of performance-based audit elements and as a rule did not include the use of engineering/technical specialists. However, PQS relied on Nuclear Procurement Issues Committee (NUPIC) audits, which were performance based and used engineering/technical specialists, for two-thirds of the audits used for qualification and maintenance of Appendix B suppliers. PQS told the team that as part of the NUMARC comprehensive procurement initiative, plans were proposed to increase the use of performance-based elements and engineering/technical specialists for performing audits and commercial-grade surveys.

PQS reaction to adverse findings associated with commercial-grade surveys was informal but satisfactory in practice and resulted in revising the Commercial-Grade Supplier List (CGSL) and evaluating any effect on items in the warehouse or installed in the plant. The methodology for processing adverse findings resulting from commercial-grade surveys was not proceduralized or formally described in the commercial-grade dedication program.

The procedure for performing commercial-grade surveys, QSD-3.04, did not require the lead auditor to identify the item's critical characteristics to be verified on the commercial-grade survey checklist (Attachment 8.1). Although the attachment was patterned after the 18-point criteria of Appendix B to 10 CFR Part 50, there are no forms provided for the lead auditor to list the item, the item's critical characteristics, and the methods and accepance criteria that should be used to verify the critical characteristics.

QSD-3.04 had not been updated since July 1989 and present methodology for conducting the commercial-grade surveys and for reflecting lessons learned was not addressed. The PQS supervisor indicated that he was aware that QSD-3.04 needed updating to incorporate lessons learned and items identified by the team as needing improvement and such concerns would be considered during the scheduled biannual update of QSD-3.04.

The team concluded that the performance and documentation of commercial-grade surveys by suppliers was a strength in the NNPS commercial-grade dedication process, but the procedure for the process needed improvement.

2.5.3 Use of Third-Party Audits

PQS had not used any third-party audits or surveys to qualify and maintain the suppliers on the CGSL. However, the audit procedures, if properly implemented, should provide adequate controls for screening third-party audits although there were no provisions in the commercial-grade dedication program for screening and using third-party commercial-grade surveys. The PQS supervisor told the team that procedure revisions would be made in the future to provide requirements for screening and using NUPIC commercial-grade surveys.

2.6 Receipt Inspection

PQS contained two sub-tier organizations: Procurement Inspection Services (PIS) with 12 inspectors and one supervisor and Procurement Vendor Services (PVS) with 10 inspectors and one supervisor. The team focused on PIS, which performs receipt inspections, purchase requisition reviews, and specification reviews, and participated in the CGI dedication and upgrade process.

QSD-3.08, "Performance of Receipt Inspection Activities," Revision 5, established the minimum requirements for performing quality related receipt inspection activities for both Millstone and Haddam Neck. The procedure was used to cover all receipt inspections at all NUSCO or vendor locations and required PIS receipt inspectors to be certified under requirements established by other QSD procedures. The team noted that QSD 3.08 did not address non-homogeneous lots of bolts (e.g., with different heat numbers). The PIS supervisor stated that he would submit a revision to handle this apparent procedural weakness.

QSD-4.07, "Commercial Dedication," Revision 0, provided requirements and responsibilities for the PQS personnel performing CGI dedication activities at MNPS. PIS ensured that commercial-grade dedication forms (CGDFs) were complete, that appropriate QSD organizations were involved, (e.g. PIS receipt inspection); and that appropriate inspection/test procedures and/or quantitative acceptance criteria had been specified. The critical characteristics of CGIs were verified through inspection, testing, or a combination of both as identified on the CGDF. PIS performed testing and inspections as part of the receipt inspection process. PVS performed testing and inspections at vendor facilities. If specific expertise or specialty equipment were required for an item, a work order for testing and inspections would be issued to the appropriate organization.

During receipt inspection of CGDF No. MPS-0092, the team noted that several important critical characteristics for the valves had been omitted from the CGDF. The CGDF specified a pressure test on the valves but failed to specify a valve seat test including the direction to apply the pressure test to the valve seat. The CGDF also did not specify the test medium or provide cleanliness requirements. QSD revised the CGDF to incorporate these findings.

The team toured and assessed the capabilities of NUSCO's Metallurgy Laboratory facilities located in Berlin, Connecticut. The capabilities of the laboratory not duplicated by MNPS testing included metallography, replication, tensile and charpy testing, and radiography. The test laboratory was used approximately once a month. The team considered the testing capability at the laboratory to be a potential strength, if combined with the MNPS capabilities to verify critical characteristics.

Receipt inspection capabilities at MNPS had undergone several beneficial improvements. The MNPS receipt inspectors had a new enclosed facility. The facility's equipment was being enhanced and included micrometers, gage blocks, a metal sorter, a shadow graph, and a variety of electronic devices. However, the team concluded that additional emphasis was required to ensure an effective overall receipt inspection process included measures for the detection of counterfeit or fraudulently marketed products.

2.7 Fraud Detection

The NRC staff issued GL 89-02, "Actions to Improve the Detection of Counterfeit and Fraudulently Marketed Products," on April 12, 1989. The staff issued IN 89-70, "Possible Indications of Misrepresented Vendor Products" on October 11, 1989, and its Supplement 1 on April 26, 1990. Although these documents were routed for information to cognizant organizations, no formal licensee actions were initiated. Receipt inspection procedure QSD-3.08 contained no specific guidance addressing the detection of fraudulent products. However, QSD receipt inspectors and supervisors were aware of common characteristics of misrepresented vendor products discussed in the IN and no one interviewed was aware of any fraudulent product issues at MNPS. MNPS made all purchases from approved suppliers/vendors. The receipt inspectors were required by procedure to verify at the time of the receipt inspection that the supplier/vendor status had not been downgraded from the approved supplier/vendor list. Appendix C, "Identifying Substandard/Fraudulent Items," to EPRI NP-6629 (NCIG-15) was available to receipt inspectors for use as guidance.

An improved receipt inspection facility and improved testing and inspection equipment had enhanced the capability of the receipt inspection process to detect misrepresented parts, equipment, and material. PEG has the potential to provide improved receipt inspection and testing acceptance criteria, thus improving the capability potential for detection of counterfeit and fraudulently marketed products.

The team concluded, however, that lack of any formal procedural guidance to receipt and source inspectors regarding detection of counterfeit or fraudulently marketed products was a weakness in the MNPS program. Action had been taken to improve the receipt inspection/testing capability and interaction with PEG.

2.8 Procurement Package Review

The team reviewed several procurement dedication packages for both the electrical and mechanical disciplines to determine if the critical characteristics for CGIs had been properly identified and verified and if the necessary procedural controls were in place to ensure that critical characteristics would be correctly translated into the procurement documents.

(1) The CGDF MP1-0483, to dedicate a filter (Y3-B4) for the gas turbine lube oil fuel shutoff valve contained several questionable entries. For example, the filter's design criteria were improperly listed as the outside diameter and length. The design criteria for the filter appeared to be in GE Technical Manual GEK7527 and on drawings L14004, and were not identified as design criteria. The CGDF identified the safety function of the filters as removal of small impurities from the lube oil. If the filter were to fail, either entrapped impurities or the filter media itself could carry over, causing accelerated wear and possible eventual mechanical failure, which could render the gas turbine inoperable. Although the gas turbine, along with the diesel generator, provides power to all the necessary auxiliaries important to the engineered safeguards systems and provides all power needed during the shutdown mode of operation, this was not mentioned. In addition, the critical characteristics were also identified on the CGDF as outside diameter and length (ensuring that the filter will fit securely in its housing, ensuring no oil can bypass the filter). Acceptance criteria were verified by tests and inspections in accordance with the part upgrade form dimensions and tolerances were obtained from the manufacturer. The length and the outside diameter were inspected and verified as being correct. No tests were identified on the CGDF as being required.

(2) The CGDF MP1-0374, to dedicate 16 inch butterfly valves 2-SW-180BC and 2-SW-181DC, for use as service water stop valves for vital ac switchgear room coolers and ac chillers also contained inappropriate entries. The

team discussed a number of entries on the CGDF with PEG personnel. The most significant concern the team expressed to PEG were the methods used to verify the material of the valve body, the valve disc, and the valve shaft. An alloy sorter was originally identified to be used to verify body, disc, and shaft materials, but were actually verified by valve body markings and verification that the valve disc and shaft material is similar to monel using a magnet.

Verification of materials by only looking at a marking on a component is not consistent with the guidance provided in EPRI NP-5652. A marking on a valve body, when used to verify a critical characteristic such as the material of the valve body, should be supported by a commercial-grade survey that confirms the process of material control and marking as being properly controlled by the manufacturer. The team also questioned how ductility was a consideration for a 150 pound service water valve. The use of a magnet to determine if material is monel is insufficient, because a magnet only gives an indication whether the material is magnetic. Nonmagnetic materials include a number of materials such as aluminum alloys, magnesium alloys, copper and copper alloys, titanium and titanium alloys, and austenitic stainless steel. In addition, the use of an alloy sorter only sorts material and does not analyze the chemical properties of the material; therefore, it was not sufficient to verify an item is a given material with specific properties.

The CGDF improperly listed design criteria as "this valve is a maintenance stop." This would be part of the safety function. No piping code, standard, or specification was listed in the design criteria section of the CGDF. Also, the CGDF listed hydrostatic test and seat leakage tests as critical characteristics. These tests are methods to verify critical characteristics. Material was not listed as a critical characteristic.

(3) The CGDF MP2-0168, to dedicate a diesel generator fuel injection nozzle for use in the Unit 2 'B' diesel engine was reviewed. The design criteria was improperly listed as inject fuel oil into combustion chamber with proper spray pattern. The design criteria for the fuel injection nozzle appeared to be in Equipment Spec. M-160 and on Vendor Drawing 16200743, Revision 0, which were not identified.

The CGDF identified the safety function of the fuel injection nozzle to open at set pressure providing proper cone shaped fine mist spray pattern for diesel fuel. The critical characteristics and verification methods listed on the CGDF were (1) set pressure; verify set pressure of nozzles at 2200 PSI (+100 PSI - 0 PSI) and (2) verify proper spray pattern once open and spray pattern to be cone shaped fine mist. MNPS Procedure No. Form 27010-12 was used to perform the verifications; however, it is unclear how MNPS verified that the spray pattern was a cone shaped fine mist when the test, according to PEG, is a post installation test.

(4) CGDFs Nos. MP1-0320 and MP3-0127, for various model GE molded case circuit breakers (MCCBs) were reviewed. Dimensions and operability were identified as critical characteristics in both cases. The verification of the critical characteristics was done by test. MP3-0127 used test procedure SP3712T, Revision 4, and MP1-0320 used test procedure PT1421A, Revision 0. These test procedures had different testing requirements.

For example, PT1421A, "Testing of Molded Case Circuit Breakers in Accordance with NRC Bulletin 88-10," required rated current hold-in test, while SP3712T did not. In addition, the critical characteristic of operability would be dependent upon the safety function and the actual plant application of the MCCB. In one case the MCCB safety function was just to act as a switch. It was not clear to the team what MCCB procedure should be specified for the verification of critical characteristics during dedication activities, since operability covers a wide spectrum of MCCB functions.

The team concluded that the identification of an item's design criteria, safety functions, critical characteristics, and the methods for verifying critical characteristics were improperly identified and not consistent with the guidance of EPRI NP-5652 or the requirements of MNPS procedure ACP-QA-4.03A. In many cases these attributes were used interchangeably, which indicated a lack of understanding of overall programmatic requirements as well as the dedication process in general. Additional training, procedural guidance, or technical experience by the contractors performing the dedication of CGIs appeared necessary.

2.9 Assessment Services Audits

The team reviewed audits of the MNPS procurement and commercial-grade dedication program performed by NNECO's Assessment Services, the Combined Utility Assessment group, and Nuclear Energy Services (NES), a contractor to MNPS. Various audits by these groups had been ongoing since mid-1988, with the most recent audit report dated February 27, 1991 (Audit A60503). This comprehensive, detailed audit of procurement activities at MNPS identified 39 findings and 10 observations. The responses to the findings and observations, including the corrective action for several of the findings, were reviewed by the team. These self-assessments conducted over the last three years had identified significant weaknesses in certain areas and directly led to improvements in the commercial-grade dedication program.

The team concluded that the involvement of Assessment Services and the other two outside groups was instrumental in the overall evolution of the procurement and commercial-grade dedication program and was a significant program strength.

2.10 Management Involvement

An NRC Region I letter dated September 1, 1989, requested MNPS to provide its program plan outline and implementation schedule to ensure dedication of CGIs. A November 8, 1989, NNECO response letter stated that a Material Control Group/Procurement Engineering Section (MCG/PES) had been established under the Superintendent of Site Services and that staffing would be provided by outside contractors starting January 1, 1990. As of January 18, 1990, three people and a supervisor were performing procurement engineering and commercial-grade dedications for the Millstone site. The contractor staff has been increased to nine people by the time of this assessment.

Recent management involvement has centered around meeting the NUMARC comprehensive procurement initiative (CPI). A memorandum dated April 8, 1991, from the Executive Vice President of Northeast Utilities (NU) directed six company directors and one supervisor to establish a steering committee to oversee NUSCO's review and assessment of the CPI. A draft CPI assessment report was in final stages of preparation at the time of this assessment. A meeting had been scheduled with the company's vice presidents to review and act on the report's recommendations. MNPS management stated that they were committed to meet the NUMARC CPI schedules.

The team concluded that management involvement in the CGI issue appeared to be at a measured pace, heavily dependent on contractors for program implementation. Management had made resources available to provide for an effective CGI dedication program. Additional improvement and control over the CGI dedication process should be realized when full staffing of the Procurement Engineering Group is completed.

2.11 Installed Commercial-Grade Item Review Project

PEG performed a review of commercial-grade items previously procured and installed at all three MNPS units. Initially 50 items were identified for each unit from 1985 to 1989. Packages were assembled for each item, including the purchase order, receipt inspection information, installation work order, and the time in service was determined. The information was reviewed and evaluated in accordance with current MNPS procurement procedures, to determine if the item purchased was acceptable for its safety-related application. The critical characteristics were identified for each item and the appropriate documents were reviewed to determine if the combination of procurement, receipt, and maintenance activities verified those critical characteristics.

After completing the reviews of the packages, MNPS determined that no operability concerns existed, although some discrepancies were noted. The discrepancies were being evaluated by engineering through the NCR process. At the completion of the review, each item was placed in one of three classes: fully acceptable, acceptable with comment, or unacceptable. A total of 143 packages were reviewed for all three units, with 9 being classified as unacceptable, 54 as acceptable with comment, and 80 as fully acceptable.

The PEG stated that until all NCR's had been processed by engineering, MNPS would not make a final decision if any further action needed to be taken on installed or warehoused commercial-grade items.

3 PROCUREMENT TRAINING REVIEW

The team reviewed the indoctrination and training of the PEG personnel who performed the procurement and dedication of commercial-grade items for use in safety-related applications at MNPS. PEG was staffed with three lead engineers who were permanent station employees and nine procurement engineers who were contractor employees. In addition, the contractor supplied a program manager for approximately 20 hours a week whose duties included reviewing the procurement engineers' work and acting as a liaison to MNPS.

Training for the PEG was controlled by Nuclear Training Manual NTM-3.202, "Technical Staff and Manager Training Program Implementing Procedure," Revision 2, dated May 10, 1990. NTM-3.202 was applicable to the technical staff and manager (TSM) population, defined in Section 4.2 to include permanent station engineers and contractors who served in TSM job functions and were expected to be on site greater than one year. Section 5.5 assigned the responsibility to the cognizant supervisor to ensure that personnel requiring training participate in the TSM training program.

NTM-3.202 listed one course related to the dedication of commercial-grade items, DCG.01, "Dedication of Commercial Grade Components." The five hour course described the process of procuring, dedicating, and utilizing commercial-grade components in safety-related applications.

The General Nuclear Training Group had developed a new 32-hour "Procurement Course," which was a comprehensive course covering the MEPL, the procurement process, technical evaluations, the dedication acceptance methods, and performance-based audits. Course outline and topics indicated the course to be much more extensive than the DCG.01 course. The Procurement Course could be a program strength if properly implemented and utilized. NNECO had not yet determined which PEG employees would be required to attend the course that was scheduled to be initially offered July 15, 1991.

There is no minimum formal training requirements for PEG personnel before they performed CGI dedications. This was considered a program weakness. Personnel were required only to complete Attachment 1 to Departmental Instruction PEG 2.01, "New Employee Training For The Procurement Engineering Group," Revision 0, dated February 22, 1990. The attachment required a self-study read-and-sign of various administrative and technical procedures including ACP-QA-4.03A and ACP-QA-4.03B. After the team discussed these weaknesses in required training, the PEG supervisor indicated that PEG 2.01 would be revised to require personnel to discuss topics pertinent to procurement with a fully qualified procurement engineer before preparing procurement documents.

PEG personnel training files indicated that the lead engineers had received extensive training including some specific to the area of CGI dedication. The training received by procurement engineers varied. All procurement engineers had completed attachment 1 to PEG 2.01, most had received some technical training, such as plant systems, and five of the nine had attended the 5-hour commercial-grade dedication course, DCG.01, although attendance in this course did not occur typically until 7 months after employment. The PEG supervisor and the program manager indicated that the contractor had provided a 2-day training session on commercial-grade dedication in October 1990 to all procurement engineers employed at that time.

The team concluded that training of the PEG was lacking because no minimum formal training was required before employees and contractors performed dedications of commercial-grade items. The new procurement course, if properly implemented, would be a program strength.

4 NUMARC COMPREHENSIVE PROCUREMENT INITIATIVE IMPLEMENTATION

NUMARC CPI, as described in NUMARC 90-13, "Nuclear Procurement Program Improvements," approved by the NUMARC Board of Directors on June 28, 1990, commits licensees to assess their procurement programs and take specific action to strengthen inadequate programs. It calls for licensees to complete their review and assessment by July 1, 1991, and their implementation of improvements by July 1, 1992. These guidelines are summarized in the enclosure to a Commission paper, "NUMARC Initiative on Procurement," (SECY 90-304), dated August 24, 1990.

A memorandum dated April 8, 1991 from the Executive Vice President of NU to six company directors and one supervisor established a steering committee to oversee NUSCO's review and assessment of NUMARC's CPIs. The steering committee initiated a meeting on March 8, 1991. In addition, a working group of 13 people was formed to support the steering committee. The working group divided assessment responsibilities among sub-groups, each sub-group was assigned one or more of the following CPI elements for assessment:

- Vendor Audits
- Appendix B and CGI Test/Inspections
- Obsolescence
- Information Exchange
- General Procurement

An overall schedule was established to include the mandate from the Executive Vice President to present the developed plans to him by June 14, 1991. A working group kickoff meeting was held on April 4, 1991. At the time of this assessment, a draft report was partially completed reflecting the output from the working group. The team concluded that the CPI review and assessment was progressing on schedule to meet the NUMARC completion date of July 1, 1991. Additionally, MNPS planned to implement approved CPI recommendations by the NUMARC implementation date of July 1, 1992. Although the team could not judge the effectiveness of the licensee's CPI program, if the recommendations documented in the draft report are implemented, it should considerably enhance the procurement and dedication program at MNPS.

5 CONCLUSIONS

MNPS had made a significant effort to upgrade its commercial-grade dedication program; however, a number of areas need to be improved. Most significantly the NNECO implementation of the commercial-grade dedication program needs increased attention. The assessment team identified several procedural weaknesses and implementation weaknesses involving the improper identification of design criteria, safety function(s), critical characteristics, and methods for verifying the critical characteristics. These dedication activities are performed by outside contractors working for the Millstone Procurement Engineering Group, and it appeared that the implementation weaknesses resulted from a lack of adequate training to program requirements combined with a lack of applicable technical background experience to current industry procurement and commercial-grade dedication practices.

The assessment team found strengths and potential strengths in such areas as receipt inspecti testing capabilities at the Metallurgy Laboratory Facilities in Berlin, Connecticut and at MNPS site, self assessments of the commercial-grade dedication program, the new 4-day procurement and commercial-grade dedication training course, the review project of previously installed CGIs at MNPS, and the general consistency of the program with the dedication approaches of EPRI NP-5652. In particular, audits by both Assessment Services and the Combined Utility Assessment Group of the commercial-grade dedication program resulted in many pertinent findings and observations that directly led to upgrades of the program and procedures. In addition, the quality, attitude, and dedication of the licensee's personnel were evident.

6 EXIT MEETING

On June 7, 1991, the assessment team conducted an exit meeting with members of the NNECO staff and management at the MNPS site. Persons contacted during the assessment are listed in the Appendix to this report. During the exit meeting, the team summarized the scope of the assessment and the observations. Throughout the assessment, the team met with MNPS management and staff to discuss concerns. The licensee did not identify any information as proprietary.

APPENDIX

PERSONS CONTACTED

Northeast Utilities

* S. Scace, Director, Millstone Station
* J. Keenan, Director, Millstone Unit 2 (MP2)
* C. Clement, Director, Millstone Unit 3 (MP3)
* F. Dacimo, Director, Site Services
* L. Johnson, Director, Field Services
* G. Baston, Director, Nuclear Production Materials
* D. McCory, Manager, Procurement Quality Services
* R. Asafayco, Manager, Nuclear Production Materials
* S. McKissick, Supervisor, Site Purchases
M. Suprenant, Supervisor, Procurement Vendor Services
* M. Ahern, Supervisor, Procurement Engineering Group (PEG)
* E. McNatt, PEG
* S. Kane, PEG
* A. Labrecque, PEG
* S. Hodge, Supervisor, General Nuclear Training
D. Pascal, Jr., Nuclear Training
* B. McLeish, Nuclear Training
* J. Coleman, Procurement Inspection Services
* S. Orefice, Project Engineer
* G. Bohn, MP3 Engineering
* J. Festa, Technical Programs
* W. Richter, Supervisor, MP3 Engineering
E. Duffy, MP2 Engineering
J. Harris, MP3 Engineering
A. Brockner, Stores
N. Thomas, General Electrical Engineering
* B. Thomas, Administration Supervisor
L. Laime, Welding Program Coordinator
J. Ely, Supervisor, Welding and Materials Test Engineering
R. Hurlburt, Engineering Specialist

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*Attended exit meeting

Nuclear Regulatory Commission

* W. Raymond, Senior Resident Inspector, MNPS
  K. Kolaczyk, Resident Inspector, MNPS
* U. Potapovs, Acting Chief, Vendor Inspection Branch, NRR
* R. McIntyre, Team Leader, NRR
* K. Naidu, Senior Reactor Engineer, NRR
* L. Campbell, Reactor Engineer, NRR
* B. Rogers, Reactor Engineer, NRR
* D. Caphton, Senior Technical Reviewer, Region I
* E. Wenzinger, Chief, Project Branch #4, Region I
* G. Vissing, Millstone Project Manager, NRR

NUMARC

* B. Bradley, Senior Project Manager

OTHERS

* F. Phillips, Con Edison of New York
* R. Rossman, Yankee Atomic Electric Company
* S. Buchwald, New Hampshire Yankee
* T. Keenan, Vice President, Nuclear Energy Services (NES)
* D. Scott, Project Manager, NES
  R. Rogozinski, Connecticut Yankee
  S. Leclerc, Maine Yankee

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*Attended exit meeting.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

October 11, 1991

Docket No. 99900779

Mr. William J. Eckert, Chairman of the Bo. d
Nutherm International, Incorporated
501 South Eleventh Street
Mount Vernon, IL 62864

Dear Mr. Eckert:

SUBJECT: NOTICE OF NONCONFORMANCE
(NRC INSPECTION REPORT 99900779/91-01)

This letter addresses the inspection of your facility at Mount Vernon, Illinois, conducted by Mr. R. C. Wilson and other members of this office on August 19-23, 1991, and the discussions of their findings with you and members of your staff on August 23, 1991. The purpose of the inspection was to determine if safety-related electrical components have been supplied by Nutherm in accordance with nuclear utility specifications and Nutherm's quality assurance (QA) program. The inspectors reviewed your dedication of commercial-grade equipment for safety-related applications and the qualification of equipment for harsh environments.

Areas examined during the NRC inspection and our findings are discussed in the enclosed report. This inspection consisted of an examination of procedures and records, interviews with personnel, and observations by the inspectors. The inspection identified that the implementation of your QA program failed to meet certain U.S. Nuclear Regulatory Commission (NRC) requirements. Specifically, Nutherm's purchase orders did not contain or reference controls necessary to ensure adequate quality of the analytical services supplied by the laboratory performing material identification services. Because the material analyses were used to dedicate commercial-grade components for safety-related applications, the results of the analyses must themselves be of high quality. In additio Nutherm's procedures did not contain adequate instructions f performing activities affecting quality. Specifically, these p ocedures did not address the content and frequency of Nutherm's surveys of commercial-grade supplier or the method used to determine sample lot homogeneity during the dedication of commercial-grade components.

The specific findings and references to the pertinent requirements for the above nonconformances are identified in the enclosed Notice of Nonconformance.

The response requested by the enclosed Notice is not subject to the clearance procedures of the Office of Management and Budget as required by the Paperwork Reduction Act of 1980, Public Law No. 96-511.

In accordance with 10 CFR Part 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosures will be placed in the NRC's Public Document Room.

Sincerely,

for Uldi Potapovs

Leif J. Norrholm, Chief
Vendor Inspection Branch
Division of Reactor Inspection
and Safeguards
Office of Nuclear Reactor Regulation

Enclosures:
1. Notice of Nonconformance
2. Inspection Report 99900779/91-01

ENCLOSURE 1

NOTICE OF NONCONFORMANCE

Nutherm International, Inc.
Mount Vernon, Illinois

Docket No.: 99900779/91-01

During a U.S. Nuclear Regulatory Commission (NRC) inspection conducted at Nutherm International, Incorporated, in Mount Vernon, Illinois, on August 19-23, 1991, the NRC inspection team determined that certain activities were not conducted in accordance with NRC requirements that were contractually imposed on Nutherm by purchase orders from NRC licensees. The NRC has classified these items as nonconformances to the requirements of Title 10 of the Code of Federal Regulations, Part 50 (10 CFR Part 50), Appendix B.

A. Criterion IV of Appendix B to 10 CFR Part 50 requires that requirements necessary to ensure adequate quality shall be included or referenced in the documents for the procurement of services.

Section 3.3 of Nutherm's Quality Assurance Procedure QAP-4-02-00, Revision 1, dated July 14, 1989, states that "the Engineering Manager is responsible for ensuring all Purchase Order descriptions and requirements, for purchases of commercial grade items, materials and services to be utilized as basic components in a nuclear safety related application, are delineated on a Purchase Requisition." Section 6.1 of the same procedure states that "upon the receipt of an approved Purchase Requisition, the Purchasing Agent shall initiate a Purchase Order Typing Request identifying the applicable quality requirements for that order. The purchase requisition and purchase order typing request shall be utilized to prepare the purchase order."

Contrary to the above, Nutherm's commercial-grade Purchase Order No. 4507-02-001 to the Chemir Laboratory did not include or reference the controls necessary to ensure the adequate quality of material analysis services. These services were used to verify the material identity of a gasket being environmentally qualified as a spare part for safety-related service in a temperature switch. Gasket failure could result in loss of the temperature switch's safety function (91-01-01).

B. Criterion V of Appendix B to 10 CFR Part 50 requires that activities affecting quality be prescribed by documented instructions or procedures.

Section 5.1 of Nutherm's Quality Assurance Manual QA-N 10179-5, Revision 4, dated October 5, 1990, states that activities affecting quality will be implemented in accordance with documented instructions or procedures.

Contrary to the above, Nutherm's documented instructions and procedures did not specify adequate controls for (1) the content and required frequency of surveys of commercial-grade suppliers and (2) the method used to determine sample lot homogeneity during the dedication of commercial-grade components for safety-related applications (91-01-02).

Please provide a written statement or explanation to the U. S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C. 20555 with a copy to the Chief, Vendor Inspection Branch, Division of Reactor Inspection and Safeguards, Office of Nuclear Reactor Regulation, within 30 days of the date of the letter transmitting this Notice of Nonconformance. This reply should be clearly marked as a "Reply to a Notice of Nonconformance" and should include for each nonconformance: (1) a description of steps that have been or will be taken to correct these items; (2) a description of steps that have been or will be taken to prevent recurrence; and (3) the dates your corrective actions and preventive measures were or will be completed.

Dated at Rockville, Maryland
this 11th day of October 1991.

ORGANIZATION:	NUTHERM INTERNATIONAL, INCORPORATED MOUNT VERNON, ILLINOIS
REPORT NO.:	99900779/91-01
CORRESPONDENCE ADDRESS:	Mr. William J. Eckert, Chairman of the Board Nutherm International, Incorporated 501 South Eleventh Street Mount Vernon, IL 62864
ORGANIZATIONAL CONTACT:	Laurence D. Patterson, Quality Assurance Manager
NUCLEAR INDUSTRY ACTIVITY:	Dedication and qualification of electrical components for nuclear safety-related applications, and the design and manufacture of safety-related systems.
INSPECTION CONDUCTED:	August 19-23, 1991
SIGNED:	R.C. Wilson 9/30/91 Richard C. Wilson, Team Leader, Date Reactive Inspection Section No. 2 Vendor Inspection Branch (VIB)
OTHER INSPECTORS:	Randolph N. Moist, VIB Billy H. Rogers, VIB Mark J. Jacobus, Consultant, Sandia National Laboratories
APPROVED:	Chris VanDenburgh 10/8/91 Chris A. VanDenburgh, Chief, Date Reactive Inspection Section No. 2 Vendor Inspection Branch
INSPECTION BASES:	10 CFR Part 21, 10 CFR 50.49, and 10 CFR Part 50, Appendix B
INSPECTION SCOPE:	To review the dedication and qualification activities conducted under Nutherm's quality assurance program, and review Nutherm's corrective actions for nonconformances and open items from previous NRC inspections.
PLANT SITE APPLICABILITY:	Numerous.

1 INSPECTION SUMMARY

1.1 Nonconformances

1.1.1 Contrary to Criterion IV, "Procurement Document Control," of 10 CFR Part 50, Appendix B, Nutherm's commercial-grade purchase order to Chemir Laboratory did not include or reference the controls necessary to ensure adequate quality of material analysis services (Nonconformance 91-01-01, see Section 3.3.2 of this report).

1.1.2 Contrary to Criterion V, "Instructions, Procedures, and Drawings," of 10 CFR Part 50, Appendix B, Nutherm's documented instructions and procedures did not specify adequate controls for the (1) content and frequency of surveys of commercial-grade suppliers and (2) method used to determine sample lot homogeneity during the dedication of commercial-grade components for safety-related applications (Nonconformance 91-01-02, see Sections 3.3.2 and 3.5 of this report).

1.2 Unresolved Items

1.2.1 Nutherm had not completed evaluating several differences between newly received Potter & Brumfield relays and a reference specimen that Nutherm had previously seismically tested (Unresolved Item 91-01-03, see Section 3.6 of this report).

1.2.2 Nutherm had not completed determining the revised qualified lifetimes of certain relays which were subject to a self-heating temperature rise caused by continuous coil energization (Unresolved Item 91-01-04, see Section 3.7 of this report).

1.2.3 Nutherm had not completed evaluating possible additional problems involving control panel overheating and component self-heating (Unresolved Item 91-01-05, see Section 3.8 of this report).

2 STATUS OF PREVIOUS INSPECTION FINDINGS

2.1 Nonconformance 99900779/88-01-01 (Closed)

Nonconformance 88-01-01 stated that, contrary to Criterion V, "Instructions, Procedures, and Drawings," of 10 CFR Part 50, Appendix B, Nutherm's environmental qualification test specifications lacked sufficient component-specific detail to adequately control testing.

Concerning a test record that lacked an acceptance or rejection signature, Nutherm revised data sheets in October 1989 to include such a signoff. Two instances were cited of unclear acceptance and rejection criteria, and in one instance an inappropriate test instrument had been selected. Nutherm file CWE-3455, which involved concerns of Nonconformance 88-01-01, and other files reviewed during this inspection indicated no further examples of this nonconformance. Based on these observations the inspectors closed Nonconformance 88-01-01.

2.2 Nonconformance 99900779/88-01-02 (Closed)

Nonconformance 88-01-02 stated that, contrary to Criterion III, "Design Control," of 10 CFR Part 50, Appendix B, Nutherm's program for upgrading or dedicating commercial-grade molded-case circuit breakers (MCCBs) did not always adequately evaluate material or design changes and their effect on environmental or seismic qualification. In addition, Nutherm's method of using reports of previous qualification tests to qualify new production items was considered invalid.

To correct this concern Nutherm issued Procedure QAP 4-02-00, "Procurement of Commercial Grade Items, Materials and Services," Revision 0, dated January 3, 1989, requiring documented traceability to the original equipment manufacturer (OEM) for all Nutherm-qualified items for which Nutherm relied in part on the manufacturer's information for design control. The inspector reviewed Revision 1, dated July 14, 1989, of QAP 4-02-00 and found that it adequately complied with Nutherm's previous commitments.

As a service to customers subject to NRC Bulletin 88-10 who had purchased dedicated MCCBs, Nutherm reviewed its purchase records for all MCCBs back to 1981 to determine whether it had documented traceability to the OEM. Where Nutherm records did not document traceability to the OEM, Nutherm researched the distributor's shipping and receipt records to establish traceability. When traceability was established this information was provided to the customer. Where Nutherm was unable to establish traceability, the MCCB was replaced with one traceable to the OEM. Nutherm's records associated with its research on MCCB traceability showed that Nutherm had dedicated significant resources to thoroughly researching purchase records. Based on these corrective actions the inspector closed Nonconformance 88-01-02.

2.3 Open Item 99900779/88-01-03 (Closed)

Open Item 88-01-03 involved Nutherm's disposition of anomalies that occurred during and after radiation testing for environmental qualification. An NRC review during the present inspection of 22 Record of Anomaly and Resolution forms, covering the period from April 1989 to July 1991, showed that most of the anomalies dealt with the failure of test specimens to meet post-radiation acceptance criteria. In most cases, the acceptance criterion was not violated by a large amount, and in each case, Nutherm's evaluation of the anomaly concluded that the discrepancy was not significant. However, Nutherm's documentation of the basis for acceptance was generally cursory. Nutherm indicated that the acceptance criteria usually were based on part manufacturer's specifications which were not intended to apply to post-radiation performance. Additionally, the acceptance criteria for most part applications did not require tolerances nearly as restrictive as the manufacturer's specifications.

Nutherm's parts qualification activities involved customer purchase orders for either individual parts or for Nutherm-designed systems. In either case, the Record of Anomaly and Resolution forms were included in the documentation packages provided to customers and required specific customer approval. The actual test data were also supplied. Because the customer was alerted to the discrepancy, the customer could evaluate further the actual results of a parts procurement or could question Nutherm about a system procurement. Nutherm's qualification activities for individual parts often appeared to be generic rather than application-specific. Nutherm certified the demonstrated capability of the part, rather than certifying that the part met the pre-determined performance criteria for a specific application.

Although the inspectors concluded that Nutherm's evaluation of test anomalies was satisfactory, they suggested that Nutherm consider (1) more judicious selection of test acceptance criteria for parts, rather than simply repeating manufacturer's specifications and (2) more detailed documentation of the basis for accepting parts used in Nutherm-designed systems. Based on these actions the inspector closed Open Item 88-01-03.

2.4 Open Item 99900779/88-01-04 (Closed)

Open Item 88-01-04 indicated that Nutherm's procurement and receipt inspection control should be reviewed during a future NRC inspection because Nonconformance 88-01-02 related to procurement and receipt inspection control of MCCBs. On the basis of the review described in Section 3.3 of this report, the inspectors concluded that Nutherm had taken adequate corrective action and Open Item 88-01-04 was closed.

3 INSPECTION FINDINGS AND OTHER COMMENTS

3.1 Entrance and Exit Meetings

In the entrance meeting on August 19, 1991, the NRC inspectors discussed the scope of the inspection, outlined areas of concern, and established interfaces with Nutherm's management and staff. In the exit meeting on August 23, 1991, the inspectors discussed their findings and concerns with Nutherm's management and staff.

3.2 Inspection Scope

Nutherm supplies safety-related electrical panels, racks, and small systems; performs the dedication of commercial-grade equipment; and provides qualification services. Nutherm has approximately 50 employees. Its business is entirely nuclear-related and includes several U.S. commercial nuclear plants, the U.S. Department of Energy, and some foreign facilities. The NRC's most recent inspections of Nutherm were documented in Inspection Reports 99900779/87-01, issued January 25, 1988, and 99900779/88-01, issued January 31, 1990.

The inspectors examined the findings remaining from the previous NRC inspections and reviewed the design, procurement, manufacturing, dedication, and qualification activities conducted under Nutherm's quality assurance program pursuant to the requirements of Appendix B to 10 CFR Part 50.

The inspectors reviewed ten dedication packages covering shipments made since mid-April 1991 to examine commercial-grade and safety-grade parts procurements, harsh and mild environment applications, system design efforts, and efforts restricted to dedication. The packages included dedications based on similarity and traceability to previously dedicated parts, as well as on newly performed dedication evaluations included in the package.

3.3 Quality Assurance Activities

Nutherm's Quality Assurance (QA) Manual QA-N-10179-5, Revision 4, dated October 5, 1990, governs its QA program. Nutherm's QA Procedures Manual QA-P-10179-3, dated August 1, 1991, implements and supports the QA Manual. The implementing procedures controlled activities affecting quality during design, supply of electrical components, environmental testing, commercial-grade dedication of electrical components, and calibration. The inspectors' review determined that Nutherm's control of purchased material was satisfactory. In addition, a review of sample personnel qualification documents showed that Nutherm's personnel were qualified to perform activities that affected quality.

3.3.1 Design Control

The NRC inspectors' review determined that Nutherm's design control was adequately addressed by QA implementing procedures. A review of several technical data packages showed that the customers' technical and quality requirements were translated into such design documents as test procedures, qualification plans, or component dedication planners for those activities involving commercial-grade dedication. The NRC inspectors concluded that appropriate personnel reviewed and approved design and QA documentation. A review of Nutherm's calculations showed that Nutherm's methodology was adequate.

3.3.2 Procurement and Audits

Nutherm procured nuclear safety-related components from vendors on its Nuclear Approved Vendors List (AVL), and commercial-grade components or services from vendors on the Commercial-Grade AVL. Nutherm procured almost all its commercial-grade components directly from the manufacturers. The inspectors verified that all of Nutherm's purchase orders were reviewed and initialed by the QA department. Nutherm's purchase orders indicated that 10 CFR Part 50, Appendix B, suppliers must meet the QA requirements described in the Nutherm document, "Quality Assurance Procurement Requirements for Nuclear Vendors." The inspectors' review of several technical data packages verified that customer requirements, including 10 CFR Part 50, Appendix B, and 10 CFR Part 21, were passed on to the suppliers for safety-related procurements. In one minor exception, the NRC inspectors noted that the file for safety-related Purchase Order 4378-01-000 to ASEA Brown Boveri did not contain the QA procurement requirements sheet. However, during the inspection Nutherm obtained a copy of the sheet from ASEA Brown Boveri and placed it in the file.

Although the inspectors concluded that Nutherm's implementing procedures for procurement activities affecting quality were adequate, the inspectors noted that Nutherm's commercial-grade Purchase Order 4507-02-001 to Chemir Laboratory for gasket material analysis by infrared spectroscopy did not impose adequate quality requirements on Chemir's analyses. The gasket was being environmentally qualified as a replacement part for use in a safety-related temperature switch. Gasket failure could result in loss of the temperature switch's safety function. Criterion IV of Appendix B to 10 CFR Part 50 states that requirements necessary to ensure adequate quality shall be included or referenced in the documents for the procurement of services. Nutherm's failure to include requirements necessary to control quality in the Chemir purchase order was identified as Nonconformance 91-01-01.

The inspectors' review of several Nutherm audits of 10 CFR Part 50, Appendix B, suppliers showed that Nutherm's audit checklists were adequate to assess all activities affecting quality. Nutherm's procedures required audits to be performed for all 10 CFR Part 50, Appendix B, suppliers every 3 years as shown on the AVL.

In one example, the NRC inspectors noted that Nutherm's QA department conducted a commercial-grade survey of Chemir Laboratory on September 10-11, 1990, reviewing their calibration methods, personnel qualifications, and the laboratory control program document Chemir/NI 9/10/90. The NRC inspectors' review determined that the required scope and frequency of these commercial-grade surveys were not documented in any Nutherm procedure. Criterion V of Appendix B to 10 CFR Part 50 requires that activities affecting quality shall be prescribed by documented instructions or procedures. Nutherm's failure to specify the content and frequency of surveys of commercial-grade suppliers is the first example of Nonconformance 91-01-02. (The second example is identified in Section 3.5 of this inspection report.)

In response to the inspectors' concerns, Nutherm's QA manager stated that, although Chemir/NI 9/10/90 did address laboratory procedures and practices specifically developed by Chemir for Nutherm contracts, he did not know if it was a quality assurance document. Therefore, Nutherm had not established the suitability of Chemir/NI 9/10/90 for use in procurements intended to verify components' critical characteristics. During this inspection, Nutherm scheduled another survey for September 11, 1991, to verify Chemir's program implementation and compliance as applicable to the requirements of Appendix B to 10 CFR Part 50.

3.3.3 Document Control

The inspectors compared several documents from technical data packages against the document control log to verify the revision numbers. The inspectors determined that two project travelers (NSP-4429-01 and NSP-4429-02) were both listed as Revision 0 in the document control log; however, the project traveler cover sheets showed Revision 2 for NSP-4429-01 and Revision 3 for NSP-4429-02. The inspectors also noted that a Nutherm internal QA audit for design control had identified the same type of nonconformance. The NRC inspectors did not cite this example as a nonconformance, because there were no other discrepancies of this type and Nutherm's QA department had identified this concern during their internal audits. In addition, Nutherm had scheduled corrective action for August 26, 1991. The inspectors concluded that the implementing procedures for document control were adequate and were being followed.

3.3.4 Corrective Action

The inspectors' review found that Nutherm's corrective action requests were controlled, well documented, and were forwarded to upper management as required by procedure. However, the inspectors noted that in one instance the production department did not respond in a timely manner. The original due date for Corrective Action Request (CAR) No. 40 was May 28, 1991, but the production department did not respond until August 7, 1991. In addition, the QA department submitted three overdue notifications to the production department requesting that they implement corrective action. Nutherm's slow disposition of CAR No. 40 was regarded as unusual, and the inspectors concluded that Nutherm's nonconformance notices were controlled, well documented to support conclusions, and were generally closed on a timely basis. In addition, adequate implementing procedures were in place and were being followed.

3.3.5 External Audits

The inspectors' review determined that Nutherm's responses to the findings of Nuclear Utilities Procurement Issues Council Audit A-SE-90-13, conducted October 16-19, 1990, and Arizona Public Service Company Audit 91-004-506, conducted May 14-16, 1991, were satisfactory and timely.

3.4 Commercial-Grade Dedication

The inspectors found that Nutherm procured commercial-grade items by three methods: (1) directly from the manufacturer, (2) from distributors, with provision for shipping the parts and related documentation from the manufacturer directly to Nutherm, and (3) from distributors who have been qualified by a Nutherm survey to provide a valid certification that the items shipped were obtained from the manufacturer and shipped without alteration. Nutherm's QA manager stated that 99.9 percent of all commercial-grade items were procured directly from the manufacturer.

The engineering department identified project input requirements on a Component Dedication Planner form by considering the required performance and design basis for the item or component. The form accompanied the item from receipt inspection to shipping inspection. It identified all of the item's critical characteristics that were to be verified, under the headings of "Product Identification," "Physical Attributes," and "Performance." The engineering department selected the critical characteristics by determining the item's complexity, safety function, and performance requirements, including any customer-specified critical characteristics. Nutherm verified each critical characteristic by special tests and inspections, a commercial-grade survey of the supplier, or a source verification.

During receipt inspection, Nutherm applied a sticker to the item bearing a code traceable to the purchase order number, revision number, line item number, and unit number. A Specimen Comparison Request form was then initiated to compare observable physical characteristics of the items. After the receipt inspection and specimen comparisons were completed, the items were stored in a warehouse location identified by the purchase order number.

Nutherm dedicated items as basic components (1) by comparing the items identified on the purchase order to a Nutherm test laboratory (NTL) item previously qualified or (2) by performing qualification testing on a sample of the items. In the first method, Nutherm documented all the differences between the items being dedicated and the NTL item on the comparison request form. Qualified personnel evaluated each difference to determine its effect on seismic and environmental qualification. If any differences were found, Nutherm attempted to obtain the manufacturer's material list to identify the material and design changes that had occurred since the item was qualified. Alternatively, a material sample could be sent to a test laboratory for analysis. If the manufacturer's material list was used, Nutherm's QA department audited the manufacturer to ensure that the commercial-grade control of the material list and product were adequate.

If identified differences prevented dedication based on the NTL item test data, Nutherm required the item to be requalified. If differences were noted, but the item was still considered to be satisfactory for use as a basic component, then a record of dedication was written to document the basis for acceptability. The record was reviewed and approved by appropriate personnel.

If an NTL item did not exist, then Nutherm dedicated by the second method--performing qualification testing of sample items from the purchase order. The test item was etched with the purchase order number for identification before testing and stored in the testing laboratory's "library" as a standard for future comparisons after type testing was completed. The qualification methodology was documented in Nutherm's implementing procedures.

All nuclear-qualified items were tested to demonstrate their functional performance before shipment, and the manager of dedication issued a Certificate of Dedication which certified the items as basic components.

3.5 Sample Homogeneity

The NRC inspectors questioned how Nutherm addressed possible variations among items being dedicated or qualified. The manager of dedication indicated that suppliers were unable or unwilling to comply with Nutherm's requests to establish homogeneity--such as sequential serial numbers, same date codes, same lot, or same quality control inspectors--so these requests were usually not included in Nutherm's purchase orders. The inspectors noted that Nutherm performed several independent actions to verify lot homogeneity. Using parameters such as date codes, Nutherm visually compared the items being dedicated to the NTL item as required by Procedure QAP 9-7-10-19, "Parts Comparison for Similarity," Revision 7, dated September 27, 1990.

If the lot to be dedicated did not appear to be homogeneous, Nutherm compared items within the lot by nondestructive disassembly and visual examination. If the date codes were spaced in time, one item (typically the oldest) would be disassembled and compared to the NTL item. Any differences would be evaluated in terms of performance and seismic capability, and a material analysis would be performed if the item was intended for use in a harsh environment.

If the date codes for the items received were similar within the lot but different from the NTL item, Nutherm disassembled one item and compared it to the NTL item. Nutherm tried to obtain design change information from the supplier. If the information was not available, Nutherm performed a material analysis on the item being dedicated and on the NTL, if necessary. Nutherm purchased extra items as necessary for this testing and analysis.

During this review the inspectors noted that, although these additional actions taken to verify homogeneity among parts were important to Nutherm's dedication and qualification processes, they were not prescribed by Nutherm procedures. In spite of the additional actions Nutherm had taken to verify lot homogeneity, Criterion V of Appendix B to 10 CFR Part 50 requires that activities affecting quality be prescribed by documented instructions or procedures. Nutherm's failure to specify adequate controls in their documented instructions and procedures to establish sample lot homogeneity is another example of Nonconformance 90-01-02 (identified in Section 3.3.2 of this report).

3.6 Example of Parts Comparison

The NRC inspector observed Nutherm's receiving inspection and comparison of five Potter & Brumfield MDR 138-8 relays which were purchased as commercial-grade items for subsequent dedication. The Nutherm receiving inspector used the implementing procedure, Dedication Planner form, and Potter & Brumfield data sheet at the inspection station to verify that the relays were in accordance with the purchase order requirements and the implementing procedure. A technician from the material department compared the relays using Production Standard 5001-55629-13, "Comparison to Determine Similarity," Revision 3, dated December 11, 1990. The packing list showed that the relays were shipped directly from Potter & Brumfield.

The comparison activities determined that the newly received relays slightly differed in several respects from the NTL item that Nutherm had previously seismically tested. Specifically, the color of materials, sealing locations, the screw projection from nuts, and insulator board patterns were different; the screw bottoms were beveled instead of flat; the height from the bell housing to the bottom of the first insulator was different; there was no coil housing gap between the bottom metal cap and what appeared to be plates; there was a different coil wire sleeve material; the relay weights were different; and an "AMF Incorporated" notation on the label was missing.

The Nutherm technician documented the differences on the Comparison Request form and forwarded it to the manager of dedication. The manager of dedication stated that each difference would be evaluated to determine its effect on seismic and environmental qualification, and if the evaluation results permitted the dedication to be completed they would be documented in the Record of Dedication. Nutherm would also research their records for additional test data to support dedication. If the differences did not permit the dedication to be completed using the original test data, requalification would be required. Because of the numerous changes found in the relays, this issue is designated as Unresolved Item 91-01-03, and Nutherm's actions concerning the differences will be reviewed during a future NRC inspection.

3.7 Qualification Testing

Nutherm Purchase Order File CWE-3455 covered switches, auxiliary relays, overload relays, circuit breakers, and indicator lights supplied to Commonwealth Edison Co.'s LaSalle nuclear power plant. Nutherm purchased commercial-grade items, and seismically and environmentally qualified them. Nutherm contracted the seismic testing to Wyle Laboratories and the radiation exposure to Radiation Sterilizers. Nutherm performed the remainder of the qualification work, including the steam and temperature testing.

Nutherm test report CWE-3455R, Revision 1, dated February 14, 1991, revealed a thermal aging qualification concern similar to one recently identified at Southern Testing Services, Inc. (see NRC Inspection Report 99901223/91-01, issued September 4, 1991, pages 8 and 9, for further details). The concern related to continuously-energized components which experience less self-heating temperature rise at elevated temperatures than at room temperature because the resistivity of copper coil wire increases at elevated temperature. Since Nutherm used a room temperature measurement of the self-heating temperature rise in performing the thermal aging analysis for General Electric HMA series relays, the Nutherm test exposed the relay to a lower-than-intended-temperature. Therefore, the qualification test resulted in a nonconservative estimate of the relay's qualified life.

Because of this concern Nutherm reviewed its records for other thermal aging tests of energized components, and found only two. In both cases customer purchase order changes documented that the equipment would be used in mild environments where it is not subject to thermal aging concerns.

Nutherm planned to measure the actual elevated temperature and recalculate the qualified life of the LaSalle relays with an estimated completion date of September 9, 1991. The inspectors concluded that this was satisfactory because the equipment in question was not shipped until February 21, 1991, and Nutherm estimated the true qualified life to be at least 5 years. This issue will be followed as Unresolved Item 91-01-04. The NRR project managers have been informed of this discrepancy. This issue will be reviewed as part of the NRC's ongoing evaluation of self-heating temperature effects on thermal aging analysis.

In addition, the inspectors found inconclusive test results in Nutherm File CWE-3455 for leakage current measurements during design basis accident testing of General Electric SBM-type switches. Shorting of the ground test lead from the test fixture to the leakage current monitoring fuse could invalidate the ability of the fuse to demonstrate that leakage did not exceed 0.1 ampere. Measurements taken near the end of the test showed abnormally high leakage currents (50-60 milliamps) that were attributed to heat shrink material on the test leads. Without other measurements, even if the test leads were defective, the actual leakage of the switch itself cannot be determined. Since the customer had only requested leakage current measurements for information, no acceptance criteria were violated and no notice of anomaly was generated. The NRC inspectors noted that although this discrepancy was not a nonconformance, a Notice of Anomaly would have helped to direct the customer's attention to the high leakage currents actually measured.

3.8 Nutherm 10 CFR Part 21 Activities

The NRC inspectors reviewed Nutherm Procedure QAP 15.0, "Control of Nonconforming Items," Revision 0, dated January 25, 1991, which provided instructions and requirements for Nutherm's identification, control, and documentation of nonconformances. QAP 15.0 referenced QAP 19.0, "Federal Regulations and Responsibilities Thereunder," Revision 3, dated July 14, 1989, which contained the requirements of 10 CFR Part 21. In addition, the inspectors noted that Nutherm reviewed and maintained a file of other vendor and licensee 10 CFR Part 21 notifications, NRC information notices, and NRC bulletins.

Nutherm had made only one 10 CFR Part 21 notification to the NRC before the inspection. In a notification dated August 9, 1991, Nutherm identified that it had designed and supplied filtration ventilation system heater control panels under Nutherm project A-1276 to the American Air Filter Company as environmentally-qualified (radiation was the only harsh environment parameter), safety-related equipment. The equipment had experienced blown fuses and discolored wire insulation at the Hope Creek nuclear power plant. On July 25, 1991, the Public Service Electric & Gas Company provided panel internal temperature distribution data to Nutherm. Nutherm submitted a potential deviation report to the NRC on July 30, 1991, an oral 10 CFR Part 21 notification to the NRC (and written reports to its customer and the licensee) on August 7, 1991, and the formal written 10 CFR Part 21 notification on August 9, 1991. The July 30, 1991, report advised that satisfactory interim operation could continue with the panel doors open until Nutherm's investigation was completed.

Nutherm's evaluation of the concern was addressed in Corrective Action Request No. 42 dated August 16, 1991, and internally approved and accepted on August 19, 1991. Nutherm evaluated the panel components against the temperature data provided by the licensee. During the NRC inspection Nutherm was oven-testing four components whose qualified lives could have been reduced below the specified life of the panel to determine their new qualified lives. Nutherm identified that the root cause for this problem was the failure to adequately consider the heat generated in the cable bundles and the heat transfer surface reduction due to components mounted on the sides and bottom of the panels. When Nutherm performed the calculations in 1985, an independent review was not performed.

As a corrective action, Nutherm subsequently revised Procedure QAP 3-0-02, "Preparation and Review of Calculations," to require such an independent review. Nutherm also initiated a review of the calculations in all qualification efforts that included determination of in-cabinet temperatures, and for all other harsh environment qualifications. The review also included the component self-heating concern discussed in Section 3.7 above. Completion of these reviews was scheduled for September 9, 1991. Nutherm also reviewed its records to identify other possibly affected projects. Although no harsh environment concerns were identified, two mild environment projects were found which involved panels of similar design. Evaluation of the suitability of those panels for their environment was also scheduled for completion by September 9, 1991. Completion of both these reviews will be followed as Unresolved Item 91-01-05.

The inspection team concluded that Nutherm was adequately addressing the notification requirements of 10 CFR Part 21, and that the corrective actions taken for the only notification provided to date have been thorough and timely. The inspectors had no further concerns in this area.

4 PERSONNEL CONTACTED

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* Attended both the entrance and exit meetings of August 19 and 23, 1991

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555

November 15, 1991

Docket No. 50-323

Mr. J. D. Shiffer
Senior Vice President
Nuclear Power Generation
Pacific Gas and Electric Company
77 Beale Street, Room 1451
San Francisco, California 94106

Dear Mr. Shiffer:

SUBJECT: INSPECTION OF THE PROCUREMENT AND COMMERCIAL-GRADE DEDICATION OF THE SIXTH (2-3) EMERGENCY DIESEL GENERATOR SET FOR DIABLO CANYON NUCLEAR POWER PLANT, UNIT 2 (INSPECTION REPORT NO. 50-323/91-202)

We are transmitting the report of the U.S. Nuclear Regulatory Commission (NRC) inspection conducted April 29 through May 3, 1991, at the corporate offices of Pacific Gas and Electric Company (PG&E), San Francisco, California. Messrs. Steven M. Matthews, Richard P. McIntyre, Walter P. Haass, and Michael R. Snodderly of the NRC's Office of Nuclear Reactor Regulation and Mr. William J. Wagner of the NRC's Division of Reactor Safety, Region V, evaluated PG&E's procurement and commercial-grade dedication of an emergency diesel generator (EDG) set for Diablo Canyon Nuclear Power Plant (DCNPP), Unit 2.

The NRC views PG&E's decision to install the sixth EDG as an enhancement to the safety of DCNPP. PG&E procured the sixth EDG as commercial-grade equipment, similar to the EDGs currently installed, intending to dedicate it for safety-related service.

The NRC inspection team focused on the procurement and commercial-grade dedication activities of the EDG's diesel engine component. The team had several unresolved concerns with PG&E's procurement and commercial-grade dedication program and, therefore, with the resulting quality and reliability of the EDG. PG&E did not adequately demonstrate through its procurement and commercial-grade dedication program that all critical characteristics specific to the EDG's ability to perform its intended safety-related function had been verified and that the bases of the original seismic qualification had been maintained.

During the exit meeting on May 3, 1991, your staff expressed the desire to provide any additional information that would clarify the team's concerns and facilitate the team's review and evaluation of the EDG's procurement and dedication activities. The team prepared a list of questions and concerns as a followup to the inspection effort and gave PG&E the opportunity to present additional data, as requested. This report, therefore, incorporates (1) the team's review of the additional documentation that PG&E submitted on June 7 and 28, 1991, and (2) PG&E's presented response to the team's questions, including the reference documentation, on July 15, 1991, at the NRC's headquarters in Rockville, Maryland.

While this inspection report identifies findings with the PG&E commercial-grade dedication process, the NRC also recognizes that the findings were made at a particular point in the dedication process and that progress continues to be made and additional information may have been developed to resolve some of the identified concerns. Consequently, the staff suggests that following your review of this inspection report a meeting be scheduled to work on resolution of the issues. If all of these issues cannot be completely resolved, it may be necessary to consider performing additional testing to establish the reliability of the EDG to perform its safety function. The above items will be reviewed by the NRC regional office for any enforcement actions.

Also, we have conducted inspections of your supplier of the A.C. power generator for the EDG set, NEI Peebles - Electric Products, Inc. of Cleveland, Ohio and NEI Peebles Limited, Peebles Electrical Machines of Edinburgh, Scotland, United Kingdom. These inspections raised additional specific technical concerns regarding the use of appropriate rotor pole magnet wire and the use of a Bakelite electrical separation ring as a potentially load bearing component-part of the rotor shaft support assembly. PG&E's selection of critical components and characteristics, some of which were specified after the generator was assembled and shipped, were also of concern. The reports of these inspections will be issued in the near future and the inspection findings will be reviewed with PG&E's staff during future inspection activities.

We believe a meeting between your staff and the NRC inspection and review staff to discuss these matters would be appropriate in the near future. This meeting would focus on the safety functions of the synchronous generator including PG&E's ability to maintain the bases of the original seismic qualification as well as the matters in this report.

In accordance with 10 CFR 2.790(a), a copy of this letter and the enclosure will be placed in the NRC's Public Document Room.

Should you have any questions concerning this inspection, we will be pleased to discuss them with you. Thank you for your cooperation during this inspection.

Sincerely,

BABoger

Bruce A. Boger, Director
Division of Reactor Projects
III/IV/V
Office of Nuclear Reactor Regulation

Enclosure:
Inspection Report No. 50-323/91-202

cc w/enclosure: See next page

cc w/enclosure:

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INSPECTION REPORT

U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
DIVISION OF REACTOR INSPECTION AND SAFEGUARDS

Docket No.:	50-323
Report No.:	50-323/91-202
License No.:	DPR-82
Licensee:	Pacific Gas and Electric Company 77 Beale Street, Room 1451 San Francisco, California 94106
Facility Name:	Diablo Canyon Nuclear Power Plant, Unit 2
Inspection Location:	San Francisco, California
Inspection Dates:	April 29 through May 3, 1991

Lead Inspector: Steven M. Matthews 10/30/91

Steven M. Matthews, Team Leader
Reactive Inspection Section 1 (RIS1)
Vendor Inspection Branch (VIB)

Date

Other Inspectors: Richard P. McIntyre, RIS1, VIB
Walter P. Haass, Special Projects Section, VIB
Michael R. Snodderly, RIS1, VIB
William J. Wagner, Division of Reactor Safety, Region V

Approved By: Uldis Potapovs 10-30-91

Uldis Potapovs, Chief, RIS1
Vendor Inspection Branch
Division of Reactor Inspection and Safeguards

Date

Summary: The announced inspection of the procurement and commercial-grade dedication activities for the 2-3 emergency diesel generator (EDG) set resulted in identifying deficiencies and unresolved items. Additional information is necessary to ascertain whether the EDG's quality complies with the requirements of Appendix B to 10 CFR Part 50.

EXECUTIVE SUMMARY

The U.S. Nuclear Regulatory Commission's (NRC's) Vendor Inspection Branch, Division of Reactor Inspection and Safeguards, Office of Nuclear Reactor Regulation, with Region V participation, conducted an announced inspection at the corporate offices of the licensee, Pacific Gas and Electric Company (PG&E) in San Francisco, California, April 29 through May 3, 1991. The inspection team evaluated the licensee's procurement and commercial-grade dedication activities for the emergency diesel generator (EDG) set for the licensee's Diablo Canyon Nuclear Power Plant (DCNPP), Unit 2. According to PG&E, the new sixth (2-3) EDG will be identical (i.e., like-for-like) to DCNPP's five existing EDGs.

The team focused on the procurement and commercial-grade dedication activities for the diesel engine (DE) component of the EDG set. The licensee procured the DE for the EDG as a commercial-grade component. The licensee based the commercial-grade dedication on the performance history of identical DEs, and because of certain concerns, identified by the licensee, the performance history was later supplemented with a commercial-grade survey of the DE manufacturer utilizing selected mechanical components. Again, additional concerns were identified by the licensee and the commercial-grade survey was augmented by performing source verification of selected activities and special tests and inspections.

The team had several concerns with the licensee's procurement and commercial-grade dedication program and, therefore, with the resulting quality and reliability of the EDG. The licensee did not adequately demonstrate through its commercial-grade dedication program that all critical characteristics specific to the EDG's ability to perform its intended safety function had been verified and that the bases of the original seismic qualification had been maintained.

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1 INTRODUCTION

The U.S. Nuclear Regulatory Commission (NRC) inspection team evaluated Pacific Gas and Electric Company's (PG&E'S) procurement and commercial-grade dedication program activities to determine if the quality and reliability of the sixth (2-3) emergency diesel generator (EDG) for Diablo Canyon Nuclear Power Plant (DCNPP) Unit 2 had been adequately verified. The EDG set consisted of (1) a Model 18-251-F commercial-grade diesel engine (DE), including power-train parts and mechanical components, manufactured by GE Locomotive (GE-L) of Montreal, Canada; (2) a safety-related synchronous generator manufactured by NEI Peebles - Electric Products, Inc. of Cleveland, Ohio, and NEI Peebles Ltd., Peebles Electrical Machines, of Edinburgh, Scotland, United Kingdom; (3) a commercial-grade static exciter voltage regulator system and panel manufactured by Basler Electric Company of Highland, Illinois; (4) panels, instrumentation and control components, and piping supplied by PG&E; and (5) the assembly of the EDG by GEC Alsthom of Toronto, Canada.

The team focused their inspection on the licensee's procurement and commercial-grade dedication of the Model 18-251-F, DE manufactured by GE-L. According to the licensee, GE-L's facility in Montreal, Canada, had been manufacturing DEs for approximately 40 years. When the licensee procured the five original DEs for DCNPP in 1969, the DE manufacturer was Worthington Corporation, Alco Engine Division (ALCO). Before the licensee placed the order for the 2-3 EDG, the company had experienced two buyouts: the first by Bombardier, Inc., the second by GE-L. GE-L obtained the company in 1989.

At the time of the inspection, the licensee reported that its commercial-grade dedication activities were not complete. According to PG&E, the break-in test of the DE at GE-L's facility in Montreal, Canada, had been completed on February 11, 1991, and the DE had been shipped to GEC Alsthom's facility in Toronto, Canada, for assembly and functional performance testing of the completed EDG. The licensee also reported that it had performed source verification activities during the assembly of the EDG set. The EDG assembly consists of skid-mounting the DE, the synchronous generator, and the auxiliary systems and associated piping in preparation for the functional performance testing by GEC Alsthom. The licensee also was evaluating and revising the documentation of the commercial-grade DE dedication to incorporate the results of material testing, source verification reports, and PG&E engineering's review of GE-L's nonconforming material reports. PG&E also reported that the review and compilation of all GE-L design changes since it had purchased the existing five ALCO DEs were not complete.

The team observed activities, held discussions with the licensee's staff, and reviewed records and procedures associated with the procurement and commercial-grade dedication program. This report also incorporates the team's review of additional documentation submitted by the licensee on June 7 and 28, 1991, and the licensee's presented response to NRC's questions, including the reference documentation, on July 15, 1991, at NRC's headquarters in Rockville, Maryland.

The team has characterized its findings within this report as deficiencies or unresolved items. Deficiencies are either (1) the apparent failure of the licensee to comply with a requirement or (2) the apparent failure of the licensee to satisfy a written commitment or to conform to the provisions of applicable codes, standards, guides or accepted industry practices. Unresolved items involve a concern about which more information is required to ascertain whether it is acceptable or deficient. These items will be reviewed by the NRC regional office for any enforcement actions.

The specific areas and documentation reviewed, and the team's findings are described in Sections 2 and 3 of this report. Section 4 addresses the exit meeting and the persons who participated in and who were contacted during the inspection are listed in Appendix A. A listing of those persons attending the licensee's presentation to the NRC staff on July 15, 1991, is given in Appendix B.

2 PROCUREMENT REVIEW

The licensee's Purchase Order (PO) No. ZS-1539-AA-9, dated January 30, 1990, was issued to GE-L for a 2600-kW EDG set, including a Model 18-251-F, stationary, oil-fueled, water-cooled, four-cycle, 18-cylinder, "V" diesel engine with cylinder liners. Although the team reviewed revision No. 1 to the PO, issued March 8, 1990, it did not appear to change the basic technical and quality procurement requirements as originally specified by the licensee. The PO imposed on GE-L the licensee's Design Specification No. 1539, Design Specification for Furnishing and Delivering Diesel Engine Generator Unit at Diablo Canyon Power Plant, Unit 2, Revision No. 1, dated January 19, 1990. The design specification stated that the DE shall conform to GE-L's ALCO Specification No. GS5100F, Specification, Diesel Generating Sets, dated June 9, 1978, and to the licensee's Specification No. CG-P-Diesel, Specification for Supplier's Certification Program (CG-P-Diesel), Revision No. 1, dated December 21, 1989.

CG-P-Diesel requires, in part, that unless otherwise noted in the specification, the supplier (GE-L) shall plan, establish, implement, and maintain a quality assurance program in accordance with the requirements of CAN3-Z299.3-85 of the Canadian Standards Association's (CSA's) CAN3-Z299, Quality Assurance Program Standards.

The CAN3-Z299 quality standards series provides the minimum requirements for a supplier's quality program, according to the quality level specified. The standard gives four levels of quality assurance (QA) programs, each with decreasing comprehensiveness and sophistication. The CAN3-Z299 levels of quality assurance programs are described below.

- The Z299.1 QA program level is intended to prevent the occurrence of nonconforming products or services because failure in service could result in extreme cost or undue risk to health and safety, or both.

- The Z299.2 QA program level aims at reacting to nonconforming products or services to prevent their recurrence because failure in service could result in serious cost or significant risk to health and safety, or both.

- The Z299.3 QA program level proposes a program for verifying the conformance of products or services throughout the process because failure in service could result in significant cost or some risk to health and safety, or both.

- The Z299.4 QA program level suggests a program for sorting the good items from the bad; it need not be documented.

Table 4 of CAN3-Z299.0-86 describes the relationship of the four levels of QA program with other quality programs. The table provides a generalized comparison of the elements of a quality standard but not its applicability. The table states, in part, that Appendix B to Title 10 of the Code of Federal Regulations Part 50 (10 CFR Part 50) correlates to only the CAN3-Z299.1 QA program standard.

Appendix B to 10 CFR Part 50 applies to all activities affecting the safety-related function of systems and components, or parts thereof, necessary to ensure (1) the integrity of the reactor coolant pressure boundary, (2) the capability to shut down the reactor and maintain it in a safe shutdown condition, or (3) the capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposure. Moreover, the CAN3-Z299.1 QA program level is the only level of CAN3-Z299 that addresses the loss of a safety function to the extent of a major reduction in the degree of protection to the public health and safety. The licensee, however, imposed the CAN3-Z299.3 QA program standards for the DE and its components, without demonstrating an adequate basis for specifying the less rigorous quality level (i.e., the factor rating method or the program element method for determining the appropriate quality level, as described in CAN3-Z299.0-86, Guide for Selecting and Implementing the CAN3-Z299-85 Quality Assurance Program Standards). Also, CAN3-Z299.0-86 states that the CAN3-Z299.3 QA program standard imposed by the licensee does not provide controls for design planning, design processes, design verifications, or design reviews. This issue applies to the adequacy of the licensee's procurement requirements and is discussed further in section 2.1 of this report.

The licensee's procurement documents for the DE specified certain requirements for critical and non-critical components of the DE, as described below.

2.1 Critical Components (Power Train Parts)

The licensee's design specification stated the criterion for determining if a component is critical and also defined the DE's critical components that are subject to the quality requirements specified in CG-P-Diesel. The criterion for determining if a component is critical was based on whether the functional performance testing adequately demonstrated the components' properties or attributes regarding the effects of long-term degradation and cyclic fatigue (i.e., a component is a critical component if the functional performance testing will not demonstrate the adequacy of the component's properties or attributes to withstand the effects of long-term degradation and cyclic fatigue).

The critical components listed in the design specification were later defined by the licensee as power train parts in its transmittal of March 27, 1991, to the NRC. The listing of power train parts in the transmittal also included valve inserts, connecting rod bolts, and connecting rod nuts, that were not listed in the design specification as critical components. The licensee's list of 14 power train parts groupings from its transmittal of March 27, 1991 (a total of 424 parts), is given below.

- engine block
- crankshaft
- cylinder liners
- cylinder heads
- valves - air and exhaust
- valve inserts
- piston bodies
- piston caps
- connecting rods
- connecting rod nuts
- connecting rod bolts
- main bearings - shell
- main bearings - thrust
- camshafts

The licensee, however, did not revise the PO to include the valve inserts, connecting rod bolts, and connecting rod nuts in its procurement documents as critical components, or demonstrate an engineering analysis of the long-term degradation and cyclic fatigue effects for these components during the functional performance testing. The licensee also failed to demonstrate an engineering evaluation of the DE that substantiates that the list of power train parts included <u>all</u> parts that are required for the DE to perform its safety functions and that are also critical components, based on the criterion stated in the design specification; those components that will not adequately demonstrate during the functional performance testing the properties or attributes to withstand the effects of long-term degradation and cyclic fatigue. This is Unresolved Item 50-323/91-202-01.

In its transmittal of March 27, 1991, the licensee described the commercial-grade dedication methodology for the DE and the special quality requirements imposed on GE-L for critical components[1]; also known as power train parts, as designated by the licensee in its transmittal. The special quality requirements were that (1) GE-L shall evaluate all suppliers of power train parts to ensure their technical and quality capability to provide items or services, (2) GE-L's evaluation of suppliers shall be documented, and (3) GE-L's evaluation shall include an annual audit of the suppliers' facilities to assess the implementation of the suppliers' quality program in accordance with CSA's Standard CAN3-Q395 or equivalent. However, the team's review also determined that the licensee's design specification and CG-P-Diesel imposed additional special quality requirements on GE-L for power train parts, as discussed in the paragraphs below.

(1) <u>Design Control</u>

Paragraph 4.2.1 of CG-P-Diesel required GE-L to (1) define the critical parts for which the quality requirements of the specification apply, (2) obtain concurrence from PG&E on the critical parts list, (3) identify the critical characteristics for each critical part (e.g., form, fit, function, material, and process; according to the licensee), and (4) obtain concurrence from PG&E on the critical characteristics applicable to each critical part. Although this section of CG-P-Diesel requires GE-L to define the critical parts for which the quality requirements of the specification apply, PG&E had previously specified the

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[1]The licensee did not attempt to distinguish between the term "critical component," as used in the design specification, and "critical part," as used in Specification No. CG-P-Diesel, and therefore, the terms were considered synonymous.

critical components in Section 14 of its design specification. The list of critical parts was verified by the licensee during its audit of GE-L performed on December 12 through 15, 1989, and documented in Supplier Commercial Qualification Audit No. 89297S.

Paragraph 4.5.3 of CG-P-Diesel requires GE-L to perform and document a design verification when changes are made to either material, manufacturing process, or the design of power train parts to ensure that critical characteristics are not adversely affected. Paragraph 4.5.4 requires GE-L to perform and document an evaluation when changes in design are made to non-critical parts to ensure that the changes in design will not adversely affect power train parts.

The licensee's Supplier Commercial Qualification Audit No. 89297S showed that GE-L's engineering procedure for processing engineering change notices (ECNs) was not located or reviewed during the audit. Although the ECN form was reviewed to ascertain the adequacy of the controls for design changes, the ECN form did not address the design verification and evaluation required, respectively, by paragraphs 4.5.3 and 4.5.4 of CG-P-Diesel.

The licensee imposed these additional design controls on GE-L because the CAN3-Z299.3 QA program, also imposed on GE-L by the licensee, does not provide controls for design activities. However, PG&E's Supplier Commercial Qualification Audit No. 89297S did not substantiate that GE-L's quality program was adequate to ensure that the additional design controls imposed in CG-P-Diesel would be achieved.

(2) Audits of Suppliers and Subcontractors

The licensee imposed through CG-P-Diesel several special requirements pertaining to GE-L's audit, evaluation, and selection of suppliers of power train parts. For example, paragraphs 4.7.2, 4.10.1, and 4.10.4 require GE-L to (1) perform annual audits of suppliers and subcontractors providing items or services for power train parts, (2) apply the quality requirements specified in CG-P-Diesel to all subcontracted work and services pertaining to power train parts, and (3) evaluate subsuppliers of power train parts prior to the start of work.

According to the licensee's presentation to the NRC on July 15, 1991, GE-L has responsibility to ensure material traceability for all power train parts, as specified in the PO. According to PG&E, GE-L is required to maintain material traceability and submit documentation to substantiate material traceability. The licensee also stated that material traceability is not specified, nor is documentation required for parts, other than power train parts. However, the team's review of the PO, design specification, and CG-P-Diesel did not confirm the licensee's assertion regarding the material traceability requirements for all power train parts.

Although PG&E's special requirements for subsupplier qualification and selection required GE-L to perform audits and evaluations of subsuppliers before the start of work, as specified in paragraphs 4.10.1 of CG-P-Diesel, this special requirement did not substantiate the quality of those power train parts which were taken from GE-L's existing parts inventory; parts which were not purchased directly for PG&E's DE (e.g., connecting rod bolts, connecting rod nuts, cylinder heads, valves - air and exhaust, valve inserts, and the engine block and its material components).

(3) Production

Paragraph 4.17.2 of CG-P-Diesel required GE-L engineering to review changes in production procedures for power train parts for acceptability before implementation. However, the licensee's Supplier Commercial Qualification Audit No. 89297S did not substantiate that GE-L's QA program was adequate to ensure that the additional process control imposed in CG-P-Diesel would be achieved.

The licensee imposed the CAN3-Z299.3-85 QA program and additional special quality requirements, specified in its design specification and CG-P-Diesel. However, the CAN3-Z299.3-85 QA program requirements are not sufficient to assure adequate quality of the DE, and the licensee's Supplier Commercial Qualification Audit No. 89297S did not substantiate that GE-L's quality program would adequately control the additional special quality requirements specified in its design specification and CG-P-Diesel. Therefore, the licensee failed to include in the procurement documents for the DE the quality requirements, or substantiate GE-L's ability to control the quality requirements that were specified, necessary to assure adequate quality and reliability expected by the NRC's regulations in Appendix B to 10 CFR Part 50. This is Deficiency 50-323/91-202-01.

2.2 Non-Critical Parts (Mechanical Components)

The licensee's design specification and CG-P-Diesel did not provide a description or definition of non-critical parts, or parts other than power train parts. However, the licensee's transmittal of March 27, 1991, described the remaining engine parts (i.e., those parts other than power train parts), as mechanical components. The licensee defined mechanical components as mechanical equipment associated with the diesel engine assembly up to the safety-related boundary, including (1) individual parts of the engine, (2) engine-mounted equipment (e.g., governor, fuel oil pressure control valve, lube oil pressure control valve, and piping), and (3) skid-mounted auxiliary components (e.g., filters, strainers, lube oil pumps, air start motors, and couplings). Based on the licensee's PO, all parts that were not identified as power train parts were non-critical components; which were later redefined by the licensee as mechanical components and evaluated in the licensee's commercial-grade dedication activities as components critical to the DE performing its intended safety-related function.

The licensee selected 14 representative sample parts from the total population of 6316 parts that were not power train parts. On the basis of the 14 representative sample parts previously selected, the licensee defined 14 associated product types. The 14 product types of mechanical components listed below are intended by the licensee to represent the remaining engine parts, other than power train parts, which were also referred to in the design specification and CG-P-Diesel as non-critical parts.

- engine mounted rotating components
- skid mounted rotating components
- special fasteners
- castings
- components from special manufacturing processes
- engine driven or skid mounted pumps
- precision machined parts
- springs
- mechanical controlling devices
- heat exchanger
- commodity - metallic
- commodity - non-metallic
- gaskets
- valves

The licensee's procurement documents referenced only critical components (power train parts) and non-critical components which were later redefined as mechanical components, however, the PO was not revised to identify these components or their safety-related function. The procurement documents did not specify the technical description of the mechanical components, and the technical and quality requirements for the mechanical components. The licensee did not demonstrate a basis for considering the mechanical components in the procurement documents as parts that are not critical to the EDG performing its intended safety-related function. Moreover, the licensee failed to evaluate the mechanical components with regard to the criteria used to identify critical components; those components that will not adequately demonstrate during the functional performance testing the properties or attributes to withstand the effects of long-term degradation and cyclic fatigue.

Therefore, the licensee failed to (1) establish the basis for considering the mechanical components as non-critical parts in the PO and procurement documents, and (2) specify the technical and quality procurement requirements for the mechanical components to ensure that the components and DE perform their safety-related function. This is Deficiency 50-323/91-202-02.

3 COMMERCIAL-GRADE DEDICATION REVIEW

To conduct the commercial-grade dedication and qualification of the DE, the licensee utilized the four acceptance methods described in the Electric Power Research Institute's (EPRI's) document NP-5652, Guideline for the Utilization of Commercial-Grade Items in Nuclear Safety-Related Applications (NCIG-07), and the recommendations outlined in the Nuclear Management and Resources Council's (NUMARC's) document 90-13, Nuclear Procurement Program Improvements. The NRC conditionally endorsed EPRI NP-5652 in its Generic Letter (GL) 89-02, Actions to Improve the Detection of Counterfeit and Fraudulently Marketed Products, dated March 21, 1989. EPRI NP-5652 described the acceptance methods for commercial-grade items as follows:

Method 1 - Special Tests and Inspections

Method 2 - Commercial-Grade Survey of Supplier

Method 3 - Source Verification

Method 4 - Acceptable Supplier/Item Performance Record

The licensee used Method 4 for the commercial-grade dedication and qualification of the DE's power train parts. The licensee qualified the use of Method 4 by performing an audit of GE-L's facility in Montreal, Canada, December 12 through 15, 1989. The audit results, documented in Supplier Commercial Qualification Audit No. 89297 , addressed GE-L's ability to control changes in design, materials, and manufacturing processes, in accordance with the NRC's GL 89-02 and to validate the use of Method 4. Because of the concerns it identified during the audit, the licensee augmented acceptance Method 4 for power train parts with acceptance Methods 3 and 1.

The commercial-grade dedication and qualification of the DE's mechanical components were also based on acceptance Method 4. The licensee supplemented Method 4 with Method 2. Commercial-Grade Survey No. 90216SS performed at GE-L's facility September 17 through 20, 1990, was based on the licensee's 14 representative sample parts from the total population of mechanical components. Because of the concerns it identified during the survey, the licensee augmented acceptance Method 2 with Methods 3 and 1.

The licensee's application of each of the acceptance methods for the commercial-grade dedication of the power train parts and mechanical components is discussed in the following sections.

3.1 Method 4 - Acceptable Supplier/Item Performance Record

PG&E evaluated several sources of performance history data to determine whether documented failures of power train parts or mechanical components could be attributed to GE-L's manufacture of the DE (i.e., identify failures that are not attributed to normal wear, adjustments of equipment, or poor maintenance and testing practices). The sources of performance history data and the team's review of the licensee's evaluation of the performance history data is given below.

(1) DCNPP's ALCO DE Failure History

The licensee's review of the documented maintenance history for the five existing ALCO DEs at DCNPP identified 33 mechanical-type component failures (i.e., parts that failed as a result of long-term degradation or fatigue cycle effects). Of these 33 failures, PG&E claimed that only 3 of the failures (a jacket water return line leak, a cylinder head coolant passage leak, and a turbocharger casing-to-flange joint cracked weld) could not be attributed to normal wear or maintenance and testing practices.

However, the licensee failed to adequately demonstrate that:

- the technical bases used to select the 33 mechanical-type component failures were directly applicable to the DEs performance history
- the technical bases used to evaluate the 33 failures and that led to the conclusion that only 3 of the component-part failures could not be attributed to normal wear or maintenance and testing practices were directly applicable to the DEs performance history
- no other failure types (i.e., other than mechanical-type failures) had occurred in the history of DCNPP's ALCO DEs that could not be attributed to normal wear, adjustments of equipment, or poor maintenance and testing practices

(2) NRC Bulletins, and Information Notices (INs)

PG&E reviewed 80 NRC Bulletins and INs to determine their effect on the procurement and commercial-grade dedication. PG&E identified two documents, INs 86-07 and 89-84, that were applicable to the performance history of the DEs. IN 86-07 described the overspeed and subsequent DE damage that resulted from the failure of a Woodward governor. IN 89-04 described the failure of Ingersoll Rand air start motors at DCNPP.

(3) Institute of Nuclear Power Operations (INPO) Nuclear Plant Reliability Data Systems (NPRDS) Data, and Significant Operating Experience Reports (SOERs)

In its transmittal dated March 27, 1991, PG&E stated that the initial review of the NPRDS data, and SOERs indicated that a cracked cylinder head at Indian Point, Unit 2, Consolidated Edison Company, and two turbocharger failures at Salem, Unit 2, Public Service Electric and Gas Company, were the only reports of mechanical problems with ALCO DEs, or its auxiliary systems, that were not attributed to normal wear, adjustment of equipment, or poor maintenance and testing practices. PG&E concluded that the NPRDS failure data did not affect the procurement and commercial-grade dedication of the DE.

However, the team found that on May 20, 1985, Consumers Power Company's Palisades plant experienced a cracked cylinder head on an ALCO DE. The NPRDS report of the Palisades event indicated that a possible cause of the failure may be the design of the cylinder head and that ALCO would modify the cylinder head design.

The licensee had not evaluated the NPRDS failure data for the Palisades event. Therefore, the licensee had not adequately demonstrated that the technical bases used to evaluate the NPRDS data were adequate to identify the critical components relevant to the EDG's ability to perform its intended safety-related function.

(4) EPRI NP-4264, "Failures Related to Surveillance Testing of Standby Equipment," Volume 2, "Diesel Generators"

EPRI NP-4264 describes EDG problems that were related to surveillance tests and presents recommended methods of alleviating those problems. The evaluation period was just over 4 years, January 1979 through early 1983. A total of 136 EDGs were surveyed and 585 failures evaluated. Surveillance testing appeared to have contributed to 70 of the 585 failures, or 12 percent of the total failures. Of the 136 EDGs evaluated, 18 were ALCO DEs, or 13.2 percent of the total. The nuclear power plants with ALCO DEs and the number of EDGs at each plant are listed below.

Plant Name	EDGs
Ginna	2
Indian Point 2	3
Indian Point 3	3
Palisades	2
Pilgrim 1	2
Salem 1	3
Salem 2	3
Total	18

EPRI evaluated failures related to the surveillance testing as they applied to each DE manufacturer. According the report, the number of surveillance test-related failures for ALCO DEs were an order of magnitude less than the number of failures for other DE manufacturers during the same timeframe.

However, the EPRI evaluation did not include surveillance test-related failures that occurred within the first 2 years after the date of a licensee's operating license (i.e., the first 2 years of an EDG's operational life as a safety-related component). Those failures were not included because, according to the EPRI report "beginning-of-life" failures were expected with large complex equipment such as EDGs. Therefore, the evaluation did not include the five ALCO DEs at DCNPP because the date of DCNPP's operating license was not within the evaluation period, even though DCNPP's DEs were installed within the timeframe of the survey. Additionally, the EPRI report evaluated only surveillance test-related failures, which were only 12 percent (70 of a total of 585) of the total failures that occurred during the reports evaluation timeframe.

The licensee's use of the EPRI NP-4264 performance history data did not adequately demonstrate:

- that it had adequately evaluated the failures of ALCO DEs that were not included in the report (e.g., beginning-of-life failures), or determined if those failures adversely affected the acceptance results
- that it had evaluated the other types of failures (e.g., failures related to unplanned demands) for ALCO DEs during the same timeframe
- that the technical bases used to evaluate the EPRI NP-4264 data were adequate to establish the performance history of critical components relevant to the EDG's ability to perform its intended safety-related function.

(5) EPRI/NSAC-108, "The Reliability of Emergency Diesel Generators at U.S. Nuclear Power Plants"

The report presents a survey of the EDG success/failure experience during 1983, 1984, and 1985, to develop EDG reliability values that accurately indicated the contribution of EDG unreliability to plant risk during the three year timeframe. Each reported event was evaluated to determine if the EDG would have fulfilled its mission in a real emergency. For the purpose of determining the impact on plant risk, the report considered EDG reliability to have two elements or phases of operation; (1) start phase reliability, and (2) load-run phase reliability. The nuclear power plant experience for the 3 years evaluated showed that overall EDG reliability was excellent: 98.6 percent reliability for test and unplanned demands, and 97.8 percent reliability for unplanned demands only.

However, the EPRI/NSAC report did not include the reliability data for the ALCO DEs at DCNPP2, did not include failures occurring within an EDG's "initial shakedown phase," and did not identify the ALCO DEs at Salem Units 1 and 2. The licensee's use of the EPRI/NSAC-108 performance history data for ALCO DEs did not adequately demonstrate:

- that it had adequately evaluated the start phase and load-run failures of ALCO DEs that were not included in the report (e.g., initial shakedown phase failures), or determine if those failures adversely affected the acceptance results

- that it had evaluated the other types of failures (e.g., surveillance test-related failures) for ALCO DEs during the same timeframe

- that the technical bases used to evaluate the EPRI/NSAC-108 data were adequate to establish the performance history of critical components relevant to the EDG's ability to perform its intended safety-related function.

(6) PG&E's Survey of Industry-Wide Performance Data

The licensee performed an independent survey of nuclear utilities with ALCO DEs to determine their reliability to start during surveillance testing for the years 1987 and 1988. However, the licensee's survey results failed to include (1) reliability data from Ginna and Indian Point Units 2 and 3, (2) performance data for 1986, and

(3) performance data for the timeframes not included in the performance data reported in EPRI NP-4264 and EPRI/NSAC-108. Therefore, the licensee's survey was not industry-wide performance data and it failed to demonstrate:

- an established Acceptable Supplier/Item Performance history on the basis of industry-wide performance data

- that the technical bases (i.e., failures to start during surveillance testing) used by the licensee in its survey to determine EDG reliability was adequate to establish the performance history of critical components relevant to the EDG's ability to perform its intended safety-related function.

(7) Non-Nuclear Failure History of ALCO DEs

The licensee determined that the best source of non-nuclear ALCO DE failure history was GE-L's equipment bulletins. In a letter to PG&E, dated October 30, 1990, GE-L stated that equipment bulletins were issued to all customers if the problem was general and if it resulted in a design change. PG&E determined that 12 of the 88 GE-L equipment bulletins reviewed were applicable to PG&E's procurement and commercial-grade dedication of the Model 18-251-F DE.

PG&E did not identify the 12 equipment bulletins it considered applicable to the DE procurement, or the status of the 16 additional equipment bulletins to be written by GE-L. The licensee failed to demonstrate that the technical bases it used to evaluate the equipment bulletins as a source of performance history data were directly applicable to verifying the EDG's ability to perform its intended safety-related function.

(8) The Government Industry Data Exchange Program (GIDEP)

As a member of GIDEP, a government-sponsored information exchange program that includes data on material problems, PG&E's search of the GIDEP data base did not identify any failures of ALCO DEs.

(9) PG&E's Supplier Commercial Qualification Audit of GE-L

The licensee qualified the use of Method 4 by performing an audit of GE-L's facility in Montreal, Canada, December 12 through 15, 1989. The audit results, documented in Supplier Commercial Qualification Audit No. 89297S, addressed GE-L's ability to control changes in design, materials, and manufacturing processes, in accordance with the NRC's GL 89-02 and to validate the use of acceptance Method 4. The licensee's CG-P-Diesel invoked additional design controls that are not prescribed by QA program standard CAN3-Z299.3-85 (see Section 2 of this report on page 2). The licensee's audit identified seven deficiencies in GE-L's quality program and its implementation, and issued an audit finding report (AFR) for each deficiency.

The licensee followed up on Audit No. 89297S by visiting the GE-L facility June 26 through 29, 1990, to assess GE-L's corrective actions taken for the AFRs issued as a result of the audit performed in December 1989. A summary of the AFRs issued by the licensee and the status of each at the conclusion of the licensee's followup visit to GE-L is given below.

AFR 89-171: GE-L failed to document a program for the qualification of personnel performing welding and did not document personnel qualifications to perform welding.

Status OPEN: The licensee verified corrective action and found it acceptable. However, the item remained open for PG&E's review of the welding qualification procedure and the weldors qualifications.

AFR 89-172: GE-L failed to calibrate test equipment used to measure and document the essential variables of welding procedures and welding machine settings.

Status OPEN: GE-L's corrective action was not fully implemented. The equipment identified in the AFR was calibrated but was not incorporated into the calibration program and additional equipment was found to be overdue for calibration.

AFR 89-173: GE-L failed to (1) require customer approval or concurrence before implementing design changes, and (2) document the bases for not imposing all quality requirements on subsuppliers or for using subsuppliers not capable of complying with the quality requirements.

Status OPEN: The licensee imposed these requirements in CG-P-Diesel and removed the requirement for customer approval or concurrence before implementing design changes. For those subsuppliers whose program or methods cannot meet the licensee's quality requirements, GE-L will provide a description of its activities to ensure that the requirements are met, or deviations controlled.

AFR 89-174: GE-L failed to record the measuring and test equipment used to perform inspections and tests. Therefore, the validity of previous inspection and test results can not be verified when measuring and test equipment is found to be out of calibration.

Status OPEN: According to PG&E, verification of corrective action could not be performed during the followup visit because GE-L had not performed any inspection activities on the licensee's items with the exception of NDE performed to assess the adequacy of the welding discussed in AFR 89-171 and receipt inspection of subsuppliers' parts.

AFR 89-175: GE-L failed to specify the quality requirements for components and parts in procurement documents to subsuppliers.

Status OPEN: Verification of corrective action revealed that GE-L's PO issued to Auburn Technologies Inc. (ATI) of Auburn, New York, did not contain quality requirements, even though the licensee determined that the original PO, retained by GE-L, contained the quality requirements. Therefore, since the copy received by ATI did not contain quality requirements, ATI did not impose quality requirements on its subsuppliers of power train parts or mechanical components supplied to GE-L. According to the licensee, the quality requirements imposed on the power train parts taken from GE-L's existing inventory were also indeterminate because GE-L could not verify what, if any, quality requirements were imposed on orders to ATI before establishing the quality program.

AFR 89-176: GE-L failed to demonstrate that the use of engineering change notices (ECNs) and the performance of associated activities are accomplished in accordance with documented procedures.

Status CLOSED: The licensee verified corrective action and found it acceptable.

AFR 89-177: GE-L failed to implement an external audit program for all of its subsuppliers. This deficiency includes the evaluation of subsuppliers before the start of work and the annual audits of subsuppliers to maintain their qualification as required by paragraphs 4.7.2, 4.10.1, and 4.10.4, respectively, of CG-P-Diesel.

Status OPEN: GE-L's schedule for auditing subsuppliers did not contain all subsuppliers to which GE-L had issued POs for items or services for the licensee's DE. Additionally, GE-L used power train parts from existing inventory and could not identify the PO, receipt inspection, and quality requirements for the parts. Therefore, the licensee could not reasonably ensure that the power train parts comply with its design specification and Specification No. CG-P-Diesel.

During the followup visit to GE-L in June 1990, the licensee accompanied GE-L's staff on its followup visit to ATI to verify ATI's corrective actions for four deficiencies GE-L had identified during its audit of ATI on January 10, 1990. ATI was GE-L's major subsupplier of power train parts. Before GE-L bought out Bombardier Inc., ATI and GE-L were the same company. ATI is a machining and assembly facility that provided GE-L with the power train parts listed in Table I.

Table I - Power Train Parts Supplied by ATI

Power Train Parts	ATI's Source
Cylinder Liners	• Lynchburg Foundry - liners • Chromium Corporation - chrome plating and acid etch
Camshaft Assemblies (right and left side)	• Copperweld
Piston Bodies	• Alcoa - aluminum body
Piston Caps	• Ladish - steel caps
Connecting Rods	• Voest-Alpine

A summary of the deficiencies that GE-L identified with ATI's quality program and its implementation, and the status of each deficiency at the conclusion of the licensee's followup visit to GE-L and the joint followup visit to ATI by the licensee and GE-L are given below.

* ATI failed to establish documented instructions for the inspectors' use of stamps to identify acceptable parts.

  Status CLOSED: Procedures were established and verified.

* ATI failed to establish documented instructions for conducting audits of subsuppliers.

  Status CLOSED: Procedures were established and verified.

* ATI failed to conduct periodic audits of its current subsuppliers.

Status OPEN: ATI had not performed audits of subsuppliers as required.

* ATI failed to perform final inspections of power train parts. ATI's quality control group performed in-process inspections with the machine operator and asserted that this activity constitutes full inspection. ATI's quality department audited the operator's inspections of camshafts on a sampling basis but did not audit all product lines.

  Status OPEN: ATI had not performed corrective action as required.

The licensee also noted that ATI purchased the connecting rod nuts and connecting rod bolts in large volumes and verified them at receipt inspection, before adding them to its inventory. However, traceability was not maintained and material certifications were not available. Although material certifications were available for the power train parts listed in Table I, the licensee concluded that the validity of the material certifications was indeterminate because ATI had not audited its subsuppliers.

GE-L's audit of ATI and the results of its followup visit identified weaknesses in GE-L's ability to control changes to design, materials, and manufacturing processes. Moreover, the licensee's audit and followup of GE-L's corrective actions substantiated the identified weaknesses in GE-L's quality program and, therefore, the licensee failed to demonstrate that GE-L adequately controlled changes in design, materials, and manufacturing processes necessary to support the use of acceptance Method 4 as the basis for the commercial-grade dedication.

The team found that the licensee's evaluation of and conclusions with regard to several of the sources of performance history data contained weaknesses which were directly related to the licensee's DE and its safety-related performance history. Several of the sources of data did not represent industry-wide performance history because of either omissions in the specific source, or gaps in the collective timeframe of the data. Additionally, the licensee's audit findings and conclusions regarding GE-L's corrective actions, and the results of GE-L's audit of its major subsupplier (ATI) did not substantiate that GE-L adequately controlled changes in design, materials, and manufacturing processes necessary to support the use of acceptance Method 4, as the basis for the commercial-grade dedication. Moreover, the weaknesses identified in the licensee's performance history data were of such a nature to question whether industry-wide data could be established that would adequately substantiate the licensee's use of acceptance Method 4 as the overall basis for the commercial-grade dedication of the DE. Although the licensee supplemented acceptance Method 4 with other methods of commercial-grade dedication, the licensee did not adequately establish performance history data that would be acceptable as an overall corrective action to resolve weaknesses found in the licensee's other methods of commercial-grade dedication. This is Unresolved Item 50-323/91-202-02.

3.2 Method 2 - Commercial-Grade Survey of Supplier

Commercial-Grade Survey No. 90216SS documented the licensee's survey of GE-L's facility, September 17 through 20, 1990. Although a commercial-grade survey is a means by which the licensee can take credit for GE-L's commercial quality controls by confirming that the mechanical components and their critical characteristics are adequately controlled, the licensee did not specify in its PO the acceptable GE-L commercial quality controls for supplying mechanical components. The licensee was unable to specify in the PO the controls considered adequate because the PO was issued in January 1990, before the license performed the commercial-grade survey. In its procurement documents, the licensee did not specify the acceptable quality requirements (1) to ensure the adequacy of the characteristics of the mechanical components necessary for the EDG to perform its intended safety-related function, and (2) ensure that the mechanical components were technically identical to the mechanical components of DCNPP's five existing ALCO DEs and that the bases of the original seismic qualification were maintained. This concern will be evaluated as a part of Deficiency 50-323/91-202-02, as discussed in Section 2.2 on page 7 of this report.

3.2.1 Representative Parts

The team reviewed Attachment Q, Supporting Documentation for the Commercial Grade Survey Representative Sample and Critical Characteristics, to the Spare and Replacement Parts Evaluation, RPE M-6602, Revision No. 1. PG&E Nuclear Engineering and Construction Services documented its evaluation for the DE dedication in RPE M-6602. The mechanical components consisted of a total population of 6316 parts, which included, as a single item, those components and parts purchased by GE-L as subassemblies. In August of 1990, the licensee developed a matrix identifying critical characteristics for a selected number of parts from the total (6316) of all mechanical components to provide specific technical input for the commercial-grade survey. The licensee used the following selection criteria to identify the mechanical components to be included in the matrix: (1) the subsupplier; (2) the product type, complexity, and function; (3) the construction process; (4) industry experience with fraudulent items; and (5) the performance history. This activity resulted in the licensee's selection of 14 representative mechanical components. The licensee correlated the 14 representative mechanical components to the ALCO Model No. 18-251-F, Renewal Parts List No. 943, dated July 1982, to determine if the 14 sample mechanical components previously selected would adequately represent all of the DE's 6316 total mechanical components. This activity resulted in the licensee defining 14 product types which were represented by the 14 mechanical components that were previously selected. The 14 product types and the 14 representative mechanical components and each part's associated critical characteristics, as identified in the licensee's commercial-grade survey plan, are described in Table II of this report.

The 14 product types of mechanical components defined by the licensee did not represent (1) an established batch or lot homogeneity, particularly with respect to the control of critical characteristics, (2) mechanical components furnished by the same subsupplier, and (3) mechanical components with traceability to subsuppliers with an acceptable quality program, verified through audit or survey. In its selection of the 14 mechanical components to utilize in conducting the commercial-grade survey, the licensee failed to demonstrate that:

- the mechanical component selected adequately represented all of the other mechanical components within the product type or adequately established a bases for accepting the remaining mechanical components in each product type (e.g., the piston rings, selected to represent the "casting" product type, were used to accept the water and air piping elbows, and the lube oil strainer; the fuel injection pump, selected to represent the "engine driven skid mounted pump" product type, was used to accept the lube oil pump, and jacket water pump; the fuel injectors, selected to represent the "precision machined part" product type, were used to accept the push rods, piston pin assemblies, and the fuel pump rack control assemblies, including lifters, control shafts and associated parts)

- the critical characteristics identified for the 14 representative mechanical components adequately represented all of the properties or attributes essential for the sample mechanical components, and all other mechanical components in the product type, to perform their design functions directly applicable to the EDG's ability to perform its intended safety function

- the critical characteristics of the 14 representative mechanical components ensured that the part, and all other mechanical components in the product type, were technically identical to the mechanical components in DCNPP's five existing ALCO DEs and that the bases of the original seismic qualification were maintained.

This is Unresolved Item 50-323/91-202-03.

Table II - Representative Parts for the Commercial-Grade Survey

Product Type	Representative Part and Supplier	Critical Characteristics
Engine-Mounted Rotating Component	Turbocharger - ATI	• Part No., configuration, dimensions, and workmanship • Functional testing and operability
Skid-Mounted Rotating Component	Air Start Motor - Ingersoll Rand	• Part No., configuration, dimensions, and workmanship • Functional testing and operability
Special Fastener	Cylinder Head Stud - GE-L manufactured from commodity purchased bar stock	• Part No., configuration, dimensions, and workmanship • Material • Mechanical properties
Casting	Piston Rings - Kaydon Ring & Seal	• Part No., configuration, dimensions, and workmanship • Material • Mechanical properties
Components from Special Manufacturing Process	Radiator - Young Radiator	• Part No., configuration, dimensions, and workmanship • Functional testing and operability • Special manufacturing

Table II continued

Product Type	Representative Part and Supplier	Critical Characteristics
Engine-Driven or Skid-Mounted Pump	Fuel Injection Pump - Lucas Bryce	• Part No., configuration, dimensions, and workmanship • Functional testing and operability
Precision Machined Part	Fuel Injector - Lucas Bryce	• Part No., configuration, dimensions, and workmanship • Functional testing and operability • Material
Spring	Valve Spring - Associated Spring	• Part No., configuration, dimensions, and workmanship • Material • Mechanical properties
Mechanical Controlling Device	Governor - Woodward Governor	• Part No., configuration, dimensions, and workmanship • Functional testing and operability
Heat Exchanger (this product type has only one part)	Lube Oil Cooler - McRae Engineering	• Part No., configuration, dimensions, and workmanship • Material • Special manufacturing
Commodity, Metallic	Exhaust Manifold Stud - Erie Bolt	• Part No., configuration, dimensions, and workmanship • Material • Mechanical properties

Table II continued

Product Type	Representative Part and Supplier	Critical Characteristics
Commodity, Non-Metallic	Flex Hose - Aeroquip	• Part No., configuration, dimensions, and workmanship • Functional testing and operability • Material
Gasket	Valve Cover Gasket - Joints-Etanches Supply	• Part No., configuration, dimensions, and workmanship • Material
Valve	Fuel Oil Pressure Control Valve - Fulflo	• Part No., configuration, dimensions, and workmanship • Functional testing and operability

3.2.2 Commercial-Grade Survey Results

The licensee evaluated five quality program elements and their associated quality criteria from Appendix B to 10 CFR Part 50 during its commercial-grade survey of GE-L. The commercial-grade survey of the 14 selected mechanical components identified several deficiencies in GE-L's quality program and its implementation. Several of the deficiencies identified during the commercial-grade survey should have been identified by the licensee during its Supplier Commercial Qualification Audit No. 89297S and its followup visits to GE-L and ATI; other deficiencies identified during the commercial-grade survey were previously identified by the licensee during its audit and followup visits. The deficiencies identified during the survey are summarized by quality program elements and are given below.

(1) Design Control

- The survey did not describe an evaluation of GE-L's design documentation for the radiator or the lube oil cooler.

- The traceability of a part's design evolution from the original purchase of DCNPP's five existing DEs to the current order was not readily available or retrievable. (The licensee's PO specified that the DE shall conform to GE-L's ALCO Specification No. GS5100F, dated June 9, 1978, however, the licensee asserted that the DE will be identical to its five existing DEs; which were purchased in 1969 to the applicable specification for that timeframe.)

- Where obsolete parts were replaced by a new part from the same subsupplier, GE-L relied on the subsupplier's assertion that the replacement part was equivalent to or better than the original. GE-L did not perform an engineering evaluation to substantiate the adequacy of the replacement part.

- ECNs did not adequately substantiate engineering evaluations of substitutions and modifications to component parts for like-for-like form, fit, and function considerations.

(2) <u>Procurement Controls</u>

- GE-L's procedures for procurement document control, supplier evaluation and selection, and receipt inspection were adequate. However, the survey showed that GE-L did not implement the program requirements.

- Procurement documents to subsuppliers did not provide the quality requirements for the component part.

- GE-L engineering specified the subsupplier for the air start motor, piston rings, fuel injection pump, fuel injectors, governor, and flex hose. However, GE-L did not evaluate any of the subsuppliers of these items.

- GE-L performed sampling receipt inspection for the piston rings, valve springs, exhaust manifold studs, and valve cover gaskets. However, GE-L's sample size did not comply with the requirements of MIL-STD-105D for acceptable sample size requirements, specified in the inspection and test plan.

- GE-L did not verify the quality documentation at receipt inspection for the governor, as required.

(3) Identification and Control of Material, Parts, and Components

- GE-L's procedures for the identification and control of material, parts, and components were adequate. However, the survey showed that GE-L did not implement the program requirements.

- Component parts in GE-L's existing inventory were traceable to POs for the same items surveyed. However, traceability to a specific PO or subsupplier, where more than one subsupplier was involved, was not possible.

- The turbocharger had been received from ATI and placed in the warehouse and released for use without GE-L performing a receipt inspection.

- GE-L manufactured 1,000 cylinder head studs from stock material; 126 cylinder head studs were for PG&E's DE. During manufacturing, the process sheet that contained the material identification disappeared and groups of unidentified studs were removed from the manufacturing area to perform other processes such as magnetic particle testing and final dimensional inspection. Other groups of cylinder head studs were installed in the DE without dimensional and acceptance inspection, which could not be performed after installation.

- The fuel injectors, exhaust manifold studs, and the valve cover gaskets were received and placed in the warehouse without being identified with an acceptance tag.

- The flex hose could not be located, even though GE-L's computer tracking system indicated that it had been received.

- The radiator, lube oil cooler, and fuel oil pressure control valve were not at GE-L's facility and therefore not considered in the survey.

(4) Inspection and Test

- The in-process inspections of primary parts and subassemblies were not defined by an in-process inspection procedure and the status of the inspections were not required to be signed off to indicate completion of the inspection activity.

- GE-L did not have documented inspection instructions and test instructions for the 14 representative mechanical components surveyed.

* GE-L did not have documented qualification records for its inspectors.

* GE-L performed the hydrostatic test of the engine block without a documented test procedure.

(5) Control of Nonconformances

* GE-L did not perform adequate engineering evaluations to justify the corrective actions taken, especially on repetitive problems. The survey identified 23 nonconforming material reports (NMRs) specific to the licensee's DE. Of the 23 NMRs, 8 addressed mis-drilled holes and only 1 of these NMRs documented an engineering root-cause analysis.

* GE-L did not submit the NMRs to the licensee, as required.

* GE-L did not adequately segregate nonconforming items to be evaluated.

* GE-L did not adequately define the activities of the material review board as it relates to the disposition of NMRs.

In its transmittal of March 27, 1991, the licensee claimed that the survey showed GE-L had an excellent commercial program for the production of diesel engines, and also stated that its approach to the commercial-grade survey will provide reasonable assurance that the DE meets the PO requirements.

However, Attachment R, Engineering Resolution to Open Items Identified in Commercial Grade Survey No. 90216SS, to RPE M-6602 did not establish an adequate bases for accepting the 14 mechanical components chosen for the commercial-grade survey because it did not adequately evaluate the findings of the survey with regard to the specific critical characteristics of the mechanical components selected for the survey. In Attachment R, the licensee stated that the radiator and the lube oil cooler, two of the 14 mechanical components selected for the survey, were purchased, received, and installed by GEC Alsthom of Toronto, Canada, and that resolution of the open survey issues for these items was contingent on GE-L's audit of GEC Alsthom. The licensee's procurement documents, however, showed that GE-L was responsible for the overall design and performance of the completed EDG assembly, in addition to supplying the DE. Therefore, GE-L had the design responsibility for the radiator and lube oil cooler, which were not evaluated by the licensee during the survey. The licensee also failed to demonstrate its bases for utilizing GE-L's audit of GEC Alsthom as its commercial-grade survey of GE-L for the radiator and lube oil cooler.

The findings of the licensee's commercial-grade survey failed to substantiate that GE-L's quality program and its implementation provided reasonable assurance that the quality program elements surveyed were adequate to control the 14 selected mechanical components and raised concerns regarding the adequacy of the quality program to control the remaining mechanical components that were not evaluated during the survey. The survey identified deficiencies in GE-L's quality program and its implementation that also adversely effect the power train parts. Several of the deficiencies that were identified during the survey had not been identified previously by the licensee during its audit and followup visit to GE-L. This is Unresolved Item 50-323/91-202-04.

Because of the deficiencies identified during the commercial-grade survey, the licensee concluded, as stated in Attachment R, that the following compensatory actions would resolve all of the survey's open items: (1) develop QC Surveillance Plan 6602-1 using acceptance Methods 3 and 1; (2) obtain GE-L's commitment to sign the manufacturing process sheets for the licensee's DE; and (3) develop Action Request A0206904 to track followup actions to resolve the survey's open items.

3.3 Method 3 - Source Verification

Acceptance Method 3 consisted of the licensee witnessing GE-L perform quality activities that are intended to confirm that GE-L adequately controlled the quality requirements that assure the components meet their design specifications and the critical characteristics that ensure the component will perform its safety-related function. The licensee's source verification activities for power train parts and mechanical components are discussed below.

3.3.1 Power Train Parts

In its presented response to the NRC staff on July 15, 1991, the licensee provided a reference document identified as XI Summary of Unique Safety Related Engine and Auxiliary System Mechanical Parts and Their Independent Verification. This document appeared to be part of RPE M-6602 and listed parts from the ALCO Model 18-251-F, Renewal Parts List No. 943, dated July 1982, included in Attachment Q, Supporting Documentation for the Commercial Grade Survey Representative Sample and Critical Characteristics. The notes to the listing showed that power train parts were independently inspected and tested for configuration and material acceptability according to the requirements of the licensee's Inspection Plan No. DC-271, dated August 23, 1990. The inspection plan divided the licensee's source verification activities into the following three groups:

- Source verification activities consisted of dimensional and documentation checks that were identified as inspections for configuration in Attachment D to the licensee's transmittal of March 27, 1991. The critical characteristics chosen by the licensee for this portion of its source verification activities are given in Table III on page 29 of this report. The critical characteristics for the engine block, although described in Table III, were not included in the licensee's inspections for configuration because the engine block was not included in this portion of the source verification activities.

- Source verification activities during GE-L's manufacture of the DE consisted of the following licensee witness points:

  engine block and base welding
  engine block machining
  cylinder liner hydrostatic test
  engine block assembly
  crankshaft deflection
  inspection of cylinder head section
  torquing activities
  bumping clearance
  engine test
  lube oil and fuel oil analysis

- Source verification activities during assembly of the DE, generator, and auxiliary systems and associated piping by GEC Alsthom consisted of the following licensee witness points:

  skid welding and heat treatment
  instrument tubing installation
  pressure tests
  critical piping and fastener dimensions
  radiator alignment checks
  system cleanliness and flushing
  electrical connections
  painting
  ASME certification for applicable tanks
  break-in test
  final running test and inspection
  diesel auxiliaries test
  final packaging

Inspection Plan No. DC-271 did not include (1) the GE-L quality control elements to be verified by the licensee during the source verification activities and that were specific to the power train part's critical characteristics, (2) the surveillance methods or verification activities to be performed, and (3) an evaluation to determine the adequacy of the supplier's (GE-L and GEC Alsthom) controls that were verified during the source verification activities. This is Unresolved Item 50-323/91-202-05.

Table III - Critical Characteristics for Source Verification of Power Train Parts

Power Train Parts	Critical Characteristics
Engine Block	• Fabrication/welding • Weld fusion • Weld continuity
Crankshaft	• Dimensions: diameter at bearing and crankpin journals, length at thrust bearing face, length at center of crankpin
Cylinder Liners	• Dimensions: inside diameter after plating, outside diameter at top land, thickness of liner flange
Cylinder Heads	• Dimensions: overall length, overall height, location of four valve guide bores, location of seven bolt holes, bolt hole size
Valves - Air and Exhaust	• Dimensions: overall length, diameter at stem, diameter at seat • Fusion of stem to seat • Surface continuity for stem and seat
Valve Inserts	• Dimensions: outside diameter, thickness
Piston Bodies	• Dimensions: overall length, diameter, bottom oil ring location, top compression ring location
Piston Caps	• Dimensions: diameter at the top, top compression ring location

Table III continued

Power Train Parts	Critical Characteristics
Connecting Rods	• Dimensions: center piston pin bore to center crankpin bore, diameter of piston end with bushing, diameter at crankshaft end without bearing, location of bolt hole centerline
Connecting Rod Nuts	• Dimensions: diameter, thread pitch, threads per inch
Connecting Rod Bolts	• Dimensions: overall length, diameter at shank, pitch diameter at each end, major diameter at big end, threads per inch, thread taper
Main Bearings - Shell	• Dimensions: thickness at center, two thicknesses 5/8 inches from the parting line, free spread diameter, surface finish, blowhole limitation
Main Bearings - Thrust	• Dimensions: thickness at center, two thicknesses 5/8 inch from parting line, free spread diameter, overall width, inside width, surface finish, blowhole limitation
Camshafts	• Dimensions: longest length with a toleranced dimension, diameter at bearing location

For the purposes of this report, the team's review and evaluation considered only selected portions of the licensee's first and second groups of source verification activities from Inspection Plan No. DC-271. The team reviewed the documentation of source verification activities for only selected power train parts because the licensee's dedication documentation was stamped "Preliminary," and the documentation reviewed by the team was incomplete and being revised, as discussed in Section 1 on page 1 of this report. The completed dedication documentation for the power train parts is subject to review during a future inspection. The team's observations for the power train parts described below are not considered complete because of the preliminary status of the licensee's documentation, and therefore, are subject to change on the basis of future inspections of completed documentation. The crankshaft, connecting rod bolts, and main bearings (shell and thrust) were not reviewed for inclusion in this report.

(1) Engine Block

The licensee procured two engine blocks with serial nos. 14 and 15. One of the engine blocks will be used in the completed DE and the other will be a spare. The engine block was manufactured by welded construction and consisted of forgings and low-carbon steel plates that were manufactured in accordance with the American Society for Testing and Materials (ASTM) A-36. The saddle, the main bearing caps, and the foundation plate were manufactured in accordance with the American Iron and Steel Institute (AISI) -1021, -1045, and -1018, respectively. GE-L's Engineering Evaluation No. DE-35692, identified the following methods used to verify the critical characteristics and the critical components of the engine block:

machining inspection
dimensions
stress relief
hydrostatic testing
magnaflux inspection
heat numbers of steel plates

GE-L verified the critical characteristics using associated QC procedures. The licensee witnessed only a sampling of GE-L's verification activities during its source verifications, as documented in the licensee's inspection reports and provided for in its inspection plan. The licensee's inspection plan, however, did not address all of the critical characteristics identified by GE-L in its Engineering Evaluation No. DE-35692.

GE-L's QA report Nos. M-03202 and M-03203 state that the material used to manufacture the middle deck plate, water plate, and the inside wall section, were different from the material required by the design specification and drawings. The reports further stated that the material supplied had a higher tensile strength than the material required. GE-L's evaluation, however, did not address (1) the increased hardness associated with the higher tensile strength, (2) the substituted material's susceptibility to the effects of long-term degradation and cycle fatigue, or (3) the differences between the chemical and mechanical properties of the two materials.

GE-L's welding program, used to assemble the engine block, did not comply with the requirements of the CAN3-Z299.3-85 QA program standards, imposed by the licensee's PO, in that GE-L failed to document a program for the qualification of personnel performing welding and did not document the individuals' welding performance qualifications, as identified during the licensee's audit of GE-L. Although the licensee identified GE-L's weakness regarding welding and weldor performance qualification, the licensee did not witness any of the actual engine block fit-up or welding of the engine block. The licensee chose to witness only a sampling (30 percent) of GE-L's nondestructive examinations (NDE) of the completed engine block weldments, using the magnetic particle examination (MT) method, and only six weldments using the ultrasonic testing examination (UT) method.

The licensee did not witness the actual welding of the engine blocks, or the welded repairs made to numerous weldments on both engine blocks. GE-L had completed the welding of the engine block, repaired numerous weldments, and performed all of the NDE of the weldments when the licensee arrived to perform its witness activities. The licensee witnessed only the repeated NDE of a portion of the weldments on engine block no. 15. The licensee failed to demonstrate (1) that the NDE sampling of weldments was adequate to accept all engine block weldments, given the deficiencies in GE-L's welding program, and (2) that the MT examination for surface discontinuities was an adequate bases for accepting those weldments that did not receive a volumetric examination.

(2) Cylinder Liners

The cylinder liner is a cast iron cylindrical shell with an inner diameter of approximately 9-inches and a length of about 2-feet, with a flange at the upper end to facilitate installation. The cylinder liner forms the pressure boundary of the combustion chamber volume over which the pistons move; the cylinder head forms the upper portion of the boundary and the piston itself forms the lower boundary. The DE contains 18 cylinder liners, one for each cylinder.

The licensee's source verification activities for the 36 cylinder liners manufactured (18 of which were spares), showed that (1) 5 cylinders liners did not satisfy the inside diameter requirement, (2) 3 cylinders liners did not satisfy the outside diameter requirement at the top land, and (3) 3 cylinders liners did not satisfy the liner flange thickness requirement. Although the dimensions of the cylinder liners had previously been checked and found acceptable by ATI, the licensee stated that the following factors may have contributed to the apparent dimensional deficiencies:

- a change in the cylinder liner temperature at the time of the second measurement
- use of a different measuring device
- performance of the second measurement at a different location on the cylinder liner

The licensee concluded that the apparent oversized and undersized dimensions did not affect the proper functioning or installation of the cylinder liners and that no programmatic quality problem existed. Although the cylinder liners were found acceptable, the licensee did not demonstrate an engineering evaluation (1) to substantiate the acceptance of the cylinder liners with dimensional deviations from their design requirements, and (2) that analyzed the dimensional deviations of the cylinder liners with regard to their effects on long-term degradation and cyclic fatigue.

(3) Cylinder Heads

The cylinder head is a cast iron block that forms the upper boundary of the cylinder and contains the inlet and exhaust valves that controls the ingress of combustion air and the egress of the products of combustion. The cylinder head also provides the penetration for fuel oil injection into the cylinder. The cast iron block is machined to a thickness of approximately 10-inches with a cross-sectional area of approximately 11-inches x 8-1/2-inches. The cylinder head is bolted to the engine block, forming a pressure containing seal with the cylinder liner.

The licensee used GE-L's manufacturing drawings to verify the following dimensional requirements:

- The "x" and "y" coordinates of the bore locations for the valve guides were measured using a coordinate measuring machine (CMM). Of the 18 cylinder heads measured, 5 had at least one oversized dimension.

- The "x" and "y" coordinates of the hole locations for the mounting bolts were measured using the CMM. Dimensional discrepancies were found with all 18 cylinder heads.

- The overall length, width, and thickness of the cylinder heads were measured. Dimensional discrepancies were found with the air and exhaust flange location on 11 cylinder heads.

Although GE-L's Engineering Evaluation No. DE-35692 had determined that there was no programmatic concern and that all cylinder heads were acceptable, the licensee's source verification activities identified several dimensional deficiencies with many of the cylinder heads. The licensee did not demonstrate an engineering evaluation that analyzed the dimensional deviations with regard to their effects on long-term degradation and cyclic fatigue.

(4) Valves - Air and Exhaust

The air and exhaust valves controls the proper sequence of the ingress of fresh combustion air and the egress of the products of combustion from the cylinders during the engine cycle. The air and exhaust valves were manufactured by Eaton Corporation and consisted of a stainless steel head (commercial designation 21-4N) welded to an alloy steel stem. The licensee's source verification of Eaton's activities, as described in its Inspection Report No. M-18, consisted of verifying the following:

- the diameter of the stem and seat

- the overall length of the head and stem assembly

- the NDE of the flash welded bi-metallic joint between the head and stem using UT, in accordance with GE-L's ALCO Manufacturing Specification No. 31P5773

- the NDE of the valves' surface using liquid dye penetrant testing (PT) in accordance with GE-L's ALCO Manufacturing Specification Nos. 31P5670 and 31P5651

- the chemical analysis of one intake valve and four exhaust valves using an alloy analyzer

GE-L's UT examination required the use of a specific setup valve standard for calibrating sensitivity rather than a flat-bottomed hole standard. The licensee's inspector observed that the setup valve standard was less sensitive than the flat-bottomed hole standard because the flat-bottomed hole standard would establish a rejection criteria based on a 0.030-inch flaw diameter in contrast to the setup valve standard that would establish a rejection criteria based on a 0.050-inch flaw diameter. Although the licensee's inspector cited the use of the less sensitive rejection criteria, the licensee accepted the air and exhaust valves without addressing this concern.

(5) Valve Inserts

Valve inserts are mounted in the cylinder head to form a hard seating surface for the air and exhaust valves and ensure a leak-tight cylinder during the compression and combustion phases of the engine cycle. GE-L purchased the air and exhaust valve inserts to ALCO Purchasing Practice No. 31P5441, which required the valve inserts to be high-temperature, cast alloy material. The licensee's source verification Inspection Plan No. DC-271 specified witnessing of the dimensional checks of all valve inserts to verify their compliance with GE-L's drawings and the air and exhaust valve insert check lists.

Although the licensee verified the outside diameter and thickness of the air and exhaust valve inserts, the licensee did not verify all other dimensions (e.g., inside diameter and length) specified by GE-L's drawings, as required in the inspection plan. The licensee did not demonstrate an engineering evaluation to substantiate that only those dimensions verified are critical with regard to the effects of long-term degradation and cyclic fatigue on the valve inserts.

(6) Piston Bodies

The piston body, or the main portion of the piston, is an aluminum alloy casting approximately 11-1/2-inches long and 9-inches in diameter. A piston pin assembly connects the rod to the body and the piston cap is attached at the upper end to form the piston assembly. The piston assembly contains 5 rings, 2 of which are located on the piston body. The licensee's source verification Inspection Plan No. DC-271 specified witnessing the dimensional checks of the overall length, diameter, bottom oil ring location, and top compression ring location.

The licensee found that all of the dimensional measurements verified were within the tolerance values specified, except for the location of the bottom oil ring on the no. 15 piston body which was out of tolerance by 0.003-inch. ATI had previously inspected and accepted the piston bodies without identifying any dimensional discrepancies.

Although the licensee accepted the piston bodies on the basis of GE-L's Engineering Evaluation No. DE-35692, the licensee did not demonstrate an engineering evaluation that analyzed the dimensional deviations of the piston bodies with regard to the effects of long-term degradation and cyclic fatigue.

(7) Piston Caps

The piston cap forms the upper portion of the piston assembly and is constructed from a steel forging with machined grooves for three compression rings. The piston cap is subjected to the effects of loads and thermal stresses encountered when the fuel and air mixture explodes during the compression phase of the combustion cycle. Each piston cap is approximately 3-inches thick and 9-inches in diameter and is fastened to the piston body by a central stud and nut arrangement.

The dimensional measurement verifications were taken with the piston caps assembled to the piston bodies. The licensee found all dimensions verified to be within the tolerances specified on the design drawings.

(8) Connecting Rods

The connecting rods provide the mechanical linkage between the piston assembly and the crankshaft, and are used to convert the translational motion of the piston assembly to the rotational motion of the crankshaft. ATI manufactured the connecting rods from steel forgings that are approximately 2-feet long, 8-inches wide at the crankpin bore, and 5-inches wide at the piston pin bore. The DE contains 18 connecting rods, one for each cylinder.

The licensee verified the dimensions of the 36 connecting rods (18 are spares) using the CMM. Of the 16 connecting rods identified with dimensional deficiencies, 15 connecting rods had diameter dimensional deficiencies at the pin bore on the crankshaft end. GE-L's factory repair service procedure defined an acceptable bore dimension to be in the range of 6.4105-inches to 6.4130-inches, which is a larger range than that specified in GE-L's design drawing that specified the bore dimension to be within a range of 6.411-inches to 6.412-inches. The licensee accepted the connecting rods on the basis of the bore dimensional range given in the repair service procedure (used to repair worn connecting rods), even though the dimensional deficiencies that were found are relative to the design requirements for new connecting rods. The licensee did not verify the centerline locations of the bolt holes used to mechanically join the connecting rod cap with the connecting rod which forms the attachment to the crankshaft. The tolerance for the bolt hole location was +/- 0.0001-inches.

Although the dimensions of the connecting rods had been previously checked and accepted by ATI, the licensee stated that the following factors may have contributed to the apparent dimensional deficiencies:

- a change in connecting rod temperature at the time of the second measurement
- use of a different measuring device
- performance of the second measurement at a different location on the connecting rods

PG&E concluded that the dimensional deficiencies did not affect the proper functioning or installation of the connecting rods and that no programmatic quality problem existed. Although the connecting rods were found acceptable, the licensee did not demonstrate an engineering evaluation (1) to substantiate acceptance of the deficient connecting rods relative to their design requirements, and (2) that analyzed the dimensional deviations with regard to their effects on long-term degradation and cyclic fatigue.

(9) <u>Connecting Rod Nuts</u>

Connecting rod nuts are used to fasten the lower end of the connecting rod to the connecting rod cap which forms the mechanical attachment to the crankshaft. The nuts are 1-3/8-inches in diameter with 7/8 - 14 N.F.3 threads.

The licensee's inspection plan specified the verification of the nut diameter and thread parameters (thread pitch and threads per-inch) for all of the 144 nuts required for the DE. The connecting rod nuts were taken from GE-L's existing inventory, as discussed in Section 2.1 (2) on page 6 of this report. Contrary to the inspection plan, the licensee verified the nut diameter by sampling only 40 connecting rod nuts. The licensee did verify the thread parameters on all connecting rod nuts.

Although the licensee found the connecting rod nuts acceptable, the licensee did not demonstrate an engineering evaluation that established (1) the bases for accepting the connecting rod nuts that were not verified, as required by the licensee's inspection plan, or (2) the relevance of those characteristics that were verified to the effects of long-term degradation and cyclic fatigue on the connecting rod nuts.

(10) Camshafts

The camshafts extend along the length of the engine with one located on each side. The camshafts consisted of eccentrically arranged cams, or lobes (one intake lobe and one exhaust lobe for each cylinder), and concentric bearing journals. The radial orientation of the lobes provide the proper sequencing motion of the push rods that activate the rocker arms, causing the intake air and exhaust valves to open and close. The lobe arrangement on the shaft determines the firing order of the cylinders, while the contour of each lobe controls the time and rate of the valves opening and closing. The camshaft is a forged steel, segmented unit (10 total segments per engine, 5 in the left camshaft and 5 in the right camshaft), and are approximately 15-feet long and 4-1/2-inch diameter at its bearing journal locations.

ATI manufactured 3 camshaft assemblies to ensure that 2 correct camshaft assemblies would be available for the licensee's DE. The licensee's inspection plan identified the "longest toleranced dimension" as a critical characteristic. The longest toleranced dimension was found to exceed the allowable dimension on three camshaft segments. Although the dimensions of the camshaft segments had been previously checked and accepted by ATI, the licensee stated that the following factors may have contributed to the apparent dimensional deficiencies:

- a change in camshaft segment temperature at the time of the second measurement

- use of a different measuring device

- performance of the second measurement at a different location on the camshaft segments

The licensee concluded that the apparent dimensional deviations did not affect the function or installation of the camshafts and that no programmatic quality problem existed. Although the licensee found all of the camshaft segments acceptable, the licensee did not demonstrate an engineering evaluation (1) that established the bases for accepting the camshafts with dimensional deviations from their design requirements, and (2) that analyzed the dimensional deviations with regard to their effects on long-term degradation and cyclic fatigue.

The licensee selected specific dimensional measurements as the critical characteristics of the power train parts. The licensee did not demonstrate its bases for determining that these dimensions (critical characteristics) were relevant to the power train parts' (1) credible failure modes and its ability to perform its safety-related function, and (2) properties or attributes necessary to withstand the effects of long-term degradation and cyclic fatigue.

The results of the licensee's dimensional source verification activities identified numerous dimensional deficiencies in many of the power train parts. The licensee accepted these dimensional deviations without evaluating their effect on the power train parts' properties or attributes to withstand long-term degradation and cyclic fatigue. Moreover, the licensee accepted these dimensional deviations based, in part, on the quality activities of GE-L and ATI, even though the licensee's audits and surveys of both organizations identified significant deficiencies in their respective quality programs that were directly applicable to the power train parts. Additionally, where the source verification activities consisted of dimensional verifications that were accepted with identified deviations from the design specification and the drawings, the licensee did not substantiate or confirm that GE-L adequately controlled the quality of the manufacturing processes for power train parts; which was the purpose of the licensee's source verification activities, and was intended to contribute to the licensee's demonstration of reasonable assurance that the power train parts meet the quality and reliability requirements of Appendix B to 10 CFR Part 50.

The licensee failed to demonstrate reasonable assurance that the technical bases for the critical characteristics chosen and verified during the source verification activities adequately (1) ensures that the power train parts and the DE will perform their safety-related function, (2) ensures that the power train parts have the properties or attributes necessary to withstand the effects of long-term degradation or cyclic fatigue, and (3) ensures that the power train parts are technically identical to the critical components of DCNPP's five existing ALCO DEs and maintains the bases of the original seismic qualification. This is Unresolved Item 50-323/91-202-06.

3.3.2 Mechanical Components

PG&E developed QA Surveillance Plan No. 6602-1, Revision No. 0, dated November 6, 1990 (described in Attachment Z of RPE M-6602), to perform source verification activities for mechanical components. This plan will be reviewed and evaluated during a future inspection.

3.4 Method 1 - Special Tests and Inspections

Acceptance Method 1 consisted of the licensee verifying the selected critical characteristics of components and parts by performing special tests and inspections that confirm that the components and parts meet their design specifications and ensure that the components and parts will perform their safety-related function. In its presented response to the NRC staff on July 15, 1991, the licensee provided a reference document identified as item XI Summary of Unique Safety Related Engine and Auxiliary System Mechanical Parts and Their Independent Verification. This document appeared to be part of RPE M-6602 and listed parts from the ALCO Model 18-251-F, Renewal Parts List No. 943, dated July 1982, included in Attachment Q, Supporting Documentation for the Commercial Grade Survey Representative Sample and Critical Characteristics. The notes to the listing showed that power train parts were independently inspected and tested for configuration and material acceptability according to the requirements of the licensee's Inspection Plan No. DC-271, dated August 23, 1990. The inspection plan divided the licensee's source verification activities into three groups, as discussed in Section 3.3.1 on page 27 of this report. However, Inspection Plan No. DC-271 did not address the licensee's special test and inspection activities and the licensee did not demonstrate a plan for these activities.

The licensee's transmittal of March 27, 1991, identified the following functional performance testing to be performed for the DE and the completed EDG:

- break-in test
- performance test
- control and alarm test
- diesel auxiliaries test
- rated load test
- rated rejection test
- margin test
- acceleration test
- dead load pickup test
- starting capacity test

The break-in test for the DE was completed at GE-L's facility on February 11, 1991. GEC Alsthom will perform the remaining integrated system tests listed above at its facility in Toronto, Canada, after the DE, the emergency synchronous generator, and the DE's auxiliary systems and associated piping have been skid-mounted and the EDG has been completely assembled. However, the licensee did not demonstrate the acceptance criteria specific to the critical characteristics to be verified during the functional performance testing, and the documentation requirements for the inspection and test results. The licensee did not identify a documented plan to control and prescribe the special tests and inspections that GEC Alsthom will perform, and the test methods and inspection techniques that GEC Alsthom will use to confirm the acceptability of the functional performance tests. This is Unresolved Item 50-323/91-202-07.

The licensee's special tests and inspection activities for power train parts and mechanical components are discussed below.

3.4.1 Power Train Parts

The special tests and inspection activities for the power train parts consisted of selected material testing of power train parts, as identified in Attachment E to the licensee's transmittal of March 27, 1991. The license stated that the applicable GE-L material specifications or drawings were used as the acceptance criteria for all material tests, even though the licensee did not demonstrate a plan to perform the special test and inspection activities, as discussed in Section 3.4 above. The critical characteristics chosen by the licensee for the special tests and inspection activities are described in Table IV on page 42 of this report.

For the purposes of this report, the team's review and evaluation considered only selected portions of the licensee's special tests and inspection activities. The team reviewed the special tests and inspection dedication documentation for only selected power train parts because the licensee's dedication documentation was stamped "Preliminary," and the documentation reviewed by the team was incomplete and being revised, as discussed in Section 1 on page 1 of this report. The completed dedication documentation for the power train parts is subject to review during a future inspection. The team's observations for the power train parts described below are not considered complete because of the preliminary status of the licensee's documentation, and therefore, are subject to change on the basis of future inspections of completed documentation. The crankshaft, connecting rod bolts, and main bearings (shell and thrust) were not reviewed for inclusion in this report.

Table IV - Critical Characteristics for Special Tests and Inspections of Power Train Parts

Power Train Parts	Critical Characteristics
Engine Block	• Material: top deck plate, saddle, foundation plate, and main bearing cap • Material strength: top deck plate, saddle, foundation plate, and main bearing cap
Crankshaft	• Material • Material strength
Cylinder Liners	• Material • Material strength • Chrome plating: internal surfaces
Cylinder Heads	• Material • Material strength
Valves - Air and Exhaust	• Material
Valve Inserts	• Material
Piston Bodies	• Material • Material strength
Piston Caps	• Material • Material strength
Connecting Rods	• Material • Material strength
Connecting Rod Nuts	• Material • Material strength
Connecting Rod Bolts	• Material • Material strength
Main Bearing - Shell	• Material
Maim Bearing - Thrust	• Material
Camshafts	• Material • Material strength

(1) Engine Block

GE-L identified nine structural members of the engine block that it considered critical to the engine block's function. The critical characteristics selected by the licensee consisted of the material and its strength for only four of the nine structural members identified by GE-L. The nine structural members are listed below; those tested by the licensee are identified with an asterisk.

* saddle
* main bearing cap
camshaft bearing
* top deck plate
middle deck plate
* foundation plate
inside wall
outside wall
rib plate

GE-L did not have material certifications for several of the structural members. Material traceability for the structural members with material certifications was not adequate because the basis of the material certifications had not been verified by GE-L performing an audit or survey of its supplier.

The main bearing cap was purchased to AISI-1045, which specifies a carbon content requirement of 0.43 to 0.50 percent. The licensee used filings from the main bearing cap to determine its carbon content by performing an x-ray fluorescence analysis. The chemical composition test report showed a carbon content of only 0.386 percent (+/-0.008) which was below the 0.43 percent minimum specified for AISI-1045 material.

The licensee performed an evaluation to justify the use of the discrepant material and utilized a carbon content of 0.42 to 0.50 percent (not the 0.43 to 0.50 percent specified by AISI-1045). The evaluation referenced Table 2.9, "Product Analysis Tolerance for Carbon and High Strength Low Alloy Steels," from Steel Products Manual, American Iron and Steel Institute, dated March 1986, which stated that the tolerance for a specified range of 0.43 to 0.50 percent for a material sample less that 100-cubic inches was 0.03 percent over the maximum or under the minimum limits. The evaluation concluded that the minimum carbon limit including the tolerance of +/-0.03 percent is 0.39 percent; which is equal to the measured carbon value of 0.386 percent after it was rounded off to the next higher value, or 0.39 percent. The licensee accepted the material on this basis.

The licensee's evaluation, however, did not substantiate an adequate basis for taking credit for the tolerance of +/- 0.03 percent, which applies to a product analysis using wet chemistry that was compared to an x-ray fluorescence analysis that had an associated tolerance of +/- 0.008 percent. The licensee's evaluation did not adequately substantiate the use of 0.42 percent carbon, versus the 0.43 percent carbon, as specified for AISI-1045 forgings found in Table 10 on page 125 of the American Society for Metals publication Handbook; Volume 1, Properties and Selection: Irons and Steels, Copyright 1978.

Although some material specifications for the engine block specified fine grain material, the licensee did not perform any special test and inspection activities to verify material grain size. The licensee did not establish an adequate basis for using the +/-10 Rockwell B conversion deviation for the Equotip hardness testing data. Where material traceability was not substantiated by a material certification, verified by audit or survey of the subsupplier, the licensee's material tests were not adequate to identify the material used in its engine block or confirm that the material met GE-L's design specification.

The preliminary test procedure for the DE required all external valves to be in the correct running position, however the procedure did not list the valves or the correct running position. The procedure also required checks of vital parts, but did not identify the vital parts to be checked. GE-L performed the hydrostatic test of the engine block without documented procedures to identify and control the test parameters.

(2) Cylinder Liners

The licensee tested all cylinder liners, using Procedure QCP-10.7 to verify material chemistry and checked for weight (density), magnetism, visual appearance, spark test, and system scientific test to determine whether the material characteristics were consistent with those required for a non-specific cast iron. Even though the material specification noted that the maximum contents of sulfur and phosphorus were mandatory requirements, the licensee did not determine the specific elemental composition of sulfur and phosphorus, or for carbon, silicon, manganese, chromium, and molybdenum.

To determine the material strength, L hardness values were measured at 5 locations of each cylinder liner; which were averaged and corrected to a single Brinell hardness number (BHN). All BHN values were in the range of 190 to 269, which met the acceptance criteria.

Although the licensee determined that the results for the cast iron and chromium plating analyses were acceptable, the licensee failed to establish an adequate technical basis to substantiate its conclusions and did not evaluate the effects of long-term degradation and cyclic fatigue on the cylinder liners with regard to the chemical elements that were not analyzed.

(3) Cylinder Heads

The license performed special tests to verify the material chemistry of the cylinder heads relative to cast iron. Material filings taken from 9 of the 18 cylinder heads (50% sample size) were analyzed by the x-ray fluorescence method. The analysis showed that (1) the content of the silicon was below the minimum allowable for every sample, (2) the manganese was below the minimum allowable for eight of the nine samples, (3) the chromium was below the minimum allowable for five of the nine samples, and (4) the nickel was below the minimum allowable for four of the nine samples. The carbon and molybdenum contents were acceptable.

Although the licensee accepted all of the cylinder heads on the bases that the associated analytical error precluded excluding the material on the basis of measured values, the licensee failed to establish an adequate technical basis for its conclusions, and did not evaluate the long-term degradation and cyclic fatigue effects on the cylinder heads with regard to the material discrepancies, specifically those elements where the discrepancy measured exceeded the analytical error tolerance.

(4) Valves - Air and Exhaust

The licensee analyzed the chemical content of all exhaust valves and determined that the incorrect material was supplied and, therefore, rejected all 36 of the original exhaust valves. The licensee verified the material chemistry of only three of the replacement exhaust valves. All three were found acceptable and the licensee accepted the remaining exhaust valves on the basis of Eaton's letter dated November 13, 1990. The letter stated that all supplied exhaust and intake valves were inspected for head and stem material using a material analyzer and that the valves conformed to the requir ments of the material specification.

However, since the 36 original exhaust valves had also been inspected and found acceptable by Eaton, and were subsequently rejected by PG&E, the licensee did not substantiate an adequate basis for sampling only 3 valves from the replacement set and accepting the remaining replacement valves.

(5) <u>Valve Inserts</u>

The licensee chemically analyzed only four air valve inserts and only four exhaust valve inserts using the x-ray fluorescence method and combustion-infrared techniques. The licensee determined that the material met the chemical requirements of the ALCO specification for the elements analyzed. Although the ALCO specification stated that the silicon content shall not exceed 1.5 percent, the licensee did not analyze the samples for their silicon content or determine that only the characteristics examined were important. Although the ALCO specification required a minimum hardness of 50 Rockwell-C (RC), the licensee did not verify the hardness of the valve inserts. The licensee, therefore, failed to establish an adequate basis for accepting the valve inserts.

(6) <u>Piston Bodies</u>

The licensee chemically analyzed 9 of the 18 piston bodies using the x-ray fluorescence technique. PG&E determined that the material was acceptable although only six of the elemental constituents were analyzed and found to be within the acceptable range. The licensee, however, did not analyze the material content for chromium, magnesium, and silicon.

The licensee measured the hardness of all 18 piston bodies using the Equotip technique that resulted in L values in the range of 435 to 449, which were converted to 104 - 109 BHN. These hardness values were below the minimum acceptance value.

The licensee, therefore, failed to establish an adequate basis for accepting the piston bodies and failed to evaluate the effect of these deficiencies on the long-term degradation and cyclic fatigue of the piston bodies.

(7) <u>Piston Caps</u>

The licensee chemically analyzed material filings from all 18 piston caps using the x-ray fluorescence technique. Although none of the piston caps were analyzed for silicon content and four caps were found to have a carbon content below the material specification requirements, the licensee accepted all of the piston caps. The licensee, therefore, failed to establish an adequate basis for accepting the piston caps and failed to evaluate the effect of long-term degradation and cyclic fatigue of the caps with regard to the material deficiencies.

Hardness values were measured on the center post and the upper rim using the Equotip method. The licensee measured hardness values of 285 - 321 BHN on the piston caps, which were converted to values of 30 - 35 RC.

(8) Connecting Rods

The licensee chemically analyzed material filings from 9 of the 18 connecting rods using the x-ray fluorescence technique. PG&E determined that the material chemistry was acceptable, although the analysis showed that the chromium content was excessive for all nine rods tested and the manganese and nickel did not comply with the material specification (AISI E86345 steel) for three of the rods tested. Only the molybdenum content was verified to be correct. The licensee did not verify the material content for carbon, silicon, and boron. PG&E accepted the connecting rods despite the composition discrepancies because it believed the associated analytical error was greater than the amount exceeding the limit.

Although the material hardness values for 14 of the 18 connecting rods tested were below the lower limit of acceptability, the licensee accepted the connecting rods on the basis of using the Equotip conversion chart.

The licensee, therefore, failed to establish an adequate basis for accepting the connecting rods and failed to evaluate the effects of the deficiencies on the long-term degradation and cyclic fatigue of the rods.

(9) Connecting Rod Nuts

The licensee chemically analyzed spare nuts to avoid the destruction of parts to be used in its DE. A sample size of 10 percent was selected for testing. The licensee's analysis determined that the connecting rod nuts were AISI E-4140H steel, complying with all elements of the material specification with the exception of sulfur. The sulfur content exceeded the 0.025 percent maximum level for all test specimens but one. PG&E tested only 8 nuts rather than the 14 to 15 that would be required to meet the 10 percent sample size requirement.

The material strength of the connecting rod nuts was verified by the licensee performing hardness measurements using the Equotip device to determine an L value that was converted to RC. The measured values were within the range of 26 - 37.5 RC and acceptable. The licensee tested a sample size of 28 nuts; 8 initially, supplemented by another batch of 20. The sample size examined by the licensee, however, was smaller than the sample size specified for examination.

GE-L's audits of ATI showed that the connecting rod nuts were procured in large volumes and commingled with existing inventory, following acceptance so that traceability to a specific PO or material certification was not maintained by ATI. The licensee failed to evaluate this condition in its acceptance of the connecting rod nuts.

The licensee, therefore, failed to establish an adequate basis for accepting the connecting rod nuts and failed to evaluate the effects of the material deficiencies on long-term degradation and cyclic fatigue of the nuts.

(10) Camshafts

The licensee chemically analyzed material filings taken from the end flange of one of the camshaft segments. The material chemistry verification, as compared to the material specification for AISI-E1080, showed that the manganese content met the specification requirement. Although the licensee concluded that the camshaft material met the material specification for the elements analyzed, the licensee did not evaluate any other elemental components, except for chromium, which was identified as a trace element. The licensee, therefore, failed to establish an adequate technical basis for accepting the camshafts and failed to evaluate the effects of long-term degradation and cyclic fatigue of the camshafts with regard to the deficiencies.

The material strength was verified by the licensee performing hardness tests at five lobe locations on each camshaft assembly. An average L value was determined and converted to Rockwell C values. The values were within the acceptance criteria and therefore acceptable.

The licensee selected specific chemical elements from the allowable constituents specified in the material specifications as the critical characteristics of the power train parts. The licensee did not demonstrate its bases for determining that these chemical elements (critical characteristics) were relevant to the power train parts' (1) credible failure modes and its ability to perform its safety-related function, and (2) properties or attributes necessary to withstand the effects of long-term degradation and cyclic fatigue.

The results of the licensee's special tests and inspection activities identified numerous deviations in the chemical composition and hardness, or strength, in many of the power train parts. The licensee accepted these deviations in material requirements without evaluating their effects on the power train parts' properties or attributes to withstand long-term degradation and cyclic fatigue. Moreover, the licensee accepted these deviations in material requirements based, in part, on material certifications that were not traceable to the power train parts, and had not been verified by audit or survey of GE-L's or ATI's subsupplier. In other instances the licensee accepted the power train parts without material certifications and without performing a comprehensive material test to ensure that it complied with the material specifications required by the design specification. Additionally, where the special tests and inspection activities consisted of an analysis of a specific chemical element or hardness that were accepted with identified deviations from the material specifications required by the design specification, or without material certifications, or without verified material traceability, the licensee did not substantiate or confirm that GE-L adequately controlled the material used to manufacture the power train parts; which was the purpose of the licensee's special tests and inspection activities, and was intended to contribute to the licensee's demonstration of reasonable assurance that the power train parts meet the quality and reliability requirements of Appendix B to 10 CFR Part 50.

The licensee failed to demonstrate reasonable assurance that the technical bases for the special tests and inspection activities (1) ensures that the power train parts and the DE will perform their safety-related function, (2) ensures that the power train parts have the properties or attributes necessary to withstand the effects of long-term degradation or cyclic fatigue, and (3) ensures that the power train parts are technically identical to the critical components of DCNPP's five existing ALCO DEs and maintains the bases of the original seismic qualification. This is Unresolved Item 50-323/91-202-08.

3.4.2 Mechanical Components

PG&E developed QA Surveillance Plan No. 6602-1, Revision No. 0, dated November 6, 1990 (described in Attachment Z of RPE M-6602), to perform special tests and inspection activities for mechanical components. This plan is subject to future inspection.

4 EXIT MEETING

The team expressed its concerns regarding PG&E's procurement and commercial-grade dedication of an EDG set for DCNPP2 to the PG&E staff on May 3, 1991. Attending staff are listed in Appendix A. During the exit meeting, PG&E staff said it would like to provide any additional clarification or information that would facilitate the team's final evaluation of the EDG procurement and dedication activities. The team prepared a list of questions and concerns as a followup of the inspection effort and provided PG&E the opportunity to present additional data, as requested. PG&E provided its response during a presentation to the NRC staff on July 15, 1991. This report, therefore, incorporates the team's review of (1) the additional documentation submitted by PG&E on June 7 and 28, 1991, and (2) PG&E's presented response to NRC's questions, including the reference documentation, on July 15, 1991.

APPENDIX A

PERSONS CONTACTED

The U.S. Nuclear Regulatory Commission staff participating in the inspection of the procurement and commercial-grade dedication of the emergency diesel generator for Diablo Canyon Nuclear Power Plant (DCNPP) and the persons contacted during the inspection are listed below.

<u>Pacific Gas and Electric Company</u>:

	*	Anderson, Richard C.	Manager, Nuclear Engineering and Construction Services (NECS)
•		Barkhuff, William	DCNPP/QC
	*	Bhattacharya, Shan	Chief, Civil Engineering (CE), NECS
•	*	Chu, Winnie	Equipment Dynamic Analysis Group, Equipment Qualification Group (EQG), Nuclear Engineering (NE), NECS
•	*	Clark, Rich	Assistant Project Engineer, NECS
•	*	Connell, III, E. C.	Project Engineer, NECS
•		Dalal, Kersi	Group Leader, Piping Engineering Group, Piping Group, NECS
•		deUriarte, Thomas G.	Director, Nuclear Safety Assessment and Regulatory Affairs (NSARA)
•	*	Dobrzensky, Michael	Supervising Engineer, Project Quality Assurance (PQA)
•	*	Farradj, Usama	Group Leader, Safety Systems Group, Mechanical Systems (MS), NECS
•		Frederick, Spencer	Technical and Ecological Services (TES)
	*	Fujimoto, Warren	Vice President, Nuclear Technical Services
•	*	Hardesty, Dan	Safety Systems Group
•		Hartz, Chris	Quality Assurance Engineer, DCNPP/QA
•		Hepponstall, Burt R.	EDS Group, Electrical Engineering Group, NECS
	*	Hoch, John B.	Manager, NSARA
•		Ilisko, Harry	Process Control Group, Instrument and Control Group (I&CG), NECS
•	*	Kahler, Edwin R.	Group Leader, Procurement Design Engineering Group, EQG/NE/NECS
•	*	Khan, Mohsin R.	Group Leader, Equipment Dynamic Analysis Group, EQG/NE/NECS
•	*	Love, Brian F.	Quality Assurance Engineer, PQA
•	*	Nicholson, Alan	Regulatory Compliance Engineer, NSARA

•	*	O'Connell, Michael L.	Operations Licensing Engineer, NSARA
•		Ovadia, David	Supervising Engineer, CE/NECS
•		Pons, Lou	Group Leader, Power Block Group, CE/NECS
•	*	Tateosian, Dave	Supervising Engineer, MS/NECS
•		Tibbles, Paul	TES
	*	Tidrick, Gary	Supervising Engineer, NE/EQG/NECS
		Tresler, Mike	Project Engineer, NECS
•		Waligora, Marik	TES
•	*	Walters, Ed	Replacement Part Evaluations Group, MS/NECS
•		Wiggs, Bruce D.	Process Control Group, I&CG/NECS
•	*	Young, Jay C.	Director, PQA

U.S. Nuclear Regulatory Commission:

•	*	Haass, Walter P.	Senior Reactor Engineer, Special Projects Section, Vendor Inspection Branch (VIB), Division of Reactor Inspection and Safeguards (DRIS), Office of Nuclear Reactor Regulation (NRR)
•	*	Matthews, Steven M.	Team Leader, Reactive Inspection Section 1 (RIS1), VIB/DRIS/NRR
•	*	McIntyre, Richard P.	Senior Reactor Engineer, RIS1/VIB/DRIS/NRR
	*	Potapovs, Uldis	Acting Branch Chief, VIB/DRIS/NRR
•	*	Snodderly, Michael R.	Reactor Engineer, RIS1/VIB/DRIS/NRR
•	*	Wagner, William J.	Reactor Inspector, Division of Reactor Safety, Region V

• = Attended the Entrance Meeting
* = Attended the Exit Meeting

APPENDIX B

PERSONS ATTENDING JULY 15, 1991 MEETING

On July 15, 1991, the NRC staff met with representatives of the PG&E in Rockville, Maryland to discuss PG&E's presented response to the staff's questions that resulted from the April 29 through May 3, 1991, inspection of the procurement and commercial-grade dedication of the 2-3 EDG for Diablo Canyon Nuclear Power Plant, Unit 2. The attendees are listed below.

Pacific Gas and Electric Company:

Anderson, Richard C.	Manager, Nuclear Engineering and Construction Services (NECS)
deUriarte, Thomas G.	Director, Nuclear Safety Assessment and Regulatory Affairs (NSARA)
Farradj, Usama	Group Leader, Safety Systems Group, Mechanical Systems (MS), NECS
Freund, Mark C.	Procurement Quality Assurance
Kahler, Edwin R.	Group Leader, Procurement Design Engineering Group, Equipment Qualification Group, Nuclear Engineering, NECS
Walters, Ed	Replacement Part Evaluations Group, MS/NECS

U.S. Nuclear Regulatory Commission:

Dummer, Ann	Division of Reactor Projects III, IV, V (DRPW), Project Directorate V (PD5), Office of Nuclear Reactor Regulation (NRR)
Haass, Walter P.	Special Projects Section, Vendor Inspection Branch (VIB), Division of Reactor Inspection and Safeguards (DRIS), NRR
Huey, Randall F.	Region V, NRC
Matthews, Steven M.	Reactive Inspection Section 1 (RIS1), VIB/DRIS/NRR
Norrholm, Leif J.	VIB/DRIS/NRR (Chief)
Rood, Harry	DRPW/PD5
Runyan, Michael F.	Region IV, NRC
Zech, Gary G.	DRIS/NRR (Deputy Director)

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555

October 10, 1991

Docket No. 99900839

Mr. Robert Arnold, President
Rotork Controls, Incorporated
19 Jet View Drive
Rochester, New York 14624

Dear Mr. Arnold:

SUBJECT: NOTICE OF NONCONFORMANCE
(NRC INSPECTION REPORT NO. 99900839/91-01)

This letter addresses the inspection of your facility at Rochester, New York conducted by Mr. Uldis Potapovs, of this office on August 5-7, 1991 and the discussion of his findings with you and other members of your staff at the conclusion of that inspection.

The purpose of this inspection was to review the status of corrective actions for nonconformances identified during the Nuclear Regulatory Commission (NRC) inspection of September 12-13, 1989, to assess the progress of your implementation of a commercial-grade dedication program as committed in your letter of November 8, 1990, and to review the interfaces between Rotork Controls, Incorporated and Rotork Controls, Limited in Bath, England. Details of this inspection are discussed in the enclosed report.

During this inspection it was determined that your quality assurance (QA) program failed to meet certain NRC requirements. The specific findings and references to the pertinent requirements are identified in the enclosed Notice of Nonconformance.

We are concerned that the nonconformance is repetitive of a deficiency identified during the previous NRC inspection of your facility. We are also concerned that the implementation of your commercial-grade dedication program has not progressed in accordance with the schedule described in your letter of November 8, 1990, and urge that additional emphasis be directed to this important activity.

The response requested by the enclosed Notice is not subject to the clearance procedures of the Office of Management and Budget as required by the Paperwork

Reduction Act of 1980, Public Law No. 96-511. In accordance with 10 CFR Part 2.790 of the NRC's "Rules of Practice" a copy of this letter and its enclosures will be placed in the NRC's Public Document Room.

Sincerely,

Leif J. Norrholm, Chief
Vendor Inspection Branch
Division of Reactor Inspection
and Safeguards
Office of Nuclear Reactor Regulation

Enclosures:
1. Notice of Nonconformance
2. Inspection Report No. 99900839/91-01

ENCLOSURE 1

NOTICE OF NONCONFORMANCE

Rotork Controls, Incorporated
Rochester, New York

Docket No. 99900839/91-01

During an inspection conducted at the Rotork Controls, Inc. facility in Rochester, New York, on August 5-7, 1991, the Nuclear Regulatory Commission (NRC) inspector determined that certain activities were not conducted in accordance with NRC requirements which were contractually imposed on Rotork Controls, Inc. by purchase orders (POs) from NRC licensees. The NRC has classified the item described below as nonconformance to the requirements of Title 10 of the Code of Federal Regulations, Part 50 (10 CFR Part 50) Appendix B, imposed on Rotork Controls, Inc. by contract and the supplemental requirements of its nuclear utility customers.

Criterion III, "Design Control," of Appendix B to 10 CFR Part 50 states in part: "Measures shall be established to assure that applicable regulatory requirements and the design basis...are correctly translated into specifications, drawings, procedures and instructions. These measures shall include provisions to assure that appropriate quality standards are specified and included in the design documents... Measures shall also be established for the selection and review for suitability of application of materials, parts, equipment, and processes that are essential to the safety-related functions of the structures, systems, and components."

List of Parts, LOP 050, requires Item 69, the 3/8" diameter, 1" long, sockethead capscrews that hold the thrust ring in place to have a tensile strength of 70 tons/square inch.

Contrary to the above, on May 22, 1991, Rotork Controls, Inc. ordered 4000 of these capscrews from Rochester Screw & Bolt Co. as commercial-grade items without specifying any tensile requirements and did not perform any activity to assure that the capscrews received are suitable for the intended application (91-01-01). This is a repeat of nonconformance identified during the September 1989 NRC inspection.

Please provide a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C. 20555 with a copy to the Chief, Vendor Inspection Branch, Division of Reactor Inspection and Safeguards, Office of Nuclear Reactor Regulation, within 30 days of the date of the letter transmitting this Notice of Nonconformance. This reply should be clearly marked as a "Reply to a Notice of Nonconformance" and should include for each nonconformance: (1) a description of steps that have been or will be taken to correct these items; (2) a description of steps that have been or will be taken to prevent recurrence; and (3) the dates your corrective actions and preventive measures were or will be completed.

Dated at Rockville, Maryland
this 10th day of October, 1991.

ORGANIZATION:	Rotork Controls, Incorporated Rochester, New York
REPORT NO.	99900839/91-01
CORRESPONDENCE ADDRESS:	Mr. Robert Arnold, President Rotork Controls, Incorporated 19 Jet View Drive Rochester, New York 14624
ORGANIZATIONAL CONTACT:	Mr. Doug Matla, QA Manager (716) 328-1550
NUCLEAR INDUSTRY ACTIVITY:	Electric and Hydraulic Valve Actuators
INSPECTION CONDUCTED:	August 5-7, 1991

Uldis Potapovs — 10-10-91

Uldis Potapovs, Section Chief
Reactive Inspection Section No. 1
Vendor Inspection Branch — Date

INSPECTION BASES:	10 CFR Part 50, Appendix B and 10 CFR Part 21
INSPECTION SCOPE:	To review status of corrective actions for nonconformances identified during a September 1989 inspection and to assess Rotork Controls, Inc. progress in implementing a commercial-grade item dedication program.
PLANT SITE APPLICABILITY:	Numerous

1 INSPECTION SUMMARY

1.1 Nonconformance

1.1.1 Contrary to Criterion III of Appendix B to 10 CFR Part 50 and List of Parts, LOP 050, Rotork Controls, Inc. (Rotork) purchased 3/8" diameter, 1" commercial-grade sockethead capscrews to hold down thrust rings without verifying that these capscrews met the 70 tons/square inch tensile strength requirement specified on LOP 050. (91-01-01) This is a repeat of nonconformance identified during the September 1989 inspection.

2 STATUS OF PREVIOUS INSPECTION FINDINGS

2.1 (Closed) Nonconformance 89-01-01

Contrary to Criterion III of Appendix B to 10 CFR Part 50 and Rotork QA Manual, Rotork personnel had failed to route Nonstandard Product Request Forms to the QA Manager for review and approval.

Corrective action was accomplished during the 1989 inspection. To prevent recurrence, training has been administered to affected individuals.

2.2 (Open) Nonconformance 89-01-02

Contrary to Criterion III of Appendix B to 10 CFR Part 50 and Rotork specifications, Rotork purchased 3/8" diameter, 1" commercial-grade sockethead capscrews to hold down thrust rings without verifying that the capscrews met the required tensile properties.

Rotork's November 9, 1990 response stated that corrective action would be accomplished through a program to dedicate commercial-grade items which was being developed for immediate implementation.

Review of Rotork's activities in these areas determined that a commercial-grade dedication program had not been implemented (see paragraph 3.3 for additional discussion) and that Rotork had recently procured additional thrust ring capscrews as commercial-grade items without verifying the specified tensile properties (91-01-01). This item remains open pending specific corrective action and implementation of a commercial-grade dedication program.

2.3 (Closed) Nonconformance 89-01-03

Contrary to Criterion IV of Appendix B to 10 CFR Part 50, Rotork's QA manual did not require that suppliers to Rotork pass QA requirements down to their suppliers.

Rotork has revised Section 7 of its QA manual to state that if lower tier procurement is required, the vendor must invoke the applicable QA requirements. Review of recent purchase orders indicated compliance with this change.

2.4 (Closed) Nonconformance 89-01-04

Contrary to Criterion IV of Appendix B to 10 CFR Part 50 and Rotork's QA manual, two purchase orders to ASCO were not approved by the QA manager and did not include appropriate QA requirements.

Corrective action was accomplished during the 1989 inspection. To prevent recurrence, appropriate training was administered to seven affected individuals.

2.5 (Closed) Nonconformance 89-01-05

Contrary to Criterion V of Appendix B to 10 CFR Part 50, Rotork had no documented instruction or procedure on how items returned from customers were to be handled.

Procedure QC 330, "Handling of Service and Returned Items Related to Nuclear," was issued on November 1, 1990. The procedure adequately addresses processing of returned items.

2.6 (Closed) Unresolved Item 89-01-06

Rotork's procedure for reporting defects under 10 CFR Part 21 did not include provisions to notify customers of a deviation when Rotork can not perform an [illegible]ation to determine if a defect exists.

[illegible]cedure has been revised to require notification of customers when [illegible] is unable to perform a Part 21 evaluation. No such notifications have [illegible]de since the procedure was revised.

[illegible]ECTION FINDINGS AND OTHER COMMENTS

[illegible]rance and Exit Meetings

[illegible]pector informed Rotork of the scope of the inspection and established [illegible]g interfaces during the entrance meeting on August 5, 1991. It was [illegible]ively agreed at the entrance meeting that the report of this inspection [illegible] be combined with inspection report of Rotork Controls, Limited, Bath, England (Rotork Ltd.) which was scheduled for September 1991. The Rotork Ltd. inspection has since been postponed and will be reported separately. On August 7, the inspector summarized the inspection findings, observations and concerns to Rotork management.

3.2 QA Program Interfaces

Domestic nuclear sales of Rotork actuators are processed by Rotork. Rotork assembles and tests the actuators at their Rochester, New York facility using mostly component parts supplied by Rotork, Ltd. although some items such as fasteners and paints are procured in the United States. Rotork considers

Rotork, Ltd. a qualified subcontractor with a QA program meeting 10 CFR Part 50, Appendix B requirements. Rotork, Ltd. is also responsible for all design and qualification activities including the control of design changes.

An NRC inspection of Rotork Ltd. during October 9-10, 198?, identified several nonconformances and unresolved items related to control of design and material changes and the effect of these changes on environmental qualification of the operators. Rotork's corrective action to these findings (at both the Rotork and Rotork Ltd. facilities) included a commitment to develop and implement a commercial-grade dedication program. The progress of this effort at the Rotork facility was reviewed and is discussed in the following paragraph.

3.3 Commercial-Grade Dedication Program

As a result of the corrective action commitments discussed above, Rotork contracted for consulting services to develop a commercial-grade dedication program for its product line. Although this work has been completed, the proposed dedication program had not been incorporated into Rotork's QA manual or procedures at this time. The proposed dedication program consisted of four volumes:

- Methods Statement for Dedication of NA1 Actuator Range
- Part Level Specifications for Non-Metallic Parts used in NA1 Actuator Range
- Justification of Non-Metallic Parts Used in NA1 Actuator Range
- Dedication of Non-Metallic Components.

The inspector performed a cursory review of these documents and made the following observations:

- The dedication methodology was not clearly defined. While the Methods Statement specified a combination of methods 1 (testing) and 2 (survey) as the preferred dedication approach, "Dedication of Non-Metallic Components" stated that supplier audit or survey (method 2) was the preferred acceptance method (methods 1 and 2 refer to terminology used in Electric Power Research Institute publication NP-5652).

- The documents did not contain adequate guidance for the use of method 2 (survey). For example, guidance for verifying terminal block material was limited to checking vendor's procurement control to ensure that correct material was ordered and checking the vendor's material receipt and storage controls. No provisions were established to verify that the vendor's supplier actually provided the correct material.

- Some of the justifications for acceptance of non-metallic parts were very weak. For example, the justification for accepting material substitution for Syncroset terminal blocks stated that based on comparison of material properties in BIP Chemical, Ltd. telefaxed information, there will be no impact on environmental qualification. The justification did not address additional information supplied by BIP Chemical, Ltd. which specifically states that the two materials (6908 GB and 6199 N7B) "are similar in some areas but the materials are not similar to each other" and that no information is available on radiation resistance of the substituted material.

- If was not clear whether metallic materials such as capscrews were to be included in the scope of this program.

Rotork management indicated that the proposed program was still being reviewed and appropriate revisions would be made before incorporating it into Rotork's QA system.

3.4 Document Review

Recent purchase orders (POs) for critical components were examined to evaluate corrective actions on previous inspection findings and to assess the adequacy of current procurement practices.

PO 36808 dated May 22, 1991, was placed with Rochester Screw & Bolt Company, Tonawanda, New York for 4000 capscrews which were to be used for thrust ring hold down application. The design requirements for these capscrews are specified as 70 tons/square inch ultimate tensile strength (LOP 050, Item 69). The PO only specified P/N 06-023 capscrews 3/8 UNC x 1. No material or tensile requirements were included.

The inspector interviewed the buyer responsible for this order who stated that, as standard practice, when capscrew material is not specified, the supplier provides "standard alloy" which is supposed to have a minimum tensile strength of 160 Ksi which exceeds the 70 ton/square inch requirement.

Failure to assure that design requirements were adequately translated to procurement documents was identified as nonconformance 91-01-01.

This is a repeat of similar nonconformance identified during the August 1989 inspection. The inspector was shown an Engineering Department memo dated March 5, 1991 which was also identified as a 10 CFR Part 21 evaluation related to the original nonconformance. This memo stated that Rotork had been ordering these capscrews as alloy steel in conformance with ASTM A574 having minimum tensile strength of 180 Ksi therefore these capscrews are acceptable as meeting design requirements. The inspector noted that, in view of the procurement practice discussed above and the fact that no evidence was presented to demonstrate that the capscrews conformed to ASTM A574, Rotork should reevaluate the reportability of this issue.

4 PERSONNEL CONTACTED

* Robert Arnold	President
* Doug Matla	QA Manager
William Cortney	Buyer

* Attended entrance and exit meetings.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

November 27, 1991

Docket No. 99901229

Mr. Albert E. Riesen, President
Teledyne Wah Chang Albany
1600 N.E. Old Salem Road
Albany, Oregon 97321

Dear Mr. Riesen:

SUBJECT: NOTICE OF NONCONFORMANCE
(NRC INSPECTION REPORT NO. 99901229/91-01)

This letter addresses the inspection of your facility at Albany, Oregon conducted by Messrs. R. L. Cilimberg, G. P. Hornseth, and R. K. Frahm, Jr. of this office on October 7-10, 1991 and the discussions of their findings with Mr. T. E. Cordier and other members of your staff at the conclusion of the inspection. The purpose of the inspection was to determine if the supply of material by Teledyne Wah Chang Albany (TWCA) is in accordance with nuclear utility specifications and the TWCA quality assurance (QA) program. The inspectors were especially interested in whether TWCA had shipped nonconforming zircaloy 2 (Zr2) tubeshells to customers who were using this material to manufacture fuel cladding to be used for nuclear fuel rods for supply to the U.S. nuclear industry. The NRC has received information which alleged that TWCA had shipped Zr2 tubeshells that had been improperly heat treated and which subsequently resulted in leaking fuel in reactors.

Areas examined during the NRC inspection and our findings are discussed in the enclosed report. This inspection consisted of an examination of procedures and representative records, interviews with personnel, and observations by the inspectors. During this inspection it was found that the implementation of your QA program failed to meet certain NRC requirements which are summarized as follows: (1) the TWCA QA manual did not state that activities affecting quality were to be prescribed in documented procedures and performed in accordance with these procedures; (2) TWCA did not issue a Product Condition Information Request (PCIR) to document deviations of samples of Zr2 heat 228821 which had been exposed to the nodular corrosion test. The NRC inspectors did not substantiate the allegations concerning improper heat treatment. Inspection of corrosion samples and observation of heat treating of Zr2 billets determined that TWCA tubeshells were in accordance with customer requirements.

The specific findings and references to the pertinent requirements for the above nonconformances are identified in the enclosed Notice of Nonconformance.

The responses requested by this letter and the enclosed Notice are not subject to the clearance procedures of the Office of Management and Budget as required by the Paperwork Reduction Act of 1980, Public Law No. 96-511.

In accordance with 10 CFR Part 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosures will be placed in the NRC's Public Document Room.

Leif J. Norrholm

Leif J. Norrholm, Chief
Vendor Inspection Branch
Division of Reactor Inspection
and Safeguards
Office of Nuclear Reactor Regulation

Enclosures:
Notice of Nonconformance
Inspection Report 99901229/91-01

NOTICE OF NONCONFORMANCE

Teledyne Wah Chang Albany
Albany, Oregon

Docket No.: 99901229/91-01

During an inspection conducted at the Teledyne Wah Chang Albany (TWCA) facility in Albany, Oregon on October 7-10, 1991, the inspection team from the U.S. Nuclear Regulatory Commission (NRC) determined that certain activities were not conducted in accordance with NRC requirements, which are contractually imposed on TWCA by purchase orders (POs) from nuclear fuel manufacturers. The NRC has classified these items, as set forth below, as nonconformances to the requirements of Title 10 of the Code of Federal Regulations, Part 50 (10 CFR Part 50) Appendix B, imposed on TWCA by contract and the supplemental requirements of its nuclear customers.

A. Criterion V of Appendix B to 10 CFR Part 50 requires that activities affecting quality are to be prescribed by documented procedures and be accomplished in accordance with these procedures.

   Contrary to the above, the TWCA Quality Control Manual (QCM), Revision 1, dated February 15, 1991, does not state that activities affecting quality be prescribed by documented procedures and be performed in accordance with these procedures (91-01-01).

B. Criterion XV of Appendix B to 10 CFR Part 50 requires that nonconforming items be reviewed and accepted, rejected, repaired or reworked in accordance with documented procedures.

   Section P.3 of the TWCA QCM, dated October 23, 1989, requires that deviations from process specifications and written procedures are to be documented using the Product Condition Information Request (PCIR).

   Contrary to the above, TWCA did not issue a PCIR to document deviations of samples from Zircaloy 2 heat 228821 which had been exposed to the nodular corrosion test (91-01-02).

Please provide a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C. 20555 with a copy to the Chief, Vendor Inspection Branch, Division of Reactor Inspection and Safeguards, Office of Nuclear Reactor Regulation, within 30 days of the date of the letter transmitting this Notice of Nonconformance. This reply should be clearly marked as a "Reply to a Notice of

Nonconformance" and should include for each nonconformance: (1) a description of steps that have been or will be taken to correct these items; (2) a description of steps that have been or will be taken to prevent recurrence; and (3) the dates your corrective actions and preventive measures were or will be completed.

Dated at Rockville, Maryland
this 4th day of December 1991.

ORGANIZATION:	TELEDYNE WAH CHANG ALBANY ALBANY, OREGON
REPORT NO.	99901229/91-01
CORRESPONDENCE ADDRESS:	Mr. Albert Riesen, President Teledyne Wah Chang Albany 1600 N.E. Old Salem Road Albany, Oregon 97321
ORGANIZATIONAL CONTACT:	Dr. J. R. Wille, Director, Quality Control
NUCLEAR INDUSTRY ACTIVITY:	Materials supplier for nuclear, military, and commercial application.
INSPECTION CONDUCTED:	October 7-10, 1991

Ramon L. Cilimberg 11/25/91

R. L. Cilimberg, Team Leader — Date
Reactive Inspection Section No. 1
Vendor Inspection Branch (VIB)

Geoffrey P. Hornseth, Engineering Materials & Chemical Engineering Branch (EMCB)
Ronald K. Frahm, Jr., VIB
Phillip V. Joukoff, OI Region V

Uldis Potapovs 11-25-91

Uldis Potapovs, Chief — Date
Reactive Inspection Section No. 1
Vendor Inspection Branch

INSPECTION BASES:	10 CFR Part 21 and Part 50, Appendix B
INSPECTION SCOPE:	To review the Teledyne Wah Chang Albany (TWCA) QA program relative to the supply of material to the nuclear industry.
PLANT SITE APPLICABILITY:	Numerous.

1 INSPECTION SUMMARY

1.1 Nonconformances:

1.1.1 Contrary to Criterion V of Appendix B to 10 CFR Part 50, the TWCA Quality Control Manual (QCM), Revision 1, dated February 15, 1991, does not state that activities affecting quality be prescribed by documented procedures and be performed in accordance with these procedures (91-01-01).

1.1.2 Contrary to Criterion XV of Appendix B to 10 CFR Part 50, and Section P.3 of the TWCA QCM, dated October 23, 1989, TWCA did not issue a Product Condition Information Request (PCIR) to document deviations of samples of Zircaloy 2 (Zr2) heat 228821 which had been exposed to the nodular corrosion test (91-01-02).

2 STATUS OF PREVIOUS INSPECTION FINDINGS:

There were no open findings to address as this was the first NRC inspection of TWCA.

3 INSPECTION FINDINGS AND OTHER COMMENTS:

3.1 Entrance and Exit Meetings

The Nuclear Regulatory Commission (NRC) inspectors informed TWCA staff of the scope of the inspection, outlined areas of concern, and established working interfaces during the entrance meeting on October 7, 1991. On October 10, 1991, the NRC inspectors summarized the inspection findings, observations, and concerns to TWCA management during the exit meeting.

3.2 Allegation

The NRC received information which alleged that TWCA had shipped Zr2 tubeshells to fuel manufacturers which were susceptible to nodular corrosion and resulted in leaking fuel rods in nuclear reactors. The corrosion susceptibility was alleged to have resulted from improper heat treating of billets which were used to make the tubeshells. The improper heat treating was alleged to be indicated by samples of Zr2 heat 228821 which failed corrosion testing in the TWCA laboratory. The improper heat treating was allegedly caused by problems with the Mark II induction furnace. The allegations could not be substantiated because inspection of corrosion samples from heat 228821 and review of heat treating of Zr2 billets determined that the billets which were shipped complied with customer requirements. Furthermore, the customer used the tubeshells from heat 228821 for water rod applications only. Since water rods do not contain fuel, no fuel leakage could have resulted from the use of this material. Additionally, allegations concerning the Mark II induction furnace (Mark II) could not be substantiated as discussed in sections 3.5 and 3.6 below.

3.3 Document Review

The inspectors determined by reviewing the TWCA QCM dated February 15, 1991, that the QCM does not contain a definitive statement that activities are to be prescribed in written procedures and performed in accordance with these procedures. Dr. Wilie agreed that the QCM could be more specific with respect to Criterion V of Appendix B to 10 CFR Part 50. (See Nonconformance 91-01-01)

The inspectors determined that a nonconformance report (PCIR) was not issued by TWCA to document nonconforming tubeshells from Zr2 heat 228821. TWCA wrote extensive documentation on this material but failed to meet the PCIR requirement of the QCM dated October 23, 1989. (See Nonconformance 91-01-02)

3.4 Corrosion Testing

TWCA performs 500°C steam corrosion tests on samples of tubeshells in accordance with customer requirements to provide assurance that the tubeshells have been properly heat treated. Zr2 is an alloy of pure zirconium and small amounts of tin, chromium, iron and nickel. The enhanced corrosion resistance of Zr2 is due to the presence of these elements, and corrosion resistance is maximized when the elements are dispersed throughout the crystalline structure of the zirconium. When Zr2 is heated above 980°C, the zirconium is transformed from an alpha phase to a beta phase and these elements are dissolved rapidly in the beta phase. If the temperature of the Zr2 is then rapidly reduced by quenching in water, the Zr2 is transformed to the alpha phase with a fine precipitation of the alloying elements which provides enhanced corrosion resistance to the Zr2. This heat treatment is called beta quenching and it is performed on Zr2 billets prior to the extrusion of the billets to make tubeshells. If the beta quench of a billet is performed improperly, the corrosion test samples obtained from the tubeshell extruded from that billet will not pass the corrosion test. Samples which have been exposed to 500°C steam are compared to a visual standard to determine if the samples meet the required limit for nodular corrosion appearance.

The NRC inspectors examined one lead end and one tail end sample from each of the 121 tubeshells produced from Zr2 heat 228821. This examination determined that one sample from tubeshell 84 failed to meet the 1002 visual standard which does not allow a nodule greater than 0.007 inches. The sample from tubeshell 19 could pass or fail depending on the judgement of the examiner. TWCA did not accept these 2 samples in addition to samples from 14 other tubeshells which exhibited varying degrees of frost which is not a basis for corrosion test failure. TWCA shipped 105 tubeshells from this heat to be manufactured into water rods by Kobe Steel. The NRC inspectors confirmed that the samples of each of the tubeshells that had been shipped to Kobe Steel passed the corrosion test. The numbers of the 16 tubeshells that were scrapped by TWCA are 1, 3, 7, 10, 19, 26, 34, 46, 52, 54, 56, 58, 84, 119, 120, and 121. The TWCA staff who perform corrosion testing are well trained and conservative in their determinations of whether the samples meet customer imposed test criteria. They were not aware of any problems with a large number of failed samples which could be associated with the improper heat treating in the subject allegation.

3.5 Mark II Induction Furnace

The Mark II is used by TWCA to heat Zr2 billets for beta quench heat treating. The inspectors reviewed two subject areas concerning the response and accuracy of thermocouples (T/Cs) used for setting up and controlling the furnace, and the evenness and repeatability of the furnace in producing a heat of 120 billets.

3.5.1 T/C Response in the Mark II

The T/C response to the Mark II environment was examined with respect to alleged inaccuracies related to furnace/billet temperature measurements as follows: (1) use of uncalibrated T/C and associated instruments; (2) induction heating of the T/C by the furnace; and (3) differential heating of the T/C instrumented profile billet at the T/C holes due to geometric effects.

An examination of instruments dedicated to the Mark II did not reveal any instruments with stickers past the calibration due date. This observation was consistent with observations made elsewhere in the plant which support the conclusion that TWCA adheres to its instrument calibration QA program. Discussion with Mr. W. Meeks, instrument repairman, indicated that the instrument shop personnel possess a high degree of expertise in their field as confirmed by information which Mr. Meeks provided in answer to questions by the inspectors. The inspectors determined from this discussion that TWCA ensures the maintenance of properly operating instrumentation.

A Zr2 billet is similar to a heavy walled pipe with dimensions equal to 7 inches outside diameter (OD), 2 1/4 inches wall thickness and a 21 inch length. Several profile billets contain three pairs of T/C in holes drilled in the billets which are used to set up the Mark II prior to a production run. One T/C of each pair is located 1/2 inch from the billet OD while the other T/C from each pair is located 1/2 inch from the billet inside diameter (ID). The T/C pairs are located 1/2 inch from each end of the billets and one pair near the mid-length. T/C holes are not drilled in production billets, but furnace T/Cs are suspended in the center of the billet bore to measure the temperatures near the ends and mid-length of the billet and control the heating. Before each production run in the Mark II, a profile billet with embedded T/Cs is used to adjust the temperature distribution within the billet until the appropriate temperature tolerances are reached and correlated with the furnace T/Cs. The furnace T/Cs are then used for temperature control for the induction heating beta quench heat treatment of production billets.

The inspectors observed tests in the Mark II to determine the effect of induction heating on the new T/Cs embedded in a Zr2 billet. This profile billet was heated to 1160°F using the billet T/Cs for control while comparing them to the furnace T/Cs. As expected and as previously experienced by TWCA personnel, the billet T/Cs indicated a higher temperature than the furnace T/Cs. This temperature differential is due to known effects in the induction furnace. The billet is exposed directly to the induction field and the billet T/Cs sense the heat from this exposure directly. The furnace T/Cs in the bore of the hollow billet are not significantly heated by the furnace. They sense the heat radiating from the ID of the billet. Since radiant heat transfer is a relatively inefficient process, the furnace T/Cs in the bore experienced a temperature lag during the heating process. When the furnace power was switched off, the billet T/C sensed a gradual fall in temperature. The bore/furnace T/C continued to register increasing temperatures for some time as the radiant heat of the billet continued to warm these sensors.

The inspectors determined from these observations that any effect of the induction heating directly on the T/Cs was insignificant. This conclusion was made because no step change occurred in the T/C temperature versus time plot when the furnace power was switched off. Secondly, a correlation could be made between the T/Cs imbedded in the billet and the T/Cs in the bore even with a 60°F differential between the furnace and billet T/Cs. Thirdly, any preferential heating of the T/Cs was not supported. If the billet T/Cs had been preferentially heated, the large mass of the billet would act as an efficient heat sink and absorb any excess heat. Similarly, the furnace T/Cs in the bore would experience excess heat that would radiate to the mass of metal in the billet. When the furnace power was switched off the furnace T/Cs would have indicated a drop in temperature rather than the rise that was observed by the inspectors.

The inspectors performed independent temperature measurements to compare with the temperature being indicated by the billet and furnace T/Cs. An infrared pyrometer measured a billet surface temperature of 675°C at the same time that the mid-OD billet T/C measured an internal metal temperature of 686°C. A contact pyrometer measured a surface temperature of 630°C compared to a T/C reading of 629°C. An 1100°F temperature indicating crayon (Tempilstik) melted to indicate a temperature in excess of 1100°F while a 1200°F crayon did not melt which indicates a billet surface temperature between 1100-1200°F and similar to the range measured by the billet T/C. The inspectors did not observe any billet incandescence when the 1100-1200°F measurements were made which agrees with typical heat treating experience for the ambient lighting which prevailed in the Mark II environment at the time.

Previous to this inspection, TWCA performed a test to determine if any furnace induced T/C effects existed, and provided a time-temperature plot of the results for review. With a cold furnace and starting from room temperature, five minutes of induction heating produced a 10-15°C temperature rise of the furnace T/C. This is a small amount of heating of the T/C when compared to the significant amount of heating which occurs to a massive billet being heated in the heat treating range of 1050-1200°C.

An additional experiment was performed to assess the allegation that the drilled holes in the profile billets caused uneven and excessive heating around the holes drilled in the billets due to geometric effects on the induced current. A profile billet was heated normally to the beta quench range of 1050-1200°C and lowered from the furnace for observation. In this temperature range the billet exhibits a bright orange incandescent glow. Any significant temperature variation would be visible as a color and brightness difference. Several heating cycles were observed on two different profile billets. The area around the T/C holes was closely observed by the NRC inspectors and several TWCA employees. No color/intensity difference was seen at the holes compared to the rest of the billet which supports a conclusion that no significant temperature difference exists. The inspectors reviewed a series of colored photographs with known temperature differentials between opposite ends of a billet. At a difference of 30°C, a noticeable color/brightness change was apparent. Further confirmation that there exists no large temperature difference at the T/C holes is provided by the pyrometer experiment described previously which did not detect any large (>100°F) temperature differences. The NRC inspectors could not substantiate the allegations concerning improper or inaccurate temperature measurement.

3.5.2 Mark II Heating/Uniformity and Repeatability

Allegations concerning the uniformity and repeatability of the Mark II were reviewed. An inconsistent process would affect final product quality which would result from improper heat treating temperatures during production runs. Aside from the profile billets, only the first few billets of any production run have T/C embedded in holes in the billets. The correlation between the billet and furnace T/C is expected to be constant and accurate during production runs.

TWCA has taken corrective action on problems related to the Mark II such as packing the top of the furnace with insulation to eliminate drafts due to the chimney effect. Furnace operators verify the placement of this packing before each billet heating cycle. The base block upon which the billet is supported is preheated prior to a cycle to avoid any chilling of the billet due to conduction through a cold base block. Billets are machined to minimize the effect of variable billet lengths on induction heating uniformity. Furnace operators were observed verifying billet length against the specified limits for each run. A random sampling of billets awaiting heat treating were verified to conform to the specified length tolerance.

The billet position in the Mark II must be carefully controlled to maintain uniformity of heating, because a change of 1/10 of an inch can adversely affect the temperature profile within the billet. Before each production run the Mark II is tested and adjusted with profile billets. The operator loads the profile billet into the Mark II and proceeds to induction heat it in the same manner as a production billet. When the temperature has reached the required range, a record/profile of the temperatures are made. The profile is evaluated for uniformity of heating within the desired range. Adjustments are normally required to obtain an acceptable profile or uniformity of heating. Profile changes are made by adjusting the billet position (height) within the Mark II. The height adjustment within the furnace is the significant variable while side to side or radial position has little effect. The sensitivity and repeatability of the height position can cause significant changes in temperature along the length of a single billet. A large variance in position from billet to billet can cause nonuniform heating between billets.

The inspectors observed that the operators were familiar with this sensitivity and were able to estimate the effects of billet position adjustments on the billet temperature profile. Position adjustments were on the order of tenths of an inch. After an adjustment was made, another temperature profile was obtained and evaluated until several cycles of adjustments had obtained an acceptable profile.

The inspectors noted that billet height in the Mark II was monitored by a computer control system to assure that this sensitive variable is being monitored for process control. This approach ensures that a significant deviation is discovered at the time it occurs rather than during later processing or testing.

The inspectors did not verify accuracy and repeatability of billet positioning due to time limitations for observing a sufficient number of billets to ensure statistical validity during the inspection. The furnace profiling operation was observed to be a position sensitive process, and TWCA is aware of this as exhibited by ongoing refinement of the Mark II and associated instrumentation. The current Mark II and control configurations are not identical to those in operation at the time the allegations were made. Changes to the system have been made as a result of TWCA initiated process improvements and response to the allegations. The difficulty of furnace profiling has prompted TWCA to plan for future replacement of the existing Mark II with a different design.

3.6 Customer Requirements

The inspectors determined by reviewing Zr2 purchase orders for the period 1987 to 1991 that customer requirements for the number of corrosion test specimens vary from 0 to 100% for a production run of 120 billets. When no samples are specified, the customer assumes responsibility for performing the heat treatment and the corrosion testing and no reliance is placed on heat treating performed by TWCA. When 2 samples are required for each tubeshell (100% sampling), the corrosion testing discussed in section 3.4 above ensures that the beta quench heat treating of the billets has been performed properly and that it achieved the required metallurgical structure. If a customer requires that 3 samples per heat are to be subjected to corrosion testing, the potential exists for that customer to receive tubeshells which have been improperly heat treated, and the heat treating consistency part of the allegation would be substantiated. However, the NRC inspectors did not find any orders for tubeshells to be used for BWR fuel cladding in the United States that would not have the proper heat treating as substantiated by corrosion testing.

The inspectors reviewed orders for tubeshells which were used to fabricate tubes for water rods which do not contain fuel and are not pressure boundary components. Improper beta quench heat treatment of billets for this material would not result in fuel leaks. Heat 228821 was used by Kobe Steel to make water rods as discussed in 3.2 and 3.4 above.

3.7 10 CFR Part 21

The inspectors determined that TWCA has maintained the required postings in six locations and implemented procedure QCI-B-7, "Reporting of Defects and Noncompliance," Revision 0, dated September 18, 1991 and instruction QCI-P-2, "Product Condition Information Request," Revision 6, dated June 28, 1990. No violations were found during this inspection.

4 PERSONNEL CONTACTED

+ * G. Arbelbide, Audit Coordinator
M. Aspinwall, Assistant General Counsel
D. Brown, QA Representative
T. Burgess, Process Analysis Technician
* T. Cordier, Vice President of Technology
T. Danielson, Metallographer
* J. Denham, TWCA Counsel
+ * C. Eucken, Manager of Process Development
+ * L. Findley, Director of Fabrication Division
+ R. Graham, Manager of Process Engineering
M. Halfman, Lead Technician
* R. Hickman, Manager of Metallurgical Laboratory
P. Justice, Beta Quench Operator
W. Meeks, Instrument Repairman
* L. Moody, Manager of Extrusion
T. Nelson, QA Representative
+ A. Riesen, President
T. Scaltreto, Metallographer
+ J. Schlewitz, Laboratory Manager
* J. Tosdale, Manager of Process Analysis
* B. Valder, Product Sales Manager
+ * N. Vaughn, Director of Plant Engineering
+ * J. Wille, Director of Quality Control

+ Attended entrance meeting on May 13, 1991
* Attended exit meeting on May 17, 1991

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555

November 21, 1991

Docket No. 99900761

Mr. Martin Smith, President
United Controls Division of Hub, Inc.
1554 Litton Drive
Stone Mountain, Georgia 30083

Dear Mr. Smith:

SUBJECT: NOTICES OF VIOLATION AND NONCONFORMANCE (NRC INSPECTION REPORT NO. 99900761/91-01)

This letter addresses the inspection of your facility at Stone Mountain, Georgia, conducted by Messrs. Bill Rogers and Steve Alexander of this office on October 9 through 11, 1991, and the discussions of their findings with you and other members of your staff at the conclusion of the inspection. The purpose of the inspection was to determine if safety-related electrical components have been supplied by United Controls in accordance with nuclear utility specifications and United Control's quality assurance program. The U. S. Nuclear Regulatory Commission (NRC) inspectors reviewed the implementation of your 10 CFR Part 21 reporting program, including your recent 10 CFR Part 21 notification to the NRC, and your dedication of commercial grade equipment for safety-related applications.

Areas examined during the NRC inspection and our findings are discussed in the enclosed report. This inspection consisted of an examination of procedures and representative records, interviews with personnel, and observations by the inspectors. The inspection identified that certain of your activities appeared to be in violation of NRC requirements, as specified in the enclosed Notice of Violation. The violation was of concern because United Controls' procedures adopted pursuant to 10 CFR Part 21 did not contain provisions for informing customers of deviations that United Controls was not able or willing to evaluate with respect to substantial safety hazards, nor did the procedures contain provisions for notifying directors or responsible officers of defects or failures to comply.

You are required to respond to this letter and should follow the instructions specified in the enclosed Notice of Violation when preparing your response. In your response, you should document the specific actions taken and any additional actions you plan to prevent recurrence. After reviewing your response to this Notice, including your proposed corrective actions and the results of future inspections, the NRC will determine whether further NRC enforcement action is necessary to ensure compliance with NRC regulatory requirements.

In addition, the inspection found that the implementation of your QA program failed to meet certain NRC requirements. Specifically, the procedures United Controls developed for the dedication of commercial grade items did not provide sufficient assurance that commercial grade items were adequately verified to be suitable for their safety-related applications. A principal deficiency found in United Controls' commercial grade dedication program related to the lack of requirements to define and document the safety functions (and other safety-related application requirements) that commercial grade items must perform. Also, the definition of critical characteristics, i.e., that they provide reasonable assurance that the item received is the item specified, although consistent with EPRI NP-5652, did not state that critical characterisitcs are those attributes that are all necessary to be verified to demonstrate that the item will perform its safety function(s) and is otherwise suitable for its intended safety-related application, as discussed in NRC Generic Letter 91-05, "Licensee Commercial Grade Procurement and Dedication Programs."

Please provide us, within 30 days from the date of this letter, a written statement in accordance with the instructions specified in the enclosed Notice of Nonconformance. We will consider extending the response time if you can show good cause for us to do so.

The responses requested by this letter and the enclosed Notices are not subject to the clearance procedures of the Office of Management and Budget as required by the Paperwork Reduction Act of 1980, Public Law No. 96-511.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosures will be placed in the NRC Public Document Room.

If you have any questions concerning this inspection, we will be pleased to discuss them with you.

Sincerely,

Leif J. Norrholm, Chief
Vendor Inspection Branch
Division of Reactor Inspection
and Safeguards
Office of Nuclear Reactor Regulation

Enclosures:
1. Notice of Violation
2. Notice of Nonconformance
3. Inspection Report 99900761/91-01

Enclosure 1

NOTICE OF VIOLATION

UNITED CONTROLS DIVISION
Stone Mountain, Georgia

Docket No. 99900761

During a U.S. Nuclear Regulatory Commission (NRC) inspection conducted at the United Controls Division of Hub, Inc. on October 9 through 11, 1991, the NRC inspection identified the following violation of NRC requirements. In accordance with "General Statement of Policy and Procedure for NRC Enforcement Actions," 10 CFR Part 2, Appendix C (1991), the violation is listed below:

A. Section 21.21(a) of Part 21 of Title 10 of the Code of Federal Regulations (10 CFR Part 21) states, in part, that each individual, corporation, partnership, or other entity subject to the regulations in this part shall adopt appropriate procedures to (1) provide for evaluating deviations or informing the licensee or purchaser of the deviation in order that the licensee or purchaser may cause the deviation to be evaluated unless the deviation had been corrected; and (2) assure that a director or responsible officer is informed if the construction or operation of a facility, or activity, or basic component supplied for such facility or activity fails to comply with the Atomic Energy Act of 1954, as amended, or any applicable rule, regulation, order or license of the Commission relating to a substantial safety hazard, or contains a defect.

   Contrary to the above, the United Controls procedures adopted pursuant to 10 CFR Part 21 did not contain provisions for informing customers of deviations that United Controls was not able or willing to evaluate with respect to substantial safety hazards. In addition, United Controls' procedures did not contain provisions for notifying directors or responsible officers, as defined in 10 CFR Part 21, of defects or failures to comply.

This is a Severity Level V violation (Supplement VII).

Pursuant to the provisions of 10 CFR 2.201, United Controls is hereby required to submit a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C. 20555 with a copy to the Chief, Vendor Inspection Branch, Division of Reactor Inspection and Safeguards, Office of Nuclear Reactor Regulation, within 30 days of the date of the letter transmitting this Notice of Violation. This reply should be clearly marked as a "Reply to a Notice of Violation" and should include for each violation: (1) the reason for the violation, or, if contested, the basis for disputing the violation, (2) the corrective steps that have been taken and the results achieved, (3) the corrective steps that will be taken to avoid further violations, and (4) the date when full compliance will be achieved. Where good cause is shown, consideration will be given to extending the response time.

Dated at Rockville, Maryland
this 21 day of November, 1991

Enclosure 2

NOTICE OF NONCONFORMANCE

UNITED CONTROLS DIVISION
Stone Mountain, Georgia

Docket No. 99900761

During a U.S. Nuclear Regulatory Commission (NRC) inspection conducted at the United Controls Division of Hub, Inc. in Stone Mountain, Georgia, on October 9 through 11, 1991, the NRC inspection identified that certain of your activities were not conducted in accordance with NRC requirements that were contractually imposed on United Controls by purchase orders from NRC licensees. The NRC has classified these items as nonconformances to the requirements of Title 10 of the Code of Federal Regulations, Part 50 (10 CFR Part 50), Appendix B.

A. Criterion V, "Instructions, Procedures, and Drawings," of Appendix B to 10 CFR Part 50 requires that activities affecting quality be prescribed by documented instructions, procedures, or drawings, appropriate to the circumstances. In addition, Criterion III, "Design Control," and Criterion VII, "Control of Purchased Material, Equipment, and Services," of 10 CFR Part 50, Appendix B, require that for items intended for use in safety-related applications, the important design, material, and performance characteristics be identified, acceptance criteria be established, and reasonable assurance be provided that the items conform to the acceptance criteria.

   Contrary to the above, United Controls' Quality Control Procedure 3.4, "Commercial Grade Item Dedication Procedure," which described the method United Controls used for the dedication of commercial grade items for nuclear safety-related plant applications, was not appropriate to the circumstances. Specifically, the procedure did not ensure that the dedication program would provide sufficient assurance that commercial grade items dedicated for safety-related use would be adequately verified to be capable of performing their safety functions or otherwise be fully suitable for their safety-related plant applications under all design basis conditions.

Please provide a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C. 20555 with a copy to the Chief, Vendor Inspection Branch, Division of Reactor Inspection and Safeguards, Office of Nuclear Reactor Regulation, within 30 days of the date of the letter transmitting this Notice of Nonconformance. This reply should be clearly marked as a "Reply to a Notice of Nonconformance" and should include for each nonconformance: (1)

a description of steps that have been or will be taken to correct these items; (2) a description of steps that have been or will be taken to prevent recurrence; and (3) the dates your corrective actions and preventive measures were or will be completed.

Dated at Rockville, Maryland
this 21 day of [illegible], 1991

ORGANIZATION:	UNITED CONTROLS STONE MOUNTAIN, GEORGIA
REPORT NO.:	99900761/91-01
CORRESPONDENCE ADDRESS:	Mr. Martin Smith, President United Controls Division of Hub, Inc. 1554 Litton Drive Stone Mountain, Georgia 30083
NUCLEAR INDUSTRY ACTIVITIES:	Dedication and qualification of commercial grade electrical components for nuclear safety-related applications.
INSPECTION CONDUCTED:	October 9 - 11, 1991
SIGNED:	CA VanDenburgh for Bill H. Rogers, Team Leader Reactive Inspection Section No. 2 Vendor Inspection Branch (VIB) 11-19-91 Date
OTHER INSPECTORS:	Stephen Alexander, VIB
APPROVED:	CA VanDenburgh Chris A. VanDenburgh, Chief Reactive Inspection Section No. 2 Vendor Inspection Branch 11-19-91 Date
INSPECTION BASES:	10 CFR Part 21, 10 CFR Part 50.49, and 10 CFR Part 50, Appendix B
INSPECTION SCOPE:	To review the implementation of United Controls' 10 CFR Part 21 program and its dedication of commercial grade items for safety-related use under its 10 CFR Part 50, Appendix B, quality assurance program.
PLANT SITE APPLICABILITY:	Numerous.

1 INSPECTION SUMMARY

1.1 Violations

Contrary to the requirements of Section 21.21(a) of 10 CFR Part 21, United Controls' procedures did not contain provisions for informing its customers of deviations that United Controls was not able or willing to evaluate with respect to substantial safety hazards. In addition, the procedures did not contain provisions for notifying United Controls' directors or responsible officers of defects or failures to comply (Violation 91-01-01, see Section 2.3.1 of this report).

1.2 Nonconformances

Contrary to the requirements of Criterion V of 10 CFR Part 50, Appendix B, United Controls' Quality Control Procedure 3.4, which prescribed the dedication of commercial grade items, was not appropriate to the circumstances because it did not provide sufficient assurance that commercial grade items would be adequately verified to be suitable for their safety-related applications (Nonconformance 91-01-02, see Section 2.4.1.d of this report).

1.3 Open Items

The dedication package for the Asea Brown Boveri (ABB) relays that United Controls supplied to Turkey Point contained several discrepancies which tended to confirm the inadequacies of United Controls' commercial grade dedication program identified as Nonconformance 91-01-02 in Section 2.4.1.d of this inspection report. Specifically, the package listed testing as the method of verification of the relay's seismic qualification; however, the verification testing performed was on a sample without demonstrating the applicability of this testing to the lot dedicated. In addition, the relay's coil and contact current ratings were not included among the critical characteristics for acceptance. The resolution of these concerns will be reviewed during a future inspection (Open Item 91-01-03, see Section 2.4.2 of this report).

2 INSPECTION FINDINGS AND OTHER COMMENTS

2.1 Entrance and Exit Meetings

During the entrance meeting on October 9, 1991, the NRC inspectors discussed the scope of the inspection, outlined the areas of concern, and established interfaces with United Controls' management and staff. During the exit meeting on October 11, 1991, the inspectors discussed their findings and concerns with United Controls' management and staff.

2.2 Inspection Scope

United Controls is a wholly-owned division of the Energy and Process Division of Hub Incorporated. United Controls supplies safety-related electrical panels, systems, and components; performs the dedication of commercial grade equipment; and provides qualification services, in accordance with their 10 CFR Part 50, Appendix B, quality assurance program.

The NRC inspectors reviewed United Controls' 10 CFR Part 21 program and a recent 10 CFR Part 21 notification to the NRC concerning ABB relays. In addition, the inspectors reviewed the implementation of United Controls' program for the dedication of commercial grade items for safety-related use in the form of dedication packages for items United Controls sold as safety-related components to NRC licensees.

2.3 United Controls' 10 CFR Part 21 Activities

2.3.1 Program Review

United Controls' 10 CFR Part 21 program consisted of two documents, Quality Assurance Manual (QAM) 19, "10 CFR Part 21," Revision 0, dated April 3, 1991, and Quality Control Procedure (QCP) 21.1, "Reporting of Defects and Noncompliance," Revision 1, dated September 23, 1991. The NRC inspectors' review of these procedures identified several discrepancies and deficiencies which are described below.

a) QCP 21.1 required that the Quality Assurance Department post the required portions of 10 CFR Part 21. However, this requirement was inconsistent with the posting requirements of 10 CFR 21.6 which requires the posting of Section 206 of the Energy Reorganization Act of 1974, 10 CFR Part 21, and the procedures adopted pursuant to 10 CFR Part 21. As an alternative, 10 CFR 21.6 permits posting Section 206 and information giving the location where the procedures may be reviewed as well as the name of the person to whom deviations are to be reported. Despite this discrepancy the NRC inspectors verified that the actual posting met the requirements of 10 CFR 21.6.

b) QAM 19, paragraph 3.4, stated that when a sub-tier supplier would not accept the requirements of 10 CFR Part 21 on a safety-related order, United Controls would retain all 10 CFR Part 21 responsibilities. United Controls explained that "safety-related" in this context meant a "basic component" as defined in 10 CFR Part 21. Contrary to the stated United Controls policy, 10 CFR Part 21 requires that any party supplying a basic component assume the responsibilities of 10 CFR Part 21.

The NRC inspectors were concerned that this policy would allow the issuance of procurement documents for basic components which did not state that 10 CFR Part 21 applied and would violate the requirements of 10 CFR Part 21.31. Only if United Controls' purchase orders for items or services legitimately met the tests for a commercial grade item as listed in 10 CFR Part 21, Section 21.3(a)(4)(a-1), would United Controls be exempt from invoking 10 CFR Part 21 in the procurement documents for those items or services. In response to the inspectors' concerns in this area, United Controls stated that they had not issued any purchase orders in violation of 10 CFR 21.31. In addition, the NRC inspectors did not identify any indication of this problem during their review of the purchase orders which were included with commercial grade dedication packages reviewed during the inspection.

c) QAM 19 required United Controls' employees to report known defects or deficiencies to responsible management while QCP 21.1 required employees to report defects, noncompliances (not defined), and defects/nonconformances (nonconformance was not defined) to United Controls' Director of Quality. However, the procedure did not define the terms noncompliance and nonconformance. In addition, the procedures did not use or contain a definition of the term deviation; a requirement to evaluate deviations; or a requirement to inform customers of deviations that United Controls was unable or unwilling to evaluate. United Controls' definition of defect was consistent with 10 CFR Part 21 (...could create a substantial safety hazard, cause exceeding of safety limits...) such that it was not reasonable to expect United Controls' employees to evaluate deviations and notify management of defects, nor was it reasonable to provide any credit for the use of nonconformance or deficiencies since neither term was defined.

d) QCP 21.1, paragraph 6.5, required that the employee's report and United Controls' documentation of evaluations and notifications pursuant to 10 CFR Part 21 be kept on file for a minimum of three years. However, Section 21.51 of 10 CFR Part 21, "Maintenance of Records," requires that after the delivery of the basic component supplied and before destruction of any associated records relating to evaluations and NRC notifications, such records must be offered to the purchaser of the basic component. This is done so that the purchaser can either make a determination of whether such records are related to the creation of a substantial safety hazard or offer them to the organization to which it supplied the basic component. The records can be authorized for destruction only if they are determined not to be related to the creation of a substantial safety hazard.

Despite this procedural discrepancy, United Controls stated that they had made only one determination of a defect (discussed in Section 2.3.2 of this inspection report). The NRC inspectors verified that there had only been one notification and that the associated records had been acceptably maintained and dispositioned.

e) QCP 21.1, paragraph 5.1, contained a definition of a commercial grade item which omitted the second of the three tests, all of which must be met in order for an item to be considered a commercial grade item. Specifically, QCP 21.1 omitted the test of 10 CFR Part 21, Paragraph 21.3(a)(4)(a-1)(2), which required that commercial grade items be used in applications other than facilities or activities licensed pursuant to various parts of Title 10 of the Code of Federal Regulations.

f) QCP 21.1, paragraph 6.3, required that a committee evaluate each employee report of a defect and determine its reportability to the NRC in accordance with 10 CFR Part 21. The makeup of this committee was specified to consist of the Director of Quality, Engineering Manager, Purchasing Inspector (Receiving and/or Test), and the General Manager. Paragraph 6.4 of QCP 21.1 stated that should a defect/nonconformance be determined to be reportable as defined by 10 CFR Part 21, the Director of Quality shall notify the NRC and the customer within 48 hours of the determination. There was no requirement in the United Controls procedures to notify a director or responsible officer of defects or failures to comply, as defined by 10 CFR Part 21.

The inspectors reviewed the records relating to evaluation and notification pursuant to 10 CFR Part 21 discussed in Section 2.3.2 of this inspection report and found no instance in which United Controls had failed to evaluate a deviation and upon determining that it constituted a defect, failed to inform a director or responsible officer of the defect. However, on the basis of the procedural deficiencies identified above which would not assure that the required actions would be taken, the NRC inspectors concluded that United Controls' procedures did not meet the requirements of 10 CFR Part 21.21(a). These deficiencies are cited as Violation 91-01-01 in Section 1.1 of this inspection report.

2.3.2 Review of United Controls' 10 CFR Part 21 Notification on Failed ABB Relays

The NRC inspectors reviewed United Controls' actions regarding their 10 CFR Part 21 notification made on August 12, 1991. The notification concerned the failure of a safety-related relay, manufactured and marketed as a commercial grade item by Asea Brown Boveri (ABB). The relay was subsequently dedicated for safety-related use and supplied by United Controls as a basic component to Florida Power & Light Company's Turkey Point Generating Station (Units 3 and 4) for use in the emergency diesel generator bus load sequencing panels.

The failed relay, one of approximately 300 ABB relays (type RXMH2, models RK223068-EA and RK223069-EA), had failed to change state upon being energized during a preoperational test at Turkey Point. A failure analysis conducted by ABB indicated that the relay's coil had suffered a short circuit of the windings at the points at which the beginning lead of the coil was crossed by the subsequent windings of each layer of wire as they were wound onto the coil spool.

The beginning lead and the subsequent windings were to be separated by a piece of clear plastic adhesive tape placed over the beginning lead to hold it in a channel in the coil spool end flange. The separation tape would then hold the beginning lead in place and prevent abrasion from the subsequent windings during the winding process. However, an ABB examination of the failed coil determined that at some point during the winding process, the tape had been pulled back and dislocated away from the beginning lead it was supposed to hold in the end flange channel of the coil spool. Some of the beginning lead's varnish insulation was then apparently abraded during the winding process, allowing insulation breakdown which resulted in the relay's failure.

ABB had performed an inspection of some of the remaining relays, none of which had yet failed, to determine if the separation tape was adequately placed. For the purpose of these examinations, ABB established an acceptance criterion that the separation tape must cover the beginning lead with an overlap margin of 1.0 millimeter (mm) or greater. Although none of the relays had damaged or dislocated separation tape, ABB found that virtually all of them had less than 1.0 mm of margin.

United Controls and ABB determined that the problem had generic implications, but that the scope was limited to relays with the particular coil design in question (ie., type RMXH2, Models RK223068-EA and RK223069-EA manufactured from March 1989, through September 1990, bounded by date codes 8909 through 9036). ABB had identified that the root cause of the problem was due to the performance of one particular factory employee who had manufactured relays within the date codes cited above.

ABB made a design change to reposition the separation tape on the coil spool end flange to more evenly cover the beginning lead and avoid conditions conducive to dislocation of the separation tape during the winding process. An ABB representative, who was present at United Controls during this portion of the NRC inspection in order to participate in the discussion of this issue, stated that ABB was taking action to ensure that all pertinent drawings and procedures were updated and correct, and that all affected employees received training on the changes. At the time of the NRC inspection, United Controls was in the process of informing their affected customers of the defect. In addition, the ABB representative reported that ABB had informed all the ABB Power Transmission and Dictribution field sales offices of the defect in August 1991 via an ABB Product Reliability Letter.

On the basis of the review of pertinent records, interviews with cognizant United Controls personnel (as well as the ABB representative), examination of samples of the affected type of relays, and observation of functional testing on the relays with less than 1.0 mm tape margin, the NRC inspectors concluded that the actions of United Controls and ABB with regard to this issue were appropriate.

2.3.3 Deficiencies in United Controls' Testing Methods

The NRC inspectors reviewed a draft of the United Controls 10 CFR Part 21 followup report to the NRC entitled "Investigation Results of Potential Generic Defect of ABB Type RXMH2 Model RK223068-EA and RK223069-EA Relays," dated September 11, 1991. This report described the testing program United Controls conducted to investigate the failed ABB relay. The report stated that when 137 volts-AC (VAC) was supplied to the relay coil a 0.81 milliamps (mA) AC coil current was produced. The inspectors determined that this value of coil current was incorrect due to two separate errors in United Controls' testing methodology.

As part of the review of the followup report, the NRC inspectors observed the testing of an ABB relay (type RXMH2, Model RK223069-EA) which exhibited less than 1.0 mm of separation tape margin. The purpose of this testing was to simulate the relay's actual use and establish the relay's cycling endurance to assess the susceptibility of the relay's coil to breakdown with less than the 1.0 mm of tape margin. United Controls had just completed subjecting the relay to continual cycling with 120 percent of nominal/rated voltage applied to the coil and still had the testing apparatus in place.

During the performance of the test, the relay was cycled on for three seconds and off for two seconds while monitoring coil current with a digital multimeter. The meter's display showed 0.84 when the relay was energized, but also showed 0.41 when the relay was deenergized and observed to be mechanically in the deenergized state. Examination of the meter revealed that the range selector switch on the multimeter was set on the 10-amp scale, which was inconsistent with the test lead being plugged into the 2-amp tap. As a result, the value displayed as 0.84 was meaningless. When the meter's range selector switch was set to the position corresponding to the current tap being used, the meter displayed 0.084 with the relay energized, which would be correctly read as 0.084 amps or 84 mA. This current was more consistent (within an order of magnitude) with the expected current for a coil of this size, but was still incorrect due to a second error in test setup.

The test setup included open and closed indicating lights wired in series with the relay's contacts. The NRC review determined that the open and closed indicating lights were wired such that the current value indicated when the coil was energized (84 mA) was the sum of the current through the coil and the ON indicating light. The current value indicated when the coil was deenergized (41 mA) was the current through the OFF indicating light. With the test setup changed to indicate only the current through the coil, the meter displayed accurate coil currents of 42 mA with the relay energized and 0.0 mA with the relay deenergized. This value (42 mA) was representative of the correct value of coil current in the energized state as opposed to the 0.81 mA cited in the draft followup report.

The inspectors also noted that the test setup did not provide for monitoring the coil voltage, even though the primary purpose of the test was to verify that the relay coil did not breakdown at 120 percent overvoltage. Based upon this concern United Controls verified that 137 VAC (120 percent) was being applied to the coil during the ON cycle of the test.

In addition, the NRC inspectors identified that this testing was informally performed without instructions, procedures or drawings. The inspectors concluded that the errors identified in the test methodology most likely resulted from the lack of adequate test control. The testing was not considered an activity affecting quality because it was not performed as part of the part's commercial grade dedication. However, this information was potentially related to the creation of a substantial safety hazard because the testing was conducted to obtain information that United Controls intended to provide to the NRC regarding the susceptibility to failure of the ABB relays. Accordingly, the NRC inspectors recommended that in the future United Controls implement formal controls over all testing in order to ensure that tests are valid for the information sought, that the results are accurate, and that the test results are adequately documented.

2.4 United Controls' Commercial Grade Dedication Program

2.4.1 Program Review

The NRC inspectors reviewed and evaluated the United Controls program for the procurement and dedication of commercial grade items for use in nuclear safety-related plant applications. The process was controlled by QCP 3.4, "Commercial Grade Item Dedication Procedure," Revision 1, dated April 1, 1991.

The commercial grade dedication process was documented on the Commercial Grade Dedication Specification (CGDS) which identified the critical characteristics of the item to be validated, acceptance criteria for the critical characteristics, evaluation of any changes in the item, and the general methodology for validating the defined critical characteristics. The CGDS test results were documented using the Electrical Test Inspection Report, which listed the test equipment used, room conditions, and nonconformances found for each test performed; and the Receiving Inspection Acceptance Criteria Form, which listed the critical characteristics, acceptance methods, and results, for each item tested.

United Controls attempted to purchase all items directly from the original equipment manufacturer (OEM). Simple items that the OEM would not supply were purchased from distributors, who were authorized in writing by the OEM. For more complex items available from an authorized distributor, but not available fror he OEM, United Controls used engineering judgement to make a determinaticn on the likelihood that the item could be subject to refurbishment. United Controls stated that they had refused customer orders when they were unable to purchase the items from the OEM or an authorized distributor and they believed that the item could have been subject to refurbishment.

QCP 3.4, paragraph 1.1, stated that the program was intended to meet the guidelines of Electric Power Research Institute (EPRI) report NP-5652, "Guidelines for the U:ilization of Commercial Grade Items in Nuclear Safety Related Applications (NCIG-07)," dated June 198P and to include the mechanisms to assure detection of poten y refurbished or fraudulent components listed in Generic L 89-02 (which conditionally endorsed EPRI NP-5652). The N spectors' review of this procedure identified several concer... which are listed below:

a) Although he description contained in QCP 3.4 for United Controls' Method 2 (commercial grade surveys) corresponded to Method 2 of EPRI NP-5652, this description did not fully reflect the guidance of Generic Letter 89-02 with respect to restrictions on the use of commercial grade surveys. Even though QCP 3.4 did require the documentation of a commercial grade supplier's quality controls, it did not address the verification of effective implementation. Additionally, QCP 3.4 did not address verification of the appropriate controls by the distributor and the manufacturer, when applicable.

b) QCP 3.4, "Originally Qualified Components," paragraph 6.3.1.1, stated that items from original qualification test lots were not required to be formally dedicated when traceability to the original procurement documents and qualification testing could be established. This statement implied that if an item was traceable as a member of a lot for which one item was previously qualified, that subsequent commercial grade dedication was not required. United Controls explained that the intent of this paragraph was that items which were previously dedicated or qualified in bulk (such as cable or wire) did not need to have a second commercial grade dedication or qualification performed. Only functional testing was required, regardless of the length of time between the original dedication or qualification and its use.

c) QCP 3.4, "Procurement Lot Qualification Testing," paragraph 6.3.1.2, stated that for items qualified, if one item of a homogeneous lot is successfully tested the remaining items were to be considered dedicated. The procedure failed to require the verification of additional characteristics important to the item's safety function which should be verified for each item to be dedicated. Although the use of sampling in the commercial grade dedication process can be valid, the ability to dedicate by sampling is more difficult for more complex items. Additional functional testing for each item may be needed to verify the item's ability to perform the intended safety function under required conditions. The example given in QCP 3.4, paragraph 6.3.1.2, concerning a relay was representative of an item where seismic and environmental testing of a sample combined with functional testing of the remaining lot items may not be sufficient for the adequate dedication. A characteristic such as insulation resistance, which may not be verified during a functional test but could be important to a relay's safety function under certain operating conditions, might need to be verified for every relay being dedicated.

d) QCP 3.4 did not require that critical characteristics be derived from safety functions and stated that only a subset of the critical design characteristics need be verified for acceptance which provided "...reasonable assurance that the item received was the item specified...." Therefore QCP 3.4 did not require that the specific subset of design characteristics essential to safety function or suitability for safety-related application be verified by some means. Although the procedure provided guidance that safety functions should be considered, the procedure effectively allowed a subset of critical characteristics to be selected for verification that might merely identify the commercial grade item as the one specified and not verify its suitability for safety-related service as required by 10 CFR Part 50, Appendix B.

The NRC inspectors concluded that the United Controls procedure for the dedication of commercial grade items was not appropriate to the circumstances and constituted a nonconformance with respect to Criterion V, "Instructions, Procedures, and Drawings," of 10 CFR Part 50, Appendix B. This item is cited as Nonconformance 91-01-02 in Section 1.2 of this report.

2.4.2 NRC Review of United Controls' Commercial Grade Dedication Packages

During the inspection, the NRC inspectors identified several minor concerns and questions regarding the documentation packages United Controls developed for the dedication of commercial grade items for safety-related use. All of these questions were resolved prior to the exit meeting. However, subsequent to the completion of the on-site inspection, a further NRC review of the commercial grade dedication package for the ABB relays supplied to Turkey Point (identified as CGI 1263-41/42, Revision 0, dated March 1, 1991) identified several additional concerns which tended to confirm the inadequacies of United Controls' commercial grade dedication program previously identified as Nonconformance 91-01-02 in Section 2.4.1.d of this inspection report. The following concerns were identified regarding the review of this dedication package.

a) The NRC inspectors noted that the dedication package listed seismic qualification as a critical characteristic for acceptance and testing as the method of verification. The verification testing performed was on a sample of the dedicated lot. However, United Controls had not specified how similarity between the sample and the other relays being dedicated had been established. The technical evaluation stated that it was not possible to compare contact forces of the sample that was tested and the relays being dedicated, and made no further attempt to establish similarity. However, the NRC inspectors noted that the range of dropout voltage (which also indicates mechanical freedom and can indicate contact force indirectly) was not addressed.

b) The NRC inspectors noted that the coil and contact current ratings were not included among the critical characteristics for acceptance, even though the coil current rating was included as a design critical characteristic. The technical evaluation disregarded contact current rating on the basis that there was no physical characteristic which indicated voltage and current carrying capacity of electrical contacts. This evaluation excluded several common methods used to verify the ability to adequately withstand given voltages and currents such as contact resistance, millivolt drop tests, heat rise when carrying full rated load, or an inspection of the contacts for missing or degraded buttons.

These observations were identified to United Controls during a telephone conversation subsequent to the completion of the inspection. These concerns were also discussed with the NRC Nuclear Reactor Regulation (NRR) Project Manager for the Turkey Point Generating Station. Because these concerns were identified to United Controls subsequent to the inspection, their resolution will be followed as Open Item 91-01-03 and reviewed further during a future inspection.

3 PERSONNEL CONTACTED

* + Martin Smith, President
* + Michael Charlton, Director of Quality and Technical Services
* + William Allen, Engineering Manager
* Donald Wenner, General Manager
\+ Steve McElhanon, Quality Control Manager
\+ Alan Cone, Product Engineer
\+ Debbie Butler, Quality Assurance Coordinator
\+ Marty Smith, Quality Assurance Coordinator
Jeannine Dye, Quality Control Test Inspector

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* Attended the entrance meeting of October 9, 1991
\+ Attended the exit meeting of October 11, 1991

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

DEC 1 0 1991

Docket No. 99900404

Mr. S. R. Tritch, Manager
Nuclear Safety Department
Nuclear and Advanced Technology Division
Energy Systems Business Unit
Westinghouse Electric Corporation
Post Office Box 355
Pittsburgh, Pennsylvania 15230

SUBJECT: NOTICE OF NONCONFORMANCE
(NRC INSPECTION REPORT 99900404/91-02)

Dear Mr. Tritch:

This letter addresses the October 21-25, 1991, inspection of the Process Control Division (PCD) and Nuclear Services Division (NSD) of the Westinghouse Electric Corporation's Energy Systems Business Unit in the Pittsburgh, Pennsylvania, area. The inspection was conducted by Messrs. R. C. Wilson and R. N. Moist of this office. The inspection findings were discussed at the conclusion of the inspection with the Westinghouse representatives identified in the enclosed report. The purpose of the inspection was to review PCD's program for dedicating commercial-grade items intended for safety-related applications, and to address the findings at both divisions identified in U.S. Nuclear Regulatory Commission (NRC) Inspection Report 99900404/90-01 transmitted April 17, 1991.

Areas examined during the NRC inspection and our findings are discussed in the enclosed report. This inspection consisted of an examination of procedures and records, interviews with personnel, and observations by the inspectors. The inspection identified that the implementation of your QA program failed to meet certain NRC requirements. Specifically, PCD dedicated commercial-grade components for safety-related applications without adequate procedures to control all of the quality assurance activities performed in dedicating commercial-grade items. In addition, the documentation of this dedication process was incomplete. Although this is a serious nonconformance in your program, the inspection noted that PCD was actively implementing corrective actions to develop an improved program, and PCD had actually performed the significant elements of the commercial-grade dedication process.

We were also concerned that PCD still had not implemented corrective actions for the previously identified deficiencies in its program for the dedication of commercial-grade items. In December 1990 (Inspection Report No. 99900404/90-01), we noted several significant deficiencies in PCD's program and stated that the NRC would delay inspecting this program until PCD had an opportunity to complete and implement its corrective actions. We expected that Westinghouse would have completed its corrective action by the time of this inspection.

The specific findings and references to the pertinent requirements for the above nonconformance are identified in the enclosed Notice of Nonconformance.

The response requested by the enclosed Notice is not subject to the clearance procedures of the Office of Management and Budget as required by the Paperwork Reduction Act of 1980, Public Law No. 96-511.

In accordance with 10 CFR Part 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosures will be placed in the NRC's Public Document Room.

Sincerely,

Leif J. Norrholm, Chief
Vendor Inspection Branch
Division of Reactor Inspection
and Safeguards
Office of Nuclear Reactor Regulation

Enclosures:
1. Notice of Nonconformance
2. Inspection Report 99900404/91-02

ENCLOSURE

NOTICE OF NONCONFORMANCE

WESTINGHOUSE ELECTRIC CORPORATION Docket No. 99900404/91-02
Pittsburgh, Pennsylvania

During a U.S. Nuclear Regulatory Commission (NRC) inspection conducted at the Westinghouse Electric Corporation in Pittsburgh, Pennsylvania, on October 21-25, 1991, the NRC inspection identified that certain of your activities were not conducted in accordance with NRC requirements that were contractually imposed upon Westinghouse by purchase orders from NRC licensees. The NRC has classified these items as a nonconformance to the requirements of Title 10 of the Code of Federal Regulations, Part 50 (10 CFR Part 50), Appendix B.

A. Criterion V, "Instructions, Procedures, and Drawings," of 10 CFR Part 50, Appendix B, requires that activities affecting quality be prescribed by documented instructions or procedures, appropriate to the circumstances. Section 17.1.5, "Instructions, Procedures, and Drawings," of WCAP-8370/7800, Revision 11A/7A, dated December 1988, which implements Criterion V of 10 CFR Part 50, Appendix B, requires that activities affecting the quality of basic components be accomplished in accordance with documented instructions, procedures or drawings that include appropriate quantitative and qualitative means of verifying quality. The actions required and the responsibilities for the preparation, review, approval and control of these documents are required to be established in procedures or instructions.

   Contrary to the above, PCD supplied safety-related systems and replacement parts assembled from commercial-grade items without appropriate documented instructions or procedures. PCD's procedures did not specify significant portions of the dedication process, such as identifying the component's critical characteristics and documenting their verification. In addition, PCD prepared and twice issued for use a document identified as, "COMMERCIAL GRADE ITEM (CGI) DEDICATION TP1018 DRAFT," which lacked approval signatures, a revision level, an issue date, or any other identification that would ensure that the proper revision would be used. (91-02-01)

Please provide a written statement or explanation to the U. S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C. 20555 with a copy to the Chief, Vendor Inspection Branch, Division of Reactor Inspection and Safeguards, Office of Nuclear Reactor Regulation, within 30 days of the date of the letter transmitting this Notice of Nonconformance. This reply should be clearly marked as a "Reply to a Notice of Nonconformance" and should include for each nonconformance: (1) a description of steps that have been or will be taken to correct these items; (2) a description of steps that have been or will be taken to prevent recurrence; and (3) the dates your corrective actions and preventive measures were or will be completed.

Dated at Rockville, Maryland
this 18th day of December 1991.

ORGANIZATION:	WESTINGHOUSE ELECTRIC CORPORATION PITTSBURGH, PENNSYLVANIA
REPORT NO.:	99900404/91-02
CORRESPONDENCE ADDRESS:	Mr. S. R. Tritch, Manager Nuclear Safety Department Nuclear and Advanced Technology Division Energy Systems Business Unit Westinghouse Electric Corporation Post Office Box 355 Pittsburgh, Pennsylvania 15230
ORGANIZATIONAL CONTACT:	R. P. DiPiazza, Manager, Operating Plant Licensing (412) 374-5092
NUCLEAR INDUSTRY ACTIVITY:	Nuclear steam supply systems, components, and services.
INSPECTION CONDUCTED:	October 21-25, 1991
SIGNED:	R. C. Wilson 12/5/91 Richard C. Wilson, Team Leader — Date Reactive Inspection Section No. 2 Vendor Inspection Branch (VIB)
OTHER INSPECTORS:	Randolph N. Moist, VIB
APPROVED:	Chris A. VanDenburgh 12/5/91 Chris A. VanDenburgh, Chief — Date Reactive Inspection Section No. 2 Vendor Inspection Branch
INSPECTION BASES:	10 CFR Part 21, 10 CFR 50.49, and 10 CFR Part 50, Appendix B
INSPECTION SCOPE:	To review the Process Control Division's (PCD's) quality assurance program for dedicating commercial-grade items for safety-related applications, and to address the findings from NRC Inspection Report 99900404/90-01 at the PCD and the Nuclear Services Division (NSD).
PLANT SITE APPLICABILITY:	Numerous.

1 INSPECTION SUMMARY

1.1 Nonconformances

1.1.1 Nonconformance 91-02-01 (Open)

Contrary to Section 17.1.5, "Instructions, Procedures, and Drawings," of WCAP-8370/7800, before and during the inspection, PCD did not have documented instructions or procedures to control all of the quality assurance activities performed in dedicating commercial-grade items for safety-related use, and the new procedure, TP1018 DRAFT, was not identified by approval signatures, revision level, or issue date. (see Section 3.4 of this report).

1.2 Unresolved Items

1.2.1 Unresolved Item 90-01-08 (Open)

The inspectors did not close a portion of a previous unresolved item addressing PCD's 10 CFR Part 21 compliance program because the program was not reviewed during this inspection (see Section 2.6 of this report).

1.3 Open Items

1.3.1 Open Item 91-02-02 (Open)

This new item was opened because NSD was still considering whether to conduct contact current interrupt capacity tests for molded-case circuit breakers (MCCB). This open item was previously identified as part of Nonconformance 90-01-02, which was closed during this inspection. This issue is no longer followed as a nonconformance because PCD had established that a high current interrupt capacity was not claimed as a safety function or specified in purchase documents (see Section 2.1 of this report).

1.3.2 Open Item 91-02-03 (Open)

This new item was opened because PCD had not completed responding to findings from recent audits by Westinghouse NSD and a joint utility group, and had not implemented corresponding upgrades of its QA program (see Section 3.3 of this report).

1.3.3 Open Item 91-02-04 (Open)

This new item was opened because PCD was not adequately verifying commercial-grade item's critical characteristics by means of commercial-grade vendor surveys because the surveys were not specific to the characteristics being verified and the surveys were infrequently performed (see Section 3.5 of this report).

2 STATUS OF PREVIOUS INSPECTION FINDINGS

NRC Inspection Report 99900404/90-01-01 identified ten findings for three divisions of the Energy Systems Business Unit. These findings were addressed in Westinghouse responses dated May 15 and 16, 1991, and in an NRC letter dated August 22, 1991. The present inspection addressed eight of the findings; the other two apply to the Nuclear and Advanced Technology Division and were not covered in this inspection.

2.1 Nonconformance 90-01-02, NSD (Closed; new Open Item 91-02-02 initiated)

Nonconformance 90-01-02 stated that, contrary to Westinghouse procedures implementing Criterion V, "Instructions, Procedures, and Drawings," of 10 CFR Part 50, Appendix B, NSD dedication instructions for molded-case circuit breakers (MCCBs) did not specify four types of tests that must be performed to dedicate commercial-grade MCCBs for safety-related use. NSD has resolved every instance except one by adding requirements in the new Commercial Dedication Instruction (CDI) CEB0001, Revision 00, June 21, 1991.

With respect to contact current interrupt capacity (a very high current destructive test), NSD had agreed during the 1990 NRC inspection to witness the commercial-grade manufacturer's performance of this test, and in the May 15, 1991, letter indicated instead that NSD would perform the test. During the present inspection, NSD advised that they are studying the need to regard interrupt capacity as a critical characteristic for MCCBs. The manufacturer will continue to perform the test as a condition for UL listing. CDI CEB0001 clearly indicates that high-current interrupt capability is not a safety function addressed by the dedication process, and a survey of recent customer purchase orders showed no such requirement; thus, the inspectors agreed that this matter needed further evaluation. Based on these actions the inspectors closed Nonconformance 90-01-02 except for contact current interrupt capability testing, which is now designated as Open Item 91-02-01.

2.2 Nonconformance 90-01-03, NSD (Closed)

Nonconformance 90-01-03 stated that, contrary to Westinghouse procedures implementing Criterion VIII, "Identification and Control of Materials, Parts, and Components," of 10 CFR Part 50, Appendix B, available documentation did not adequately verify traceability to the manufacturer for MCCBs supplied under two purchase orders. During the present inspection, the NRC inspectors reviewed documents establishing traceability of the subject MCCBs to either the Beaver manufacturing plant or the Spartanburg warehouse of Westinghouse. The inspectors concluded that these actions were sufficient to establish traceability of the MCCBs, and that Nonconformance 90-01-03 was closed.

2.3 Nonconformance 90-01-04, NSD (Closed)

Nonconformance 90-01-04 stated that, contrary to Westinghouse procedures implementing Criterion VI, "Document Control," of 10 CFR Part 50, Appendix B, NSD issued a letter dated October 17, 1990, which changed the dedication requirements for MCCBs without proper approvals. The inspectors verified that NSD issued a corrected, properly approved letter on January 11, 1991; furthermore, NSD issued instructions to the affected engineering personnel on May 6, 1991, emphasizing the appropriate procedural requirements. Based on these actions the inspectors closed Nonconformance 90-01-04.

2.4 Nonconformance 90-01-07, PCD (Closed)

Nonconformance 90-01-07 stated that, contrary to Westinghouse procedures implementing Criterion V, "Instructions, Procedures, and Drawings," of 10 CFR Part 50, Appendix B, Westinghouse in two instances failed to document inspection operations during the manufacture of printed circuit assemblies as required by procedures. The inspectors verified PCD's corrective actions by reviewing records relating to training conducted in the correct use of shop travelers and the purging of PCD's stockroom to review shop travelers. The shop traveler has been replaced with a process line tag to document inspection operations. The inspectors verified proper use of the process line tags in the cabinet assembly inspection areas. Based on these observations the inspectors closed Nonconformance 90-01-07.

2.5 Unresolved Item 90-01-05, NSD (Closed)

Unresolved Item 90-01-05 addressed the NRC's concern that NSD did not adequately document the technical basis for dedicating commercial-grade items for safety-related use. During the present inspection the NRC inspector discussed NSD's actions regarding this concern with management and engineering personnel and reviewed several relevant documents. NSD issued the proprietary Topical Report WCAP-12885, "WESTINGHOUSE NUCLEAR SERVICES DIVISION COMMERCIAL DEDICATION PROGRAM," Revision 0, dated March 28, 1991, to provide a detailed description of NSD's dedication process. The NRC inspector also reviewed the new Commercial Dedication Instruction (CDI) for MCCBs, which replaced the old Engineering Control Instruction (ECI), and several other CDIs.

The new documents provide significantly better documentation of the dedication process than did the ECI-based system. The CDI provides specific definition of the commercial-grade item's safety functions, and relates critical characteristics and their verification methods to the safety functions. Section 2.1 of this report gives an example of how the improved definition of safety function clarifies the applications covered by Westinghouse's MCCB dedication. Although the NRC's review of the new documentation was relatively brief, it provides sufficient basis for the inspectors to close Unresolved Item 90-01-05.

2.6 Unresolved Item 90-01-08, NSD (Closed) and PCD (Open)

Unresolved Item 90-01-08 involved NRC concerns regarding the manner in which NSD and PCD imposed the requirements of 10 CFR Part 21 on their suppliers. The concern at NSD involved a 1985 purchase order (PO) to Velan Valve Corporation for replacement parts. Although the PO invoked the requirements of 10 CFR Part 50, Appendix B, Velan took exception to NSD's attempted imposition of 10 CFR Part 21, and NSD amended the PO to state that "10 CFR Part 21 is applicable to Design only." As stated in Westinghouse's letter of May 15, 1991, Velan now agrees to accept the imposition of 10 CFR Part 21 in NSD POs. When the inspector asked about replacement part POs placed prior to this agreement, NSD personnel pointed out that the replacement parts are for valve types that Velan supplied to Westinghouse under 10 CFR Part 21, and Velan would retain reporting responsibility from the original valve POs. Based on these observations, the inspectors closed the NSD portion of Unresolved Item 90-01-08.

The similar concern at PCD involved whether PCD properly imposed the requirements of 10 CFR Part 21 for printed circuit boards. The inspectors performed a detailed evaluation of the manner in which PCD procured commercial-grade printed circuit boards and subsequently dedicated them, and concluded that PCD had imposed proper requirements on vendors. Since the inspectors did not review PCD's program for implementing 10 CFR Part 21, the PCD portion of Unresolved Item 90-01-08 remains open.

2.7 Open Item 90-01-01, NSD (Closed)

Open Item 90-01-01 stated that the NRC inspection did not address the manner in which Westinghouse maintained MCCB traceability to the manufacturer. Based on the detailed investigation of traceability reported in NRC Inspection Report 99900404/91-01 dated April 10, 1991, the inspectors closed Open Item 90-01-01.

2.8 Open Item 90-01-06, NSD (Partially closed)

Open Item 90-01-06 addressed Westinghouse's commitment to provide customers with information concerning two types of components: Copes-Vulcan valve bonnet nuts and Potter & Brumfield relay contact ratings. Although the NRC inspection report assigned this item to NSD, the Nuclear and Advanced Technology Division (NATD) assumed the responsibility to inform Westinghouse's customers. NATD issued a letter on January 7, 1991, addressing the Copes-Vulcan valves. However, the Potter & Brumfield letter was in NATD's approval chain at the time of the inspection and was not yet issued. Based on these observations, the inspectors closed the Copes-Vulcan portion of Open Item 90-01-06, but the Potter & Brumfield portion remains open.

3 INSPECTION FINDINGS AND OTHER COMMENTS

3.1 Entrance and Exit Meetings

In the entrance meeting on October 21, 1991, the NRC inspectors discussed the scope of the inspection, outlined areas of concern, and established interfaces with PCD's management and staff. In the exit meeting on October 25, 1991, the inspectors discussed their findings and concerns with PCD's management and staff. Brief entrance and exit meetings at NSD on October 22, 1991, addressed the resolution of previous concerns at NSD.

3.2 Inspection Scope

PCD manufactures analog and digital instrumentation and control (I&C) systems for safety- and nonsafety-related applications. NSD provides replacement parts for safety-related systems. This inspection reviewed PCD's programs for quality assurance and for dedicating commercial-grade items for safety-related applications, and addressed the findings from previous NRC inspections at both divisions.

3.3 PCD's Quality Assurance Program

In 1989, Westinghouse began supplying nuclear safety-related I&C systems from PCD (which previously supplied only non-nuclear systems) and the Instrumentation Technology Training Center (ITTC) engineering group of the Nuclear Advanced Technology Division (NATD) merged into PCD. PCD combined the two quality assurance (QA) programs into WCAP 12710/TP199, "PCD Quality Assurance Program," Revision 0, dated January 1, 1990. ITTC designed, assembled, and qualified the generic Eagle 21 reactor protection system in 1987. ITTC also produced the Eagle 21 system for the Watts Bar nuclear plant and shipped it in October 1988. Although ITTC performed some design and assembly for the Sequoyah nuclear power plant's Eagle 21 system before moving to PCD in September 1989, PCD completed Sequoyah's system in April 1990. WCAP 12710/TP199, Revision 5, dated June 30, 1991, governs PCD's present QA program. Lower tier department and division technical publications supplement the WCAP.

The NRC inspectors reviewed PCD's corrective actions for the findings of two Westinghouse Energy Systems Business Unit (ESBU) audits of PCD conducted on May 8-11, 1990, and August 5-9, 1991. ESBU closed the first audit on January 10, 1991. The second audit remains open pending PCD's completion of corrective action implementation, scheduled for January 20, 1992. The open findings of the audit included the following: control of purchased material (updating the Approved Qualified Suppliers list); design control (procedures and training to improve the drawing change control process); control of measuring and test equipment (procedures and training to emphasize the importance of timely response to calibration discrepancy repo s); and document control (dates in department manuals have conflicted with the effective or approval dates in the table of contents or approved pages of the manuals). The NRC inspectors concluded that PCD's corrective actions were generally timely and adequate and that the audit findings still open raised no significant technical concerns.

In addition, the NRC inspectors reviewed PCD's corrective actions for the findings of two Nuclear Utilities Procurement Issues Council (NUPIC) audits conducted on May 21-25, 1990, and January 28 through February 1, 1991. A letter from the NUPIC lead auditor to PCD, dated June 25, 1991, accepted PCD's corrective actions for both audits, pending verification during a NUPIC audit planned for February 1992. The NRC inspectors concluded that PCD's corrective actions in response to these external audits appeared to be generally timely and adequate.

The NRC inspectors verified that PCD had revised division and departmental procedures to clarify anomalies brought out in the ESBU and NUPIC audits. The inspectors also verified that PCD had conducted periodic training sessions for systems engineering personnel to address the design control concerns that were frequently raised in the audits.

The NRC inspectors verified implementation of PCD's current QA program by reviewing the implementation of selected criteria from 10 CFR Part 50, Appendix B, including design control, procedures, document control, control of purchased services, identification of parts, test control, inspection and test status, QA records and audits. The inspectors addressed a hardware sample including a printed circuit board built by a supplier, a printed circuit board built by PCD, a cable assembly, a rack for the Zion nuclear power plant's Eagle 21 system, and instruments used for testing printed circuit boards and Zion Eagle 21 system cabinets.

The inspectors concluded that the QA program complied with the current PCD procedures. However, since the upgraded QA program will not be completed until January 20, 1992, a future NRC inspection will review PCD's implementation of the corrective actions concerning the second ESBU audit and the commercial-grade dedication program. Completion of upgrading PCD's QA program to incorporate audit responses will be followed as Open Item 91-02-03.

3.4 PCD's Commercial-Grade Dedication Activities

The NRC inspector performed a detailed review of the manner in which PCD dedicated two commercial-grade Eagle 21 printed circuit board types: a loop calculation processor board procured from Intel Corporation and slightly modified by PCD, and an analog input board assembled by PCD. The processor board was dedicated, primarily by extensive testing, before being placed in the storeroom because it was a generic board. The input board was not dedicated until factory acceptance testing of the system in which it was installed, because the board configuration depended upon the system rack slot in which it was installed. The inspector noted that although the processor board was purchased without software, PCD's dedication testing used special test programmable read only memories (proms). Type qualification of the hardware-software interface was covered during type testing of the generic system and factory acceptance testing of the delivered system. Drawing controls, inspections, and other activities associated with dedication appeared to be adequate.

PCD was dedicating the boards for safety-related service in accordance with the division procedures in effect at the time of the inspection pending full implementation of a new section-level procedure, "COMMERCIAL GRADE ITEM (CGI) DEDICATION, TP1018 DRAFT." (As noted below, the new procedure was recently issued for use by nuclear projects personnel; however, no dedications had been performed in accordance with it, and the inspectors did not review it except to discuss a related flow chart.) In particular, design control was accomplished by the development engineering orders (DEOs) and DEO notices of TP124, "Development Procedures Design Control Manual," March 1990. PCD appeared to be satisfactorily performing all the significant elements of dedication, and the inspectors found no major omissions in the activities actually performed. However, the controlling procedures were incomplete and the documentation did not provide continuity from the requirements to the test and inspection records.

The NRC inspectors were concerned because the PCD procedures did not require a specific definition of the dedicated component's critical characteristics. The test procedure for boards dedicated by generic testing appeared to list the applicable design criteria, but they could not be traced back to their source in the PO or generic system documentation. Documentation was provided by DEOs, DEO Notices, engineering permanent record books, and project auditable link documents for boards whose dedication was application-dependent; however, the references to pertinent qualification topical reports were absent. An additional disconnect for the Sequoyah project was the failure of the system configuration drawing to reference the test specifications contained on A-size drawings.

Criterion V of 10 CFR Part 50, Appendix B, requires that activities affecting quality shall be prescribed by documented instructions or procedures. PCD's failure to specify or implement the definition of critical characteristics, or the traceability of design requirements and qualification documentation, is the first example of Nonconformance 91-02-01.

PCD issued dedication procedure TP1018 in draft form because the procedure was new. PCD planned to fully implement the procedure by December 31, 1991, and held biweekly meetings and training sessions in the interim. The NRC inspectors observed that TP1018 did not contain approval signatures, a revision level, or an issue date. Different versions were issued on August 2, 1991, and October 18, 1991, for use by nuclear projects personnel.

Criterion V of 10 CFR Part 50, Appendix B, requires that activities affecting quality shall be prescribed by documented instructions or procedures. PCD's issue and use of an uncontrolled document is the second example of Nonconformance 91-02-01.

3.5 PCD's Commercial-Grade Supplier Audits

The inspectors noted that PCD's commercial-grade audit surveys of Intel Corporation, a major supplier of printed circuit boards, did not specifically address the critical characteristics to be verified by the surveys. This practice was contrary to the guidance of EPRI NP-5652, "Guideline for the Utilization of Commercial Grade Items in Nuclear Safety Related Applications (NCIG-07)," June 1988, to which the nuclear utilities are committed. This guideline states that the criteria for commercial-grade surveys of suppliers should depend on the number and type of critical characteristics of the items being purchased.

PCD personnel stated that they performed triennial surveys of commercial-grade suppliers, supplemented by annual telephonic performance evaluations. Triennial surveys are acceptable for suppliers with QA programs meeting all of the criteria of 10 CFR Part 50, Appendix B; however, suppliers with less comprehensive commercial-grade QA programs may require more frequent surveys. This frequency depends on such factors as the nature of the items being procured and their critical characteristics, as well as the scope of the supplier's QA program and of the survey.

Thus, PCD's audit content and frequency would both be unacceptable if they were solely relied upon for commercial-grade dedication or to verify critical characteristics. However, as noted above, the NRC inspectors concluded that the PCD dedication activities described in section 3.4 above were acceptable with only minimal reliance on surveys of Intel, pending the completion of the ongoing program upgrades. PCD's revision of the procedures for commercial-grade vendor surveys will be followed as Open Item 91-02-04.

4 PERSONNEL CONTACTED

Westinghouse Process Control Division (PCD):

N. Valentin, Total Quality Manager
* + P. T. McManus, Manager, Quality Assurance
\+ A. E. Pauley, Manager, Customer Systems and Projects
* + A. P. Sahasrabudhe, Manager, Nuclear Projects
* + W. L. Miller, Manager, Nuclear Process Control Systems
\+ R. L. Loving, Operations Manager
\+ R. A. Judd, Manufacturing Manager
* + C. G. Morris, Manager, Nuclear Instrumentation Systems
\+ J. C. McCann, Manager, Test Engineering
\+ J. Yurechko, Manager, Just in Time Process Engineering
T. S. Houser, Manager, WISCO Manufacturing
\+ J. J. Evans, Manager, Quality Assurance, NSD
\+ R. W. Riling, Manager, RCS Control Products Engrg., NSD
* J. E. Gourley, Engineer, Quality Assurance, NSD
J. Mears, Quality Assurance, NSD
\+ P. J. Morris, Manager, I&C Systems Licensing, NATD
* + R. B. Miller, Fellow Engineer, NATD
* + R. Stein, Senior Test Engineer
* + J. A. Davis, Senior Engineer, Just in Time Process Engrg.
* + M. J. Laubham, Senior Engineer, Quality Assurance
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\+ S. J. Martin, Senior Inspector, Quality Assurance
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B. Meyers, Just in Time Process Engineering
E. Caldwell, Test Technician
R. Glasser, Test Technician
S. Morson, Cable Inspector, Quality Assurance

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* Attended the entrance meeting on October 21, 1991
\+ Attended the exit meeting on October 25, 1991

Westinghouse Nuclear Services Division (NSD):

+ G. Dillon, Manager, Replacement Component Services
* + D. E. Rygg, Manager, RCS Engineering
* + R. W. Riling, Manager, RCS Control Products Engineering
* J. J. Evans, Manager, NSD Quality Assurance
* + M. A. Kavchak, Manager, Nuclear Products Quality Assurance
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* B. F. Barnett, Principal Engineer, Nuclear Products QA
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* Attended the entrance meeting on October 22, 1991
+ Attended the exit meeting on October 22, 1991

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

December 27, 1991

Docket No. 50-482

Mr. Bart D. Withers
President and Chief Executive Officer
Wolf Creek Nuclear Operating Corporation
Post Office Box 411
Burlington, Kansas 66839

Dear Mr. Withers:

SUBJECT: ASSESSMENT OF THE PROCUREMENT AND COMMERCIAL-GRADE DEDICATION PROGRAMS AT THE WOLF CREEK GENERATING STATION, REPORT NO. 50-482/91-201

This letter transmits the report of the assessment conducted June 17 through June 21, 1991, at Wolf Creek Nuclear Operating Corporation's (WCNOC's) Wolf Creek Generating Station (WCGS), by R. L. Pettis, L. L. Campbell, and S. D. Alexander of the Nuclear Regulatory Commission's (NRC's) Vendor Inspection Branch, and L. E. Ellershaw of NRC Region IV. At the conclusion of the assessment, the assessment team discussed its findings with Mr. F. Rhodes, Vice President, Engineering and Technical Services, and the members of your staff identified in the appendix to the enclosed report.

The staff performed the assessment to review WCNOC's program for the procurement and dedication of commercial-grade items used in safety-related applications in accordance with the requirements of Appendix B to Part 50 of Title 10 of the Code of Federal Regulations (10 CFR Part 50) and to determine the extent of implementation of the Nuclear Management and Resources Council (NUMARC) initiatives in this area.

WCNOC has made a significant effort to strengthen its commercial-grade dedication program since its inception in 1988 and, at this time, the program description is generally in compliance with the requirements of Appendix B to 10 CFR Part 50 and consistent with the dedication approaches described in Electric Power Research Institute (EPRI) Report NP-5652, "Guideline for the Utilization of Commercial Grade Items in Nuclear Safety Related Applications (NCIG-07)," June 1988, as endorsed by NRC Generic Letter (GL) 89-02, "Actions To Improve the Detection of Counterfeit and Fraudulently Marketed Products," March 21, 1989, and GL 91-05, "Licensee Commercial-Grade Procurement and Dedication Programs," April 9, 1991. However, the program did not require the verification of characteristics necessary to demonstrate that the item is suitable to perform its safety function. In addition, the program description, including most of the pertinent implementing procedures, did not completely address the issues contained in GL 89-02, which specifies certain restrictions or conditions concerning the use of EPRI NP-5652 dedication methods as acceptable methods to achieve compliance with 10 CFR Part 50 Appendix B. If the program is properly modified and implemented to address these issues, it could provide adequate co `rol over the commercial-grade procurement process. Specific strengths and weaknesses are discussed in detail in the enclosed report.

WCNOC has completed its review and assessment of the second phase of the comprehensive procurement initiatives suggested in NUMARC 90-13, "Nuclear Procurement Program Improvements," October 1990. NUMARC suggested that licensees complete their reviews by July 1, 1991, and complete implementation by July 1, 1992. Progress observed in this area indicated that WCNOC should be able to meet these goals.

The assessment team identified weaknesses both in the overall procurement program and its implementation. Weaknesses identified included WCNOC's philosophy which allowed for selecting only a subset of critical characteristics for verification as opposed to requiring verification of all critical characteristics identified to provide assurance that the item would perform its intended safety function. Licensees are responsible for identifying these attributes, establishing acceptance criteria, and providing reasonable assurance of conformance to these criteria. Additionally, two commercial-grade surveys had been performed without WCNOC having procedures in-place to perform such surveys. The assessment team also noted that for the procurement packages reviewed, not all characteristics specified to be verified were adequately verified. Additionally, documentation was not available to support the basis for using vendor certifications of acceptability.

In accordance with 10 CFR 2.790(a), a copy of this letter and the enclosure will be placed in the NRC Public Document Room.

Although no response is required to this report, we expect you to consider the concerns raised herein and to take appropriate measures. Should you have any questions concerning this assessment, we will be pleased to discuss them with you. Thank you for your cooperation in this assessment process.

Sincerely,

Bruce A. Boger, Director
Division of Reactor Projects III/IV/V
Office of Nuclear Reactor Regulation

Enclosure: Assessment Report 50-482/91-201

cc: See next page

Wolf Creek Nuclear Operating Corporation
Bart D. Withers

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U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
DIVISION OF REACTOR INSPECTION AND SAFEGUARDS

Report No.: 50-482/91-201

Docket No.: 50-482

License No.: DPR-80

Licensee: Wolf Creek Nuclear Operating Corporation
Post Office Box 411
Burlington, Kansas 66839

Facility Name: Wolf Creek Generating Station

Assessment at: Burlington, Kansas

Assessment Conducted: June 17 through 21, 1991

for Uldis Potapovs 12-19-91
Robert L. Pettis, Jr., P.E., Team Leader Date
Vendor Inspection Branch (VIB)

Other Inspectors: S. Alexander, EQ and Test Engineer, VIB
L. Campbell, Reactor Engineer, VIB
L. Ellershaw, Reactor Inspector, RIV

Approved by: Leif J. Norrholm 12/20/91
Leif J. Norrholm, Chief Date
Vendor Inspector Branch
Division of Reactor Inspection
and Safeguards
Office of Nuclear Reactor Regulation

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EXECUTIVE SUMMARY

From June 17 through 21, 1991, the Nuclear Regulatory Commission's (NRC's) Vendor Inspection Branch conducted an assessment of Wolf Creek Nuclear Operating Corporation's (WCNOC's) activities related to the procurement and dedication of commercial-grade items (CGIs) used in safety-related applications at the Wolf Creek Generating Station (WCGS). The assessment team reviewed WCNOC's procurement program to assess its compliance with the quality assurance (QA) requirements of Appendix B to Part 50 of Title 10 of the Code of Federal Regulations (10 CFR Part 50) and to assess the status of WCNOC's implementation of the Nuclear Management and Resources Council (NUMARC) initiatives on procurement and commercial-grade dedication.

The NUMARC Board of Directors has approved procurement initiatives as described in NUMARC 90-13, "Nuclear Procurement Program Improvements," October 1990, which commit licensees to assess their procurement programs and take specific action to strengthen inadequate programs. The first phase of these initiatives addresses dedication of CGIs and was scheduled to be implemented by January 1, 1990. Licensees are to meet the intent of the guidance provided in Electric Power Research Institute (EPRI) NP-5652, "Guideline for the Utilization of Commercial Grade Items in Nuclear Safety Related Applications (NCIG-07)," June 1988. The NRC has conditionally endorsed this guideline in Generic Letter (GL) 89-02, "Actions To Improve the Detection of Counterfeit and Fraudulently Marketed Products," March 21, 1989. The second phase of the initiatives provides a comprehensive procurement review and addresses vendor audits, tests and/or inspections, obsolescence, information exchange, and general procurement. Licensees were to review their programs by July 1, 1991, to determine, on the basis of guidance provided in NUMARC 90-13, if improvements are needed in these areas, and are to complete the implementation of such improvements by July 1, 1992.

The NRC performed its assessment to determine the current status of the activities to improve the procurement program related to the industry initiatives discussed above and NRC requirements. The assessment focused on a review of procedures and representative records, interviews with WCNOC's staff, including senior management and WCGS site personnel, and observations. The NRC assessment team also held meetings with WCNOC's corporate and plant management to discuss relevant aspects of commercial-grade dedication and to identify areas requiring additional information. The assessment team discussed its observations with WCNOC's representatives and senior management at the exit meeting held on June 21, 1991. The assessment team's specific conclusions are summarized below.

- o WCNOC had made a significant effort to strengthen the commercial-grade dedication program and the overall program description was generally in compliance with the requirements of Appendix B to 10 CFR Part 50, and consistent with the dedication philosophy described in EPRI NP-5652. However, certain aspects of the program and its implementing procedures, did not completely address the issues contained in NRC GL 89-02 which specified certain restrictions or conditions in using EPRI NP-5652 dedication methods, nor did they provide for alternate measures to comply with 10 CFR Part 50 Appendix B. Specifically, WCGS procedures did not address all the GL 89-02 restrictions in using EPRI Method 4. If modified and implemented to address these concerns, and others noted below, the existing program could provide adequate controls over the commercial-grade procurement process.

- WCNOC's program procedures allowed selecting a subset of the critical characteristics to verify that the item received is the item specified, as opposed to requiring verification of all critical characteristics necessary to ensure that the item performs its safety function. While this position may appear consistent with the EPRI NP-5652 definition of critical characteristics, the NRC staff's interpretation of "item specified" encompasses those attributes necessary for the performance of the item's safety functions. Licensees are responsible for identifying these attributes, establishing acceptance criteria and providing reasonable assurance of conformance to these criteria.

- WCNOC's program procedures did not provide for establishing documented verifiable traceability of CGIs to their original equipment manufacturer (OEM) as addressed in Criterion VIII of 10 CFR Part 50 Appendix B and NRC GL 89-02. The types of OEM information of concern includes: qualification type testing; production sample destructive testing; and information on the history of changes to the design, the material, and the manufacturing process. This is of particular significance because the WCGS often verified critical characteristics against information, including certificates of conformance, supplied by the vendor.

- WCNOC Procedures SMQP 10.2 and KGP-1251 provided controls for the detection of misrepresented products as identified in NRC Information Notice 89-70, "Possible Indications of Misrepresented Vendor Products," October 11, 1989 and GL 89-02. However, SMQP 10.2 also allowed the use of statistical sampling which negated the ability to effectively screen for fraudulent material.

- WCNOC Procedure SMQP 7.1, Revision 1, did not require that third-party audits be reviewed for their impact on warehouse or installed items and compliance to any WCNOC unique or special requirements invoked on the supplier by the purchase order.

- WCNOC's program provided comprehensive and structured training of personnel performing quality-related activities, however, no specific requirements for training in the area of procurement and dedication activities were identified to the assessment team. Required formal training may be helpful to achieve effective implementation of this program.

- Despite WCNOC's performance of two surveys, procedures did not exist to describe the commercial-grade survey process. Additionally, the NRC GL 89-02 restrictions concerning surveying both the manufacturer and distributor, when using EPRI Method 2, were not employed.

- Procedurally, no engineering guidance was available to identify when sampling should be performed. As a result, the decision whether or not to utilize sampling is left to the discretion of the receipt inspector.

- WCNOC Procedure KPN-D-303, and several others, did not provide guidance for the preparation or use of generic parts classification packages.

- Engineering disposition No. 890253 classified certain gaskets as nonsafety-related and limited the contaminants to less than 200 parts per million, which would be verified by sampling. However, the documentation reviewed by the assessment team identified that sampling had not been performed. The NRC assessment team also questioned the nonsafety-related classification of the gaskets.

o WCNOC's self-initiated review into the procurement practices used during the 1983-1989 period was viewed by the assessment team as a major strength aimed at improving the commercial-grade dedication program.

o The use of the supplemental parts level Q-list and WCNOC's plans to develop a Spare Parts Configuration Management data base was considered a strength by the assessment team.

1 INTRODUCTION

The NRC's Vendor Inspection Branch assessed Wolf Creek Nuclear Operating Company's (WCNOC's) efforts to improve programs for procuring and dedicating commercial-grade items (CGIs) used in safety-related applications at the Wolf Creek Generating Station (WCGS). The program was reviewed to assess its compliance with Appendix B to 10 CFR Part 50 and to assess the status of implementation of the Nuclear Management and Resources Council (NUMARC) procurement initiatives. The assessment was performed between June 17 and 21, 1991 at the WCGS site located at Burlington, Kansas. The assessment methodology included observations, discussions with licensee managers and corporate and site personnel, and a review of records and procedures associated with the licensee's procurement and commercial-grade dedication program.

The NRC staff has completed its assessments at selected licensees' facilities to review their implementation of improved programs for the dedication of CGIs and to assess the improvements made in the areas covered by the NUMARC comprehensive procurement initiative program. This initiative, approved on June 28, 1990, by the NUMARC Board of Directors, directed licensees to meet the guidance provided in Electric Power Research Institute (EPRI) NP-5652 and to review and strengthen their procurement programs in accordance with specific guidance provided in NUMARC 90-13, "Nuclear Procurement Program Improvements," October 1990.

The specific areas reviewed and the team's observations are described in Sections 2 through 4 of this report. The conclusions, strengths, and weaknesses are summarized in Section 5, and Section 6 describes the exit meeting. Persons contacted during the assessment are listed in the appendix.

2 COMMERCIAL-GRADE DEDICATION PROGRAM REVIEW

The assessment team reviewed WCNOC's programs and related commitments associated with the implementation of the NUMARC initiatives, including the program for procurement and dedication of CGIs used in safety-related applications at the WCGS. "Dedication" is generally understood to mean the process by which an item, not manufactured and supplied under an approved 10 CFR Part 50 Appendix B quality assurance (QA) program, is verified to be suitable for use in a nuclear safety-related application. Because a commercial-grade dedication program consists of activities affecting quality, it must be conducted under a 10 CFR Part 50 Appendix B QA program. Therefore, WCNOC's commercial-grade dedication programs were assessed against this critiera.

2.1 Procurement Process and Procedures

The WCNOC program for the procurement and dedication of CGIs was described and prescribed in a heirarchy of procedural documentation beginning at the WCNOC corporate level with general procedures (denoted KGPs) contained in the Wolf Creek General Procedures Manual. More detailed guidance was provided in the Nuclear Plant Engineering (NPE) procedures (denoted KPNs) contained in the NPE Procedures Manual, with additional guidance contained in the Supplier/Material

Quality Procedures (SMQPs). The overall procurement process was governed by a general procedure, KGP-1250, "Requisition and Procurement Process," which covered the purchase of items for safety-related service, from suppliers with approved 10 CFR Part 50 Appendix B QA programs, and from commercial-grade suppliers. General guidance on commercial-grade dedication was provided in KGP-1251, "Dedication of Commercial Grade Items."

In the NPE procedures, D-series KPNs covered pertinent engineering topics including safety classification (KPN-F-303), the Industry Technical Information Program (KPN-D-308), 10 CFR Part 21 (KPN-D-315), and environmental qualification and fire protection (KPN-D-319, -320, and -316). F-series KPNs covered procurement and dedication topics including KPN-F-302, -306, and -307 on technical evaluation of suppliers, bids, and supplier documents; KPN-F-309, [illegible]d -311 on requisitions and procurement; and KPN-F-319 on CGI [illegible]ion.

To begin the assessment of the overall procurement process, the team reviewed the currently effective revision of KGP-1250, Revision 5, released November 1990, with Procedure Change Notices (PCNs) 1, 2, and 3. It was noted that KGP-1250, in its reference section, did not list 10 CFR Part 21, 10 CFR Part 50 Appendix B, 10 CFR 50.49, regulatory guides and standards, pertinent NRC generic letters (GLs) or relevant EPRI documents. However, a strength was noted in that the procedure did reference KGP-1251 for procurement of CGIs, Westinghouse Nuclear Services Division (WNSD) Procedure OPR 405-5 for procurement of safety-related replacement parts from the Replacement Component Services Operation of WNSD, and General Electric Nuclear Energy (GENE) Procedure NEDO 11209-04A (GENE QA program description) for procurement of safety-related replacement parts. Additional strength was gained from the use of detailed material requisitions (MRs) and the requirement to document the suitability of bulk items if used in applications other than those pre-approved in the procurement documents or the WCNOC Material Manual.

The required elements of the item description for MRs (Paragraph 7.3.2.1.t) were quite comprehensive except that the commercial-grade dedication specifications and evaluations were not listed and the procedural interface was not enhanced by a specific requirement under Paragraph 7.3.2.1.y, "Special Instructions/Remarks," to list applicable receipt inspection plan (RIP) numbers. This section did call for inclusion of any requests for supplier submittals, but Section 7.5, covering review and approval of supplier submittals, did not address verification through audit or survey.

Section 7.6 on shop inspections did not address or reference other procedures that cover commercial-grade surveys, source verifications, or surveillances. Also, the use of the terms safety-related and special scope instead of defined procurement levels was somewhat ambiguous, such as in Paragraph 7.7.1 in which it was not clear whether the terms were being used in the sense of the item's application or the type of procurement; hence the distinction between safety-related applications based on a safety classification analysis and safety-related procurements in which 10 CFR Part 50 Appendix B, and 10 CFR Part 21 would be applicable, was not clear. Section 7.8 on material receipt, inspection and acceptance made general reference to the procedures of the Supplier/Materials Quality Department, but the provisions did not appear to reflect the advent of the commercial-grade procurement and dedication program.

The assessment team took exception to the position stated in Paragraph 7.11.3.1 that "Procurement with licensed (construction permit and operating) nuclear utilities is based on the premise that adequate controls have been developed, effectively implemented and accepted by the regulatory authority." Paragraph 7.11.4.1.d pertaining to expedited procurements required that documentary evidence that material and equipment conform to procurement requirements shall be at the WCGS before use [of the material] and that the documents shall identify meeting specific WCNOC requirements. However, no mention was made of verification of the validity of such documents. The team noted that the definition of emergency situations (Section 7.11.5) did include (although was not limited to) consideration of the health and safety of the plant staff and the general public. One discrepancy in procedural format was noted in that contrary to the requirements of Paragraph 6.6.1.9 of Revision 5 of KGP-1140, Paragraph 10.3, identifying the disposition of Forms KGF-110 and KGF-111, did not state whether they were designated as QA, non-QA or Corporate records (ref: KCP-1162), or "not records."

The WCGS general procedure that governs dedication of CGIs KGP-1251, "Dedication of Commercial Grade Items," Revision 0, July 1990, was reviewed. The procedure referenced (Section 3.0) EPRI NP-5652, and NRC GL 89-02, as well as EPRI NP-6406 on the technical evaluation of replacement items. Generic Letter 91-05, "Licensee Commercial-Grade Procurement and Dedication Programs, April 9, 1991, was of course not referenced in this revision, but was being reviewed by WCNOC.

A fundamental tenet of the dedication philosophy at the WCGS was expressed in Section 4.0 of KGP-1251. Paragraph 4.1 defined "acceptance," consistent with the EPRI concept, as employment of methods to produce objective evidence that the item received is the item specified. The procedure defined the term critical design characterisitics (Section 4.5) as critical characteristics for design as defined in EPRI NP-6406. The NP-5652 term critical characteristics (Paragraph 4.5.1), which corresponded to the NP-6406 definition of critical characteristics for acceptance, was defined as attributes that provide reasonable assurance that the item received is the item specified. Although consistent with the EPRI NP-5652 definition of critical characteristics, the NRC staff's interpretation of "item specified" encompasses those attributes necessary for the performance of the item's safety functions. The WCNOC approach did not ensure that CGIs would be suitable for their intended safety-related applications as is required by Criteria III and VII of 10 CFR Part 50 Appendix B

Four acceptance methods consistent with EPRI NP-5652 were described in Section 6.4 and it was noted that the procedure was strengthened by the implied prohibition under Paragraph 6.4.1, "Special Tests and Inspections," against the use of unverified certificates of conformance (CoC) and certified material test reports (CMTRs). Also, the words "meets the requirements of the item specified" appeared in the general description of the acceptance methods in Paragraph 6.4. This concept was restated in a description of post-installation testing in Paragraph 6.4.1.2.

With respect to addressing the information contained in NRC GL 89-02, the description of EPRI Method 2, "Commercial-Grade Surveys," did incorporate the GL provisions regarding documented and effectively implemented commercial quality programs and the verification of controls by both distributors and manufacturers. However, the description of EPRI Method 4, "Acceptable Supplier/Item Performance History," did not address the GL 89-02 criterion for the acceptability of the data to be relied upon. Nevertheless, the establishment of the practice in the procedures described above of using CGI procurement specifications and pre-positioned RIPs was considered a significant programmatic strength.

The general procurement provisions of KGP-1250 relating to CGIs and the dedication concepts of KGP-1251 were implemented, in part, by WCGS Procurement Engineering Procedure KPN-F-319, "Commercial Grade Dedication Evaluations." The assessment team reviewed the currently effective revision, Revision 0, December 26, 1989, incorporating PCN 1, June 18, 1990. The general requirements of this procedure added considerable strength to it; in particular, those dealing with safety classification in accordance with KPN-D-303, the evaluation of deficiencies per KPN-B-304, and the design change process of KPN-D-305. The principal function of this procedure was to delineate the structure and contents of commercial-grade evaluation forms and to give more-detailed guidance on their preparation. However, the sample forms attached to the procedure were substantially unformatted, except for the blocks for the evaluation number and page. The chief concern identified with KPN-F-319 pertained to the selection and verification of critical characteristics. Some general guidance was given in Section 6.2.3 that required consideration of "design characteristics" essential to function as well as those that mitigate failure effects and define bounding conditions. Also stated was the position that critical characteristics are based on complexity, safety function, and performance of the CGI. However, the next sentence stated once again the requirement that it was only necessary to identify sufficient critical characteristics to provide reasonable assurance that the item received is the item specified.

2.2 Material Receipt, Documentation, and Procedure Control

Procedures SMQP 10.1, "Inspection Planning"; SMQP 10.2, "Receipt Inspection"; and KP-2122, "Material Services Receipt," established the requirements for planning and perfomance of receipt inspection activities, while Procedure SMQP 12.1, "Material Verification Testing," established the method of material verification testing to support the acceptability of procured items and material. In addition, these procedures, either directly or by reference, endorsed the philosophy promulgated in NRC GL 89-02 and NRC Information Notice (IN) 89-70, "Possible Indications of Misrepresented Vendor Products," October 11, 1989. Although these NRC documents did not mandate specific requirements, they did address actions to improve the detection of counterfeit and fraudulently marketed products and possible indications of misrepresented vendor products, respectively. It appeared that the licensee expended considerable effort to upgrade and enhance the implementing procedures that encompassed the commercial-grade procurement and dedication program. The process included the establishment of critical characteristics that are based on design and quality attributes. The characteristics were established through a joint effort by Equipment Engineering (EE) and Material Quality Support and are defined in the applicable commercial-grade evaluations (CGEs) and commercial-grade dedication specifications (designated CGD for commercial-grade document). RIPs were developed for CGIs and are based on the established critical characteristics. The plans specify the inspection attributes, required special testing, and the acceptance criteria. It is the responsibility of the material verification group to verify, or have verified, the characteristics of the RIP. Upon acceptance of completed verification actions, the CGI is considered dedicated and acceptable for safety-related use. The RIP is a controlled document and is considered, along with all other supporting documentation, to be a lifetime QA record. The assessment team considered the methodology to be proper and appropriate.

However, during procedure review, certain weaknesses were identified. NRC IN 89-70 discussed several methods used by certain distributors or suppliers to supply misrepresented vendor products to the nuclear industry. One of those methods dealt with mixing misrepresented products with authentic products within the same shipment. Generic Letter 89-02 addressed, among other things, product acceptance programs and the use of sampling plans. It stated that for suppliers with acceptable QA programs, as confirmed by licensee audits, sampling plans are often utilized to perform the required inspections and tests. The assessment team had been informed that the acceptance method used almost exclusively to accept CGIs was EPRI Method 1, "Special Tests and Inspections," which is one of four acceptance methods given by EPRI in NP-5652. Since WCNOC rarely used (twice) EPRI's Method 2, "Commercial Grade Survey of Supplier," it followed that sampling plans would not be used. However Paragraph 6.5 in Procedure SMQP 10.2 stated that statistical sampling may be used for CGIs in lieu of 100-percent inspection for the following types of attributes: identification and marking, documentation, physical damage, cleanliness, physical properties, dimensions, weld preparations, workmanship, presence of required lubricants and oils, and electrical insulation. Paragraph 4 defined sample inspection as being a process for examination, test, and inspection of critical characteristics of one or more homogeneous units of a product selected at random from the product lot. Therefore, the use of sampling, which is based on the assumption of a homogeneous product lot, does not lend itself to detecting misrepresented parts mixed in with authentic parts (i.e., a nonhomogeneous lot). In addition, the conditions under which sampling would be implemented were not procedurally clear.

As stated previously, the procedural methodology regarding the establishment and subsequent verification of critical characteristics was considered to be appropriate. This would be meaningful only if the characteristics identified in the CGD and CGE were correctly inserted into the RIP and verified. In an attempt to ensure implementation, the assessment team selected three receiving inspection packages and compared the applicable CGD with the RIP that had been used to accept purchased items. Each RIP correctly contained the critical characteristics identified by the CGD associated with the parts. However, it was noted that in two of the three RIPs reviewed, the items were accepted despite the inspector's failure to verify certain of the critical characteristics identified.

In the first case, a shipment of 300, 3/8-inch stainless steel cap screws was received on April 7, 1990, on Material Receiving Report (MRR) 532352. The cap screws had been ordered as commercial-grade material on purchase order (PO) 536000, April 2, 1990, and were to be dedicated for safety-related applications. The inspector performing material verification did not use the cap screw RIP which had been developed from CGD 008-S0002, and which included alloy verification as a critical characteristic. Rather, the inspector used the standard receiving inspection report, which did not contain any critical characteristics; thus, alloy verification was not performed. The receiving inspection report, April 11, 1990, addressed such things as documentation, damage, cleanliness, and dimensions, all of which were shown to be acceptable; thus, allowing the cap screws to be placed in stock and to be issued when needed. It was also noted that the inspector performed a sample inspection using 50 cap screws. WCNOC was able to show that 276 of the 300 cap screws remained in stock and a review was being performed to determine where the 24 cap screws had been used. The 276 cap screws were placed on hold and Programmatic Deficiency Report (PDR) QS 91-005 was initiated to evaluate this condition.

In the second case, three metal oxide varistors were received on MRR 536341, September 26, 1990. The varistors had been ordered as commercial-grade material on PO 538566, September 17, 1990, and were to be dedicated upon receipt. In this case, the inspector (the same individual involved with the cap screws) used RIP E-121 which had been developed from CGD 061-S0001 and which contained seven critical characteristics. Review of the RIP, which showed acceptance of the varistors on October 17, 1990, revealed that the inspector failed to verify their capacitance. It was also noted that the RIP required that the actual readings obtained during the measuring of varistor voltage and direct current (dc) standby current be recorded. The inspector, rather than recording the actual values for each of the varistors, averaged their values. WCNOC stated that the three varistors in question had not been issued and were placed on hold, and that PDR QS 91-006 would be initiated to evaluate this condition.

WCNOC has established the capability to perform certain confirmation activities (e.g., dimensional, surface finish, hardness, weight, and electrical) and to conduct metallic material verifications using an x-ray analyzer. Although not operational during this assessment, WCNOC was preparing an infra-red spectrometer for use in verifying organic materials. The spectrometer is housed in an environmentally controlled area known as the Material Confirmation and Test Station. WCNOC stated that for those verification activities for which onsite capability did not exist, the items are sent to one of the five service organizations. These organizations (Metlab Testing Services, Herguth Laboratories, Inc., Wyle Laboratories, National Spectrographic Laboratory, and Professional Service Industries) have been qualified by the WCNOC to perform various services such as chemical, physical, metallurgical and metallographic testing, nondestructive examinations, petroleum product testing, failure analysis, and safety and relief valve testing. The WCNOC Supplier Information List showed that these organizations were properly qualified and are maintained in an active status.

2.3 Design Control - Equivalency Evaluations

The assessment team discussed the use of not like-for-like replacement items with the Manager of NPE, and members of EE and reviewed the following WCNOC procedures for controlling design change activities supporting the commercial-grade procurement and dedication process:

- KNP-C-301, "Initiation of Modification Requests," Revision 9, with PCN No. 4, January 27, 1990
- KPN-C-307, "Plant Modification Request Revisions and Closeouts," Revision 7, July 24, 1989

- o KPN-C-311, "Preparation of Category 3 Plant Modification Requests," Revision 0, with PCN No. 3, June 20, 1990

EE assembles and reviews design documents in order to determine the technical requirements for a replacement item. If the replacement item does not meet the current design requirements, then the item is not a like-for-like replacement. For these cases, NPE prepares a plant modification request (PMR) to authorize the use of the replacement item. The following describe the design change process used by WCNOC EE to determine if an item is a suitable replacement. The design change evaluation process includes such elements as: defining the item's intended application(s); performing safety classification for the item, including identifying the safety function and performing a failure modes and effects analysis; determining critical design characteristics, and evaluating the replacement item against critical design characteristics to original design basis requirements in form, fit, function, functional performance, and interchangeability.

If, following the design change evaluation, the change is determined to be unacceptable, the proposed replacement item and/or design basis requirements are reassessed. If the change is acceptable, the PMR is completed in accordance with requirements that provide controls for ensuring that the requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50 are met. The PMR process also provides for environmental qualification (EQ) and seismic reviews, licensing reviews, 10 CFR 50.59 safety evaluation screening, and the preparation of changes to engineering documents such as drawings, specifications, procedures, and manuals, to maintain plant configuration control. Once completed, the PMR design package is processed through Document Control and transmitted to the implementing organization, which then generates work requests and material requisitions and/or warehouse withdrawals. Once the replacement item is satisfactorily installed, as-built drawings are prepared as required by the PMP, and Document Control issues interim design changes. At this time, Configuration Management updates the configuration data base and notifies NPE to revise appropriate engineering documents to incorporate the interim design changes.

The assessment team concluded that the design control process is adequately defined and contains the essential elements for determining the acceptability of and maintaining plant configuration for replacement items that are not like-for-like.

2.4 Parts Classification System

The assessment team reviewed WCNOC Procedure KPN-D-303, "Determination of Safety Classification," Revision 6, November 29, 1990, and discussed the methodology for parts classification with the Manager of NPE and senior EE engineers. The methodology and criteria used to determine the safety classifications of parts (subcomponents) includes the following:

- o In performing a subcomponent classification analysis, the safety classification of its parent component is determined. If the parent component has not been classified, the EE engineer classifies and documents it in accordance with the requirements of KPN-D-303.

o If the parent component is classified as safety-related, an evaluation is required to determine the subcomponent's classification. The subcomponent's role in accomplishing each of the parent component's safety-related functions is evaluated. Those subcomponents that are required for the parent component to perform any one of its safety-related function(s) are classified as safety related.

o The credible failure modes likely to occur under the subcomponent's normal and design basis accident/event conditions are defined.

o The WCGS history as well as industry data are reviewed and any identified failure of the subcomponent is evaluated for inclusion in the selection of the credible failure modes.

Controlled design documents affected by a change in the safety classification of a subcomponent, are revised as appropriate. As part of the safety classification process, the assigned engineer updates the Q-List when required. The subcomponent level Q-list is reviewed and Form KEF-D-303-7, "Q-List Change Notice - Subcomponents," is generated revising or initially identifying the classification of a part on the subcomponent Q-list. The assessment team also reviewed several safety classification analyses (SCAs) and engineering dispositions. The following weaknesses were identified in the parts classification process:

o KPN-D-303, Revision 6, did not address or provide guidance for the preparation or use of generic safety classifications. Additionally, the procedure provided no controls for internal site interfaces for special requirements specified in the SCA. For example, SCA-91-0125 classified certain packing as nonsafety-related, but addressed technical requirements for the procurement of the packing as "Packing total leachable chlorides shall be less than 200 ppm"; or "Packing shall contain a suitable corrosion inhibitor." The assessment team noted that no procedure existed to ensure that packing purchased as nonsafety-related would be tested as discussed in SCA-91-0125. Similarly, the engineering disposition for gaskets used in safety-related water and steam systems were classified as nonsafety-related with identified restrictions on leachable chlorides, fluorides, and sulfur. The assessment team determined that the gaskets had not been tested for leachable chlorides, fluorides, and sulfur in accordance with a test program that meets 10 CFR Part 50 Appendix B and may have been installed in systems where such contaminants may degrade the system integrity. The team also noted that draft Engineering Disposition 90-BB-12/0 did not address checking for leachable contaminants.

o Section 6.2.5.3 of KPN-D-303, Revision 6, required that credible failure modes be defined. However, as written, the procedure did not specifically address the fact that although a part may not be required for the parent component to perform its safety-related function, the failure of the part could prevent the parent component from performing its safety function. The Subcomponent (Part) Classification Flow Chart, Figure KPN-D-303-5, did address this consideration; however, the procedure only required that the failure modes be defined. SCA-91-0031 (for lockwire) was identified as an example where nonprescriptiveness of the text may have misled the preparer since it did not specifically address what effects the failure of the lockwire would have on the parent component performing its safety function.

o The generic SCA and engineering dispositions reviewed contained very broad statements, such as asserting that the failure of gaskets and o-rings would not affect the operation of safety-related components in the surrounding areas, and referencing the ASME Code as the partial justification for the item being classified as nonsafety-related.

The assessment team concluded that Procedure KPN-D-303, Revision 6, in general, provided the basic guidance required for performing parts classification. However, the procedure did not address generic classifications nor did it provide for internal departmental interfaces for parts classified as nonsafety-related which require safety-related activities such as testing to be performed on the item. Also, the procedure did not address the need to document, in some level of detail, the basis to support broad statements in both the normal parts classification and the generic classification process.

2.5 Commercial-Grade Supplier Selection, Qualification, and Surveys

The team reviewed the process for selection, qualification maintenance, and surveys of commercial-grade suppliers to support WCNOC's commercial-grade dedication process. The team discussed the use of commercial-grade surveys with both the Manager of Supplier/Materials Quality and the Supervisor of Supplier Quality. The team also reviewed a recent commercial-grade survey and procedure SMQP 7.1, "Supplier Evaluation," Revision 1, with PCN 1, March 18, 1991, and KGP-1251, "Dedication of Commercial-Grade Items," Revision 0, March 11, 1991, in assessing WCNOC's use of EPRI Method 2.

2.5.1 Supplier Selection

As a rule, WCNOC procures replacement items from the original equipment manufacturer (OEM) or authorized distributor whether the item is a like-for-like replacement or an equivalent substitute replacement item. Typically, if the item performs a safety-related function, an attempt is made to purchase the item from a supplier who employs a 10 CFR Part 50 Appendix B QA program and who accepts the reporting responsibility of 10 CFR Part 21. If the supplier will not accept 10 CFR Part 21 and the item to be supplied meets the definition of a CGI, WCNOC purchases the item as commercial-grade and dedicates it for safety-related use.

2.5.2 Supplier Qualification and Survey

On the basis a review of the procedures used by the WCNOC Supplier Quality Department, the assessment team determined that there were no procedures for performing commercial-grade surveys of suppliers. WCNOC did have procedures for conducting 10 CFR Part 50 Appendix B audits and the audits, in general, were performance-based and often used engineering or other technical specialists as team members. The guidance and requirements contained in KGP-1251 to address EPRI Method 2 was determined to be extremely limited. The procedure also provided no detail requirements for identifying in the CGD when Method 2 should be used to verify a critical characteristic, nor did it provide guidance in performing and documenting the commercial-grade survey. The team concluded that the lack of procedural controls in the area of performing and documenting commercial-grade surveys was a weakness in the WCNOC's procurement program. The team also identified that the WCNOC procurement program did not incorporate the GL 89-02 exception to EPRI NP-5652 that the Commercial-Grade Survey of Supplier method should not be employed as the basis for accepting items from suppliers with undocumented commercial quality programs.

EE stated that the only commercial-grade survey performed was a survey of the Richmond, California facility of Chevron U.S.A., Incorporated, on March 1, 1990. However, prior to the exit meeting, WCNOC stated that one additional survey had been performed. The Chevron survey was performed to confirm that penetration, dropping point, rust preventive tests, and color and part number (batch) for SRI-2 grease were being properly conducted and controlled. The team reviewed the survey and determined that it was not consistent with the guidance provided in EPRI NP-5652, as endorsed by GL 89-02, in the following areas:

- o The revision of the Chevron QA manual controlling the critical characteristics was not identified in the survey report, nor did the PO identify the quality program or controls required during the manufacturing and testing of the grease.
- o Neither the PO, CGD, RIP, or MR required that the Chevron test report be submitted and reviewed. The survey report indicated that the results of the test were available to the customer.
- o It was unclear as to how some of the conclusions and statements in the survey were verified and confirmed. Many statements appeared to be based on requirements from Chevron's QA manual and procedures, rather than being confirmed by direct observation, surveillance, or record review, when appropriate.
- o Review of the procurement package indicated that the grease was shipped from a distributor, Oil Distributors, Incorporated, Wichita, Kansas. There appeared to be no audit or survey performed on the distributor. This is not consistent with the philosphy stated in GL 89-02 nor the requirements of KGP-1251 that both the distributor and manufacturer be surveyed when using EPRI Method 2.

2.5.3 Use of Third Party Audits

WCNOC Supplier Quality (SQ) qualifies and maintains 10 CFR Part 50 Appendix B suppliers by conducting audits and annual evaluations and using third-party audits performed by the Nuclear Utility Procurement Issues Committee (NUPIC). Approximately two-thirds of the audits used for evaluating these suppliers are NUPIC audits. To date, SQ has not used any third party audits to support using EPRI Method 2. On the basis of a review of SMQP 7.1, "Supplier Evaluation," Revision 1, with PCN 1, March 18, 1991, and discussions with the Supervisor of SQ, the assessment team concluded that requirements were in-place for screening third-party audits; however, improvement is required in the following areas:

- o SMQP 7.1, Revision 1, did not require that WCNOC's specific commitments be reviewed and a determination made that the third-party audit satisfies these specific commitments and any unique or special requirements invoked on the supplier by the WCNOC PO.

- o The results of reviewing third-party audits are required to be evaluated and the impact that any adverse findings could have on future procurements be documented and appropriate action taken such as removal or restricting the use of the supplier. There are no programmatic requirements that require SQ or any other organization to evaluate the adverse findings for impact on the use of items in the warehouse or the operability of systems that have the items installed in them. The SQ Supervisor indicated that although not required by procedure, adverse findings are evaluated for impact on items in the warehouse or installed in systems that are operable.

2.6 Spare Parts Configuration Management Data Base

From late 1989 through early 1990, WCNOC studied numerous issues affecting procurement activities and identified possible courses of action to address the issues such as part changes by suppliers, aging of the plant, fraudulent suppliers and improved programs for detecting substandard supplier products and programs, OEMs leaving the nuclear business, and new guidance from the NRC, such as GLs 89-02 and 91-05, EPRI and NUMARC. As a result of this study, WCNOC initiated the development of the Spare Parts Configuration Management (SPCM) Data Base. Features of this data base will allow the engineer to focus on those components with higher maintenance and, therefore, higher parts usage; allow the evaluation of potential vendor part problems for likely replacement parts of components; provide more consistency in the evaluation process; centralize all past design changes, part number changes, SCAs, CGDs, and referenced documents; collect known updates of vendor parts lists or changes in design different from what is installed, and evaluate those parts from problem vendors that may require additional inspection or testing. The SPCM data base should also (1) identify those parts that are industry standard parts and (2) prepare technical, quality, and documentation requirements more consistently.

Phase I of the program, a review of approximately 1300 components, has been approved and budgeted and was scheduled to begin July 8, 1991. Phase II will evaluate an additional 1200-1400 components. Their associated products will then be integrated with performance-based audits and/or critical characteristics identified for additional receipt inspecting. The assessment team viewed the program and its intended use as a very progressive action that has the potential to strengthen and enhance the WCNOC procurement program.

2.7 Fraud Detection

As stated previously, both NRC GL 89-02 and NRC IN 89-70 addressed the detection of counterfeit and fraudulently marketed products. WCNOC evaluated and subsequently improved existing procedures in an effort to better detect the existence of fraudulent parts. All Supplier/Material Quality personnel attended group meetings and read required documents dealing with fraudulent parts in order to increase their awareness of the problem.

WCNOC's review and evaluation of IN 89-70 discussed certain specifics associated with the enhancement of the procedures. Procedure SMQP 12.1 was established to, among other reasons, provide for material verification testing to prevent the acceptance of substandard or fraudulently marketed products. The critical characteristics delineated in the CGDs and CGEs govern the attributes to be verified. One of the basic purposes of the procedure was to establish a program that would provide assurance that products can be traced to the manufacturer and are not substandard in design, counterfeit, or fraudulently marketed. The procedure addressed special receipt inspections which are to be implemented in accordance with Procedure SMQP 10.2, and the development of the RIP, which takes into account the potential for receiving fraudulent parts. Procedure SMQP 10.2 discussed certain methods to be used for the detection of fraudulent parts. One such method is comparative inspection, particularly useful if fraudulent parts are mixed with genuine parts. The typical elements to be compared are shape, color, physical appearance (surface condition), and marking. It was noted that Paragraph 6.11.1 of the procedure addressed the performance of comparative inspection of incoming parts within the received lot, or comparative inspection of a representative sample from the received lot to the same parts in stock. However, Paragraph 6.12 only required comparative inspection to be performed on incoming parts for which there are some of the same parts in stock. This was identified as a weakness by the assessment team.

2.8 Review of Procurement Packages

The assessment team reviewed several procurement and dedication packages to assess the effectiveness of the implementation of the WCNOC dedication program including documentation of technical evaluations, identification of safety functions and critical characteristics, selection of critical characterisitics for verification and the verification methods chosen, receipt inspection, test methods and practices, and training. The Procurement Engineering staff compiled the packages which consisted primarily of the CGD, the CGE, the procurement and receipt inspection documents including purchase requisition (PR), PO, supplier invoice and slip, and the completed RIP.

1. CGD 013-S0001, Revision 1, September 12, 1990, and CGE 013-E0001, Revision 1, September 17, 1990 covered molded-case circuit breakers (MCCBs) with instantaneous magnetic trips only for Class 1E Motor Control Centers (MCCs) NG001A and NG002A. The MCCBs were specified to be ITE type EF3L050W/S10EER0 manufactured by either Siemens-ITE (Siemens Energy & Automation, Incorporated, the manufacturer's parent company since 1986) or Gould-ITE (a previous parent company). Siemens-ITE MCCBs manufacturered since 1986 are 480-Vac rated and were 600-Vac rated before 1986, but it was not clear from the package that the required voltage ratings were associated with the correct manufacturer for receipt inspection purposes. The MCCBs were also to be rated for 50 amps with an adjustable instantaneous magnetic overload trip feature and the model number suffix S10EER0 indicated that they were to be fitted with 125-Vdc shunt trip attachments (STAs). SCA 91-0011 (initiated by CGD 013-S0003 for model number EF3A003 W/S10EER0 MCCBs) did not include analysis of the STAs. A review of the CGD/CGE identified the "OFF/ON operation" as a critical characteristic which was to be verified by cycling the MCCB manually six times and checking for free operation, but verification of trip-free function was not addressed. Individual pole resistance was to be verified by a millivolt drop test at one-half rated load. The average of three readings, cycling the MCCB in between, was not to exceed 70 mV and the results were to be for information only, but it was not stated how the information was to be interpreted or used. A 1-hour, rated-load, hold-in test was specified to be conducted at room temperature; however, the test

and temperature requirement are somewhat meaningless for an MCCB without a thermal trip mechanism. Instantaneous magnetic overload tripping was specified to be verified by the pulse or runup method with tripping to 80 to 120 percent of the "setting" as the acceptance criterion, but no setting was given, nor was provision made for determining the setting and documenting it. The tolerance of ± 20 percent was not consistent with the field verification guidelines referenced in the National Electrical Manufacturers Association (NEMA) standard NEMA AB-2 1984 which would be -30 percent of the low end setting and +40 percent of the high end setting for the adjustable trip range. There was no guidance given for action to be taken in the event of getting a trip immediately at the lowest test point (at or just below the lower tolerance limit) where a desired no-trip result would be expected. The test as specified was inconclusive with respect to premature tripping and the 2-to 5-second ramp time was considered excessive. It was also noted that no post-installation or preoperational testing was required.

In response to some of these concerns, the cognizant procurement engineer explained that it was understood that the test was to be conducted in accordance with WCGS Procedure MGE-EOOP-11, the standard MCCB test procedure. However, the currently effective revision, Revision 2, had different setup procedures and acceptance criteria and there was no documented guidance invoking the plant procedure, delineating which steps to perform, how and in what sequence, and what test values and acceptance criteria to use.

Verification of MCCB insulation resistance was ambiguous in that it was specified to be measured at 2500 Vdc for 1 minute. However, the CGDs and CGE referenced the plant standard MCCB test procedure (MGE EOOP-11). The WCGS staff explained that this procedure is used in conjunction with the RIPs for detailed guidance on test methods. The procedure listed a Biddle Model 21359 Megger which has a maximum output voltage of 1000 Vdc and the procedure specified 1000 Vdc for the test. Also, CGD 013-S0003, for a similar MCCB, specified 1000 Vdc.

Shunt trip voltage was to be verified at 94 Vdc or below, but it was not stated if this was as low as dc bus voltage could be expected to go when the STA is needed; nor was it specified to be tested at the high end of the expected range of plant dc control bus voltage which (e.g., during battery charges) might damage a coil with insufficient winding and/or insulation resistance, and no separate verification of adequate cutoff switch operation was specified.

The configuration and markings were to be verified by inspection per the catalog with no evidence of tampering, dimensions to be checked against values provided, but there was no reference to special fraud detection criteria such as specified for some other MCCB dedications. Rated interrupt current (interrupting capacity) was identified in the CGE as a critical design characteristic, but was not listed in the CGD. Verification that even the markings indicated an interrupt current greater than that required for the available short-circuit current of the application was not prescribed. Also, verifying the validity of the rated values, such as by reference to any Underwriters Laboratories (UL) markings or the manufacturer's UL testing program, was not addressed in the listed critical characterisitcs in the CGD or the CGE; checking for UL labels was inconsistently listed in RIPs.

The assessment team reviewed purchases of MCCBs dedicated under the CGE and CGD discussed above. WCNOC PO 539013, October 24, 1990, was issued to Consolidated Electrical Distributors, Incorporated, of Wichita, Kansas, for one of the subject MCCBs, although the shunt trip was not included. The PO called for Gould-ITE or Siemens-ITE MCCBs, 600 or 480-Vac rated, which raised two concerns: (1) the Gould versions had not been produced for several years; therefore, if they were supplied, they would have come from the distributor's old stock, and (2) it was not specified (at least for fraud screening purposes) which voltage rating corresponded with which vintage/manufacturer. The PO contained no requirements for the supplier to certify and demonstrate traceability to the OEM. Although the PO did include the requirement that the seller warrant that the MCCBs are new, unused, and unrefurbished, the file did not contain evidence that the supplier's certifications had been validated, such as by commercial-grade survey. Lastly, it was not apparent to the reviewer how seismic and environmental qualification were addressed, and the PO did not invoke the supplier's commercial quality program (at least those portions which would enable the supplier to maintain traceability to the OEM).

Dedication activities upon receipt of the MCCBs from the PO above were documented on a copy of Revision 5 of RIP E-107, October 24, 1990, and executed on December 31, 1990. Attached were receipt inspection report (RIR) 537979, along with Consolidated Electric Supply's Invoice 9444-013804, which was virtually illegible and provided no traceability information. Review of this RIP and associated documents led to several concerns. Again the correlation between voltage ratings and vintage or manufacturer was not specific. Some models are obsolete, but in checking available information, the team found this was not documented. The RIP contained a note directing that the MCCBs be serialized if there were more than one in a lot, which is excellent, although this did not appear in the governing procedures. The copy of Revision 7 of the RIP included in the file (but not used for these MCCBs) did require checking for the UL label (upon which the dedication evaluation was partially based), but did not provide adequate guidance on checking UL listing numbers against the catalog, if applicable, nor UL letter numbers against date codes. The Revision 5 copy actually used for these MCCBs did not include a UL label check. Information on date codes and quality control (QC) marks, both factory and accessory installation facility (if the shunt trips were not installed at the factory), was not captured, nor were attributes like load end rating marks, lug material and configuration, case seals, and evidence of tampering.

Other concerns were identified regarding the documented testing. The setting of the instantaneous trip was not recorded; therefore, it was not evident objectively whether the results were within specification (other than the annotation of "Accept"), which rendered the results inconclusive with respect to premature tripping. The closed-contact insulation resistance measurement was specified to be taken "between poles of opposite polarity," but it was not clear how this corresponded to the poles of a three-phase alternating current (ac) MCCB. This terminology differed from the CGE and the CGD. The shunt trip test did not require recording the actual minimum trip voltage as did MGE EOOP-11, and the actual test current that was required to be recorded (by the RIP and the MGE) was listed as only one current value and without identifying the pole. Insulation resistance of the shunt trip was not checked. In the check for markings, the manufacturer's name and voltage rating ambiguity remained. Absent from the RIP were checks for the supplier's warranty required in the PO and evidence of traceability to the OEM. RIR 537979, December 31, 1990, indicated that documentation was acceptable, yet no supplier warranty or certification was on the invoice or elsewhere in the file. Finally, the supplemental RIP, consisting of special MCCB fraud-detection attributes, RIP-E-055, specified on some other MCCB RIPs was not specified on Revision 7 of RIP-E-107, nor was it specified on the Revision 5 copy filed with the PO, MRR, and RIR, that was executed on December 31, 1990.

2. CGD 013-S0002 specified the dedication of two "Gould, ITE or Siemens" type EF3L050S11 (S11 being an obsolete suffix for an STA) MCCBs with instantaneous magnetic trips only for Class 1E service in 11 "NG" series MCCs. The CGDS and CGE were quite similar to CGD 013-S0001 discussed previously and engendered similar concerns. These MCCBs were purchased under WCNOC PO 535111, February 1, 1990, issued to Bernie Electric Supply Company of Kansas City, Kansas. This PO contained some excellent words that would enhance the screening of fraudulent material, including the following: A CoC to UL-489 and NEMA AB 1 was required. Standard clause 2.02 required service advice letters [or equivalent], invoked the cited standards, gave seller deviation requirements, part number change requirements, and marking requirements that included part number (but not serial number, or date code, or PO number). The PO also contained a warranty clause (presumed to be complied with if the PO was accepted) that stated, in part: "new and free from defects in material, design and workmanship, and shall not be altered or refurbished without written authorization from the Manufacturer and the Buyer and shall fulfill satisfactorily the performance requirements specified herein." However, no CoC was required to that effect. Page "OC01" (meaning "our [WCGS's] copy only"), was not sent to the supplier and had Clause 3.01 requiring receipt inspection in accordance with the latest revision of Procedure SMQP 10.2 and RIP E-107. With respect to specifying receiving requirements and establishing traceability to the OEM, Clause 3.02 required that the MCCBs be purchased directly from Siemens Energy & Automation, Incorporated, the OEM, to ensure traceability or the seller must provide traceability to the OEM per NRC Bulletin 88-10. However, while these requirements were commendable, they were not to be transmitted to the seller, nor was the seller required to certify to traceability. There were specific requirements in the RIP to check for these requirements, but not to collect the pertinent documents. Although traceability documents were not specifically required to be captured, the file did contain the Siemens CoC to UL-489 and NEMA AB 1 and a Siemens packing list indicating that this order of MCCBs had been apparently drop-shipped from Siemens.

The specification for the instantaneous magnetic trip test was again given as 80 to 100 percent of the setting. The copy of RIP E-107 (Revision 0), executed February 2, 1990, for the three MCCBs received was annotated to indicate that this testing was performed at the "low" setting (160 amps), but no data were taken at the high setting also (as is recommended in pertinent technical documents), nor was the actual application setting tested as an alternative. The RIP allowed the use of either the pulse or runup method, stating that the recommended time for increasing the current was 2 to 5 seconds (excessive), but it was not documented if the runup or pulse method was used; so without a no-trip result at the lower tolerance limit, a pulse test would be inconclusive with respect to premature tripping. The RIP indirectly referred to the WCGS plant test procedure for MCCBs, MGE E00P-11. Revision 2, June 13, 1989, called for setting the MCCB on low, adjusting the test set to 25 percent less than the manufacturer's curve or table value, then stated that the MCCB should trip instantaneously. However, a trip at that value would be below the RIP specification, and no guidance was given with respect to which steps or specifications to use when. Also, if a trip should occur at 25 percent less than the manufacturer's curve or table value, without a no-trip result at or below the lower tolerance limit, the test would still be inconclusive with respect to premature tripping.

RIP E-055 is a special, supplemental RIP, containing attributes for detecting fraudulent/refurbished ITE MCCBs. This practice is consistent with the intent of NRC Bulletin 88-10 and the NUMARC comprehensive procurement initiative and should materially enhance WCNOC's screening capability for fraudulent MCCBs. The reviewer noted that RIP E-055 did require examination of UL labels, but gave no guidance on checking UL listing numbers against the catalog and/or UL letter numbers against date codes, as applicable. Nevertheless, its use has not been consistently specified in basic RIPs for MCCBs. Inspection per RIP E-055 was specified (and indicated as completed) on the copies of Revision 0 of RIP E-107, February ? 1990, and executed February 7, 1990 upon receipt of MCCBs dedicat [illegible] der CGD 013-S0002, being discussed in this section; although, a copy of RIP E-055 reportedly had not been filled out to objectively document the inspection. However, the Revision 5 (October 24, 1990) copy of RIP E-107, executed December 31, 1990, upon receipt of MCCBs dedicated under CGD 013-S0001 did not specify the use of RIP E-055, nor did Revision 7, June 13, 1991. It was also noted that on the Revision 0 (February 21, 1991) copy of RIP E-128, executed April 12, 1991, upon receipt of MCCBs dedicated under CGD 013-S0003, there was a note to visually inspect for tampering, but RIP E-128 (Revision 0) did not prescribe inspection per RIP E-055.

Some other concerns were identified with the receipt inspection as documented on Revision 0 copies of RIP E-107, for MCCBs dedicated under CGD 013-S0002. The file documented the acceptability of the new Siemens model number suffix "W/S10EER0" for the shunt trip but the RIP was not annotated to this effect and simply indicated "Sat" under inspection results for verification that the MCCBs bore the superseded part [catalog] number EF3L050S11. The actual test data for the shunt trip test were not recorded objectively on the RIPs (as required by MGE E00P-11), nor were actual test currents recorded for the individual pole resistance (millivolt drop) tests as were required by the RIP as well as MGE E00P-11. Insulation resistance of the shunt trip was not checked. While the verification of traceability requirements on this RIP per Clause 3.02 of the PO was excellent, it would imply that only Siemens-ITE, 480-Vac-rated MCCBs would be acceptable, which was inconsistent with the RIP's allowing 600 or 480-Vac ratings and accepting Gould or ITE or Siemens manufactured MCCBs.

The RIP (and RIR 530349) documented the practice of stencilling serial numbers (lot number plus a letter identifier) on the MCCBs for traceability to test reports. While this good practice is consistent with the requirements of Criterion VIII of 10 CFR Part 50 Appendix B, it was not found in the program procedures reviewed.

3. CGD 013-S0003, Revision 0, January 25, 1991, and CGE 013-E0003, Revision 0, January 29, 1991, covered the dedication of Gould ITE or Siemens catalog number EF3A003 W/S10EER0 MCCBs with adjustable instantaneous magnetic trip feature and fitted with a shunt trip for use in 11 "NG" series Class 1E MCCs. Concerns with this file were similar to those identified for CGDs 013-S0001, and S0002, in particular: The ambiguity with respect to voltage rating, 480 or 600 vs. manufacturer Gould, ITE, or Siemens was similar to CGDs 013-S0001 and S0002 (CGEs 013-E0001, E0002), but some critical characteristics were inconsistent with those for similar MCCBs. Added to the markings to be verified were UL listing and conductor material type (copper). Insulation resistance was specified to be tested at 1000 Vdc instead of 2500 Vdc and the open-contact readings were to be taken "between adjacent poles" instead of between line and load terminals, as would be appropriate.

   The specifications listed under "Method/Acceptance Criteria" for the critical characteristic of adjustable instantaneous magnetic tripping were inconsistent with the other dedications of similar MCCBs, being specified as "Max. trip time must be less than 6 cycles at: a. lowest setting between 75% and 125% of current setting b. highest setting between 80% and 120% of current setting." There was no explanation of the deviation from the criteria used in other similar MCCB dedications and no test method was specified where the pulse method would be preferred in order to obtain accurate trip time results (not required in other dedications). Also, the way of expressing the acceptance criteria in conjunction with the problems in interpreting them relative to the requirements of the site procedure were not conducive to obtaining conclusive results.

   PO 540321, issued by WCNOC on February 16, 1991, ordered four 480-Vac rated Siemens EF3-A003 MCCBs with shunt trips as described above, along with a Siemens CoC to UL-489 and NEMA AB 1. However, the copy of Revision 0 of RIP E-128 (February 2, 1991) executed upon receipt of the MCCBs on April 12, 1991, still allowed 600 or 480-Vac-rated MCCBs from Gould, ITE, or Siemens. The RIP did not specify RIP E-055 either, but it was the only RIP among the three MCCB dedications reviewed which noted the lack of a "UL" mark per se and documented the acceptability of the special "UR" mark used by UL for certain magnetic-only MCCBs (also known as motor circuit protectors).

   Revision 1 of the RIP included in the file was consistent with CGD 013-S0003, but it was not used for these MCCBs, and the Revision 0 version that was used did not include checking for conductor material. Also, the requirements for the instantaneous trip test were not those of CGD 013-S0003, but those of the other two MCCB CGDs and RIP E-107; i.e., pulse or runup, 80-120 percent of the marked tripping current for the trip setting tested, 2-5 second current increase time.

The insulation resistance test specified in the RIP was inconsistent with (although more correct than) the CGD/CGE in that the contacts-open portion included line-to-load readings omitted in the CGD/CGE. However, the contacts-closed portion still used the "terminals of opposite polarity" terminology, inappropriate for a three-phase ac MCCB.

The individual pole resistance test (by millivolt drop) results were more completely documented than in other dedications in that the actual test current was recorded as required. However, although the acceptance criterion was characterized as average results to be used for comparison only, and the "expected voltage drop" was expressed as "[approximately] 70 mv - for information only," the millivolt readings obtained were all consistently around 900 millivolts. Depsite their consistency with each other and consistency for each pole for the three readings, these relatively large voltage drops, more than an order of magnitude greater than the expected value and at only 1.5 amps, appeared excessive and should have been cause for some investigation and/or explanation, none of which was documented.

Other problems with the testing as documented on the RIP were that no actual data were recorded for the rated continous current tests, the adjustable instantaneous magnetic tripping test, the insulation resistance test, and the shunt trip test. Therefore with only the annotation "Acceptable" auditable, objective evidence of the MCCB's ability to perform their safety functions related to these critical characteristics was not adequately documented.

The assessment team's review of the above described dedication files identified that although the procedures called for identification of safety functions, such as during the safety classification analysis, and called for consideration of safety functions in identifying critical design characteristics, it was not specifically required to identify them in the dedication evaluations and although these were identified, it was not clear how, if at all, they were derived from the safety functions. It was also noted that not all critical characteristics were identified in all cases and there was inconsistency among different files where there should have been consistency. For the critical characteristics identified, not all were selected for verification and there were inconsistencies among files for similar equipment in similar applications. For the critical characterisitics selected for verification, appropriate methods of verification were not always chosen and/or adequately specified, and there were inconsistencies among similar files.

The results of testing and inspection that were chosen as verification of selected critical characteristics for acceptance were not always documented in an objective, auditable form, giving actual data or results. Additionally, some anomalous data recorded were neither questioned nor explained.

4. CGD 017-S0001, Revision 0, dedicated a globe valve stem. Some of the applications for the valve included containment spray system valves ENV-51, -52, -60, -89, -90, and -93 which are mainly used for test connections and whose safety function is to maintain the system pressure boundary. The critical characteristics identified for the stem were part number, dimensions, configuration, and material. All critical characteristics and their acceptance criteria were well defined; however,

the team questioned the fact that for the critical characteristic, material (which was ASTM A276, Type 316, condition B.S.S.), the verification method was to use an alloy analyzer to verify that the chromium and nickel content meets the material specification requirements. Other steels may have a chromium and nickel content that is within the range specified for the material which has a percent composition of chromium and nickel of 16.00-18.00 and 10.00-14.00, respectively. In addition to chromium and nickel, the carbon content is critical in ensuring that the material will exhibit the desired properties. Since the material specification does not require solution annealing, the valve stem, if not within material specifications, could be susceptible to stress-corrosion cracking. In addition to the method identified to verify the material of the valve stem, the assessment team was concerned about the selection of the material which was not solution annealed.

5. CGD 073-S0001, Revision 0, dedicated a wormgear for Fisher-type 1073 manual handwheel actuators. The worm gear, in conjunction with the manual handwheel, is used to position the disc of Fisher butterfly valves, GNV-001, -002, -003, and -004, to a position that is required for flow balancing. The assessment team questioned the critical characteristic identified as "gray residue from surface" and its acceptance criterion "gray residue." CGD 073-E0001 identified the part material as ASTM A126, Grade B, cast iron and the SCA for the worm gear identified the credible failure modes as including breakage of gear teeth and binding between the gear sector and the worm. The assessment team discussed the critical characteristic "gray residue from surface" with WCNOC EE personnel and pointed out that other materials also exhibit a gray residue on the surface, and that the presence of a gray residue did not provide assurance that the proper material was received.

6. CGD 01-S0002, dedicated an o-ring for a Masoneilan pneumatic actuator. The o-rings are utilized in the main steam atmospheric relief valve actuators, and provide an airtight seal between the actuator shaft and lower casing. The critical characteristics identified for the o-ring are part number, material, dimensions (nominal inside diameter and nominal cross-section), and hardness. The critical characteristics and methods for verifying the characteristics appeared to be adequate with the exception that sampling was used to determine that the o-ring material was Nitrile (NRB) ASTM D1418, Class 1. One o-ring was selected from each lot for material verification. The assessment team questioned the use of sampling to verify material because there was no audit or survey performed at the supplier's facility to support homogeneity of the lots.

3 PROCUREMENT TRAINING REVIEW

Training activities and associated records are defined in WCNOC Procedures KGP-1851, "Professional and Supervisory Training Program," Revision 3 through PCN 1, January 7, 1991, and KGP-1800, "Training and Qualifications Records," Revision 4, through PCN 1, February 1, 1991. Procedure KGP-1851 established the minimum training requirements for professional and supervisory employees. The procedure addressed three categories of training: formal instruction for specific topics, position-specific training as determined by WCNOC management, and professional enhancement training as determined by division managers. The assessment team did not identify any specific requirements with respect to training in the area of procurement and commercial-grade dedication activities. Discussion with various engineering and material management personnel revealed that, to date, there had been one formal, documented, training session which had been presented to 25 employees drawn from NPE and quality organizations. This session, "Materials Management Training Program," was presented on October 15 and 16, 1990, by ABB Impell. A review of the course material showed it to be comprehensive and well structured. An additional course, "Training Course on Maintaining Equipment Qualification-Engineer's Module," presented on November 7 and 8, 1990, provided some discussion on dedication of CGIs and the impact on equipment qualification. The records reviewed demonstrated that various employees in the supplier/material quality group had attended workshops and, conferences, and had participated in working groups dealing with procurement and commercial-grade dedication concepts.

The assessment team noted that there appeared to be heavy reliance on required reading rather than on a more-formal classroom-type of training. Manual WCNOC-46, "Nuclear Plant Engineering Required Reading Manual," Revision 3 through Change Request 3, May 31, 1991, implemented the NPE required reading program. The manual consisted of a series of matrices that outlined, by position or function, those documents that constituted introductory and continuing required reading. The manual did show that the procedures dealing with procurement and dedication of CGIs (KGP-1250 and KGP-1251, respectively) are a part of the introductory and continuing required reading for the managers, engineering supervisors, and equipment engineers in the mechanical ASME-related, electrical, and civil/mechanical non-ASME-related disciplines. EPRI's NP-5652 was also listed, but only as introductory reading for managers and engineering supervisors and not for the equipment engineers.

WCNOC also stated that a service requisition (NPE 910044) was initiated on June 18, 1991, to provide training to 20 EE and contractor personnel in the area of procurement and commercial-grade dedication and was initiated by the EE manager. Education and experience records of the 22 EE personnel, including the manager, were also reviewed and indicated an average of 11 years of nuclear experience, with 3 people having less than 6 years' experience. Of the 22 people, 18 had obtained engineering degrees, 2 were registered professional engineers, 2 were licensed senior reactor operators, and 1 had a senior reactor operator certificate. The assessment team concluded that WCNOC's training appeared satisfactory however, formal classroom training may be helpful to achieve effective implementation.

4 NUMARC COMPREHENSIVE PROCUREMENT INITIATIVE IMPLEMENTATION

NUMARC 90-13, "Nuclear Procurement Program Improvements," approved by the NUMARC Board of Directors on June 28, 1990, requested that licensees assess their procurement programs and take specific action to strengthen inadequate programs. The comprehensive procurement initiative called for licensees to complete their review by July 1, 1991, and to implement by July 1, 1992. These guidelines were summarized in the enclosure to a Commission Paper, "NUMARC Initiatives on Procurement" (SECY 90-304), August 24, 1990.

4.1 Performance-Based Supplier Audits

The guidelines contained in NUMARC 90-13 recommend the use of performance-based audits, as appropriate, for vendor audits performed by licensees and licensee-based auditing organizations consistent with EPRI NP-6630, "Guidelines for Performance-Based Supplier Audits (NCIG-16)," June 1990. WCNOC stated that NUPIC audits are being converted to performance-based audits and that the key elements of NP-6630 will be included in SMQP 18.1 and 18.2 by July 15, 1991. NUPIC audits are used after a supplier quality review is performed. WCNOC also participates in the NUPIC joint audit process and has participated in other licensee organizations. Additional monies have been budgeted for 1991 to allow for approximately 15 audits in which NPE will participate. Participation by NPE engineering personnel should strengthen the vendor audit process.

4.2 Tests and Inspections

WCNOC has incorporated several key elements referenced in EPRI NP-6629, "Guidelines for the Procurement and Receipt of Items for Nuclear Power Plants (NCIG-15)," May 1990, relative to development of procurement requirements, acceptance methods, and engineering involvement, into SMQP 10.1, SMQP 10.2, and APN-F 3.11. Test and inspection capabilities primarily used for acceptance have been improved by the purchase of an alloy analyzer, hardness tester, and infra-red spectrometer. Appendix C to EPRI NP-6629 contains guidelines for the detection of fraudulent material for the procurement of safety-related items. WCNOC stated that this criterion will be included in an upcoming training program for personnel involved in the procurement process. Negotiations are under way with a consultant to provide a 1-day course on identifying fraudulent/counterfeit material. The course will address the present industry initiatives now in progress to improve existing procurement activities, QA programs, and maintenance programs to prevent the further ingress of fraudulent materials, as well as measures presently available to detect fraudulent vendor activities.

4.3 Obsolescence

NUMARC 90-13 suggests the consideration of alternate replacements for procurement of obsolete items, where practicable, as a preference to procurement from the surplus market. However, should the surplus market be used, product performance through traceability to the OEM, or the performance of tests and inspections. WCNOC's policy is to only place orders for safety-related items with qualified suppliers employing 10 CFR Part 50 Appendix B QA programs. NUMARC 90-13 also suggests a review of EPRI NP-6406, "Guidelines for the Technical Evaluation of Replacement Items in Nuclear Power Plants (NCIG-11)," December 1989, to improve the technical evaluation process, and NP-5638, "Guidelines for Preparing Specifications for Nuclear Power Plants (NCIG-04)," April 1988, to improve procurement specifications. The intent of NP-6406 has been incorporated into various engineering procedures and, at present, procurement requirements are extracted from specifications utilized for construction.

4.4 Information Exchange

NUMARC 90-13 encourages the sharing of vendor audit information through joint audit forums and to actively share objective procurement information through designated topics on the Institute for Nuclear Power Operations (INPO) nuclear network system. WCNOC participates in the Joint Utility Task Group, EPRI and NUMARC working groups and INPO's nuclear network.

4.5 General Procurement

NUMARC 90-13 suggests providing necessary resources, including engineering resources, to support improved procurement practices; procuring items through normal supply channels (OEM or authorized distributor); specifying "new" on POs; and establishing the acceptance method at the front-end of the procurement process. WCNOC stated that additional resources, including engineering, have been provided and that purchasing items through the OEM is preferred. Additional procurement controls would apply if sources other than the OEM are used.

5 CONCLUSIONS

WCNOC has made a significant effort to upgrade its commercial-grade dedication program since initial incorporation of the EPRI guidelines in August 1988. However, needs for improvement were identified in a number of areas. A specific weakness identified was WCNOC's understanding that not all the critical characteristics identified need to be verified.

The assessment team found strengths in areas such as training and industry involvement; overall program consistency with the dedication philosophy described in EPRI NP-5652; the use of the supplemental parts level Q-list; plans to develop a Spare Parts Configuration Management data base, and WCNOC's self-initiated review of its procurement practices during the 1983-1989 period. Also, achievements in the area of the review and implementation of the NUMARC comprehensive procurement initiatives were excellent.

6 EXIT MEETING

On June 21, 1991, the assessment team conducted an exit meeting with members of the WCNOC staff and management at the WCGS site. Persons contacted during the assessment are listed in the appendix to this report. During the exit meeting, the team summarized the scope of its assessment and its observations. Throughout the assessment, the team met with WCNOC management and staff to discuss concerns. WCNOC did not identify any information as proprietary.

APPENDIX

PERSONS CONTACTED

Wolf Creek Nuclear Operating Corporation

B. Withers, President and Chief Executive Officer
* F. Rhodes, Vice President Engineering and Technical Services
* J. Bailey, Vice President Operations
* J. Pippin, Director NPE
* C. Parry, Director Quality/Safety
O. Maynard, Manager Regulatory Services
* L. Payne, Manager Supplier/Material Quality
R. Holloway, Manager Maintenance and Modifications
* N. Hoadley, Manager EE
* C. Sprout, Manager NPE
* M. Dingler, Manager NP System
W. Lindsay, Manager QA
R. Benedict, Manager QC
* R. Olson, Supervisor Expediting
* J. Fletcher, Supervisor SQ
* W. Lockwood, Supervisor Material Verification
* T. Dougan, Supervisor Material/Quality Support
* E. Peterson, Supervisor Audits
* D. Allison, Supervising Engineer
* H. Chernoff, Supervisor Licensing
* D. Robinson, Manager QA, NPPD
* W. Muilenberg, Licensing Engineer
* S. Wideman, Senior Engineering Specialist
* S. Fellers, Engineer
* S. Lucas, Equipment Engineer
* M. Gayoso, Controller
* J. Simmons, Procurement Quality Supervisor
* G. Klein, Materials Engineer
* M. Buel, QA Engineer

Nuclear Regulatory Commission

* J. Jaudon, Deputy Director, RIV
* L. Norrholm, Chief, VIB
* I. Barnes, Section Chief, RIV
* R. Pettis, Senior Reactor Engineer, VIB
* S. Alexander, EQ and Test Engineer, VIB
* L. Campbell, Reactor Engineer, VIB
* L. Ellershaw, Reactor Inspector, RIV
L. Gundrum, Resident Inspector, WCGS

Nuclear Management and Resources Council

* B. Bradley, Senior Project Manager

*Attended exit meeting on June 21, 1991.

Selected Bulletins and Information Notices
Concerning Adequacy of Vendor Audits
and Quality of Vendor Products

ISSUED	TITLE
1. Information Notice 90-57, Supplement 1	Substandard, Refurbished Potter & Brumfield Relays Represented as New
2. Information Notice 91-70	Improper Installation of Instrumentation Modules
3. Information Notice 91-87	Hydrogen Embrittlement of Raychem Cryofit Couplings

CORRESPONDENCE RELATED TO VENDOR ISSUES

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

NOV 15 1991

Thomas G. Weyenberg
Director of Contracts
Whiting Corporation
15700 Lathrop Ave.
Harvey, Illinois 60426-5198

Dear Mr. Weyenberg:

SUBJECT: REQUEST FOR AMPLIFICATION

I am responding to your October 18, 1991 letter in which you requested amplification of my letter of September 27, 1991, regarding reporting responsibility under 10 CFR Part 21. Your first question included the following:

> Whose responsibility would it be to assure that any replacement parts which [purchaser] may order are current rather than obsolete parts which would have been applicable only to the original crane before it was modified?

The position of the U.S. Nuclear Regulatory Commission (NRC) staff is that the purchaser, or a designee, is responsible for ensuring that replacement parts are suitable for use in equipment that the purchaser has caused to be modified.

The Whiting Corporation's (Whiting's) responsibilities for reporting under Part 21 of Title 10 of the Code of Federal Regulations (10 CFR Part 21) for those items ordered in the future apply only to those items that are ordered as basic components. Whiting's responsibility for these items is to ensure that the purchaser receives the item that it requested and that the item does not depart from the technical requirements in the purchase order (deviation). In my previous letter, I stated that if Whiting does discover a deviation, at any time, in any items that it supplied as a basic component, it is responsible to either evaluate the deviation or report the deviation to the purchaser so that the purchaser can cause the deviation to be evaluated.

In your letter, you also state that if a customer ordered a replacement part, "Whiting would have no way to determine the appropriateness of the originally specified part to the reconfigured application." Whiting is not responsible for ensuring that the item is compatible with a design for which Whiting was not responsible. Whiting may supply the part as a basic component since Whiting is only responsible for ensuring that the correct part is supplied. However, Whiting is responsible for the quality of the replacement part, and, if the part is a basic component, Whiting is also responsible for reporting defects or noncompliance in accordance with 10 CFR Part 21.

Your final questions were as follows:

> What control measures will be needed to assure the proper part is obtained from the appropriate vendor now that more than one vendor has supplied parts for the crane?
>
> Is this an issue that would concern the NRC?

The purchaser is responsible for ensuring that the proper parts are specified and obtained. If the parts are determined to be basic components, the purchase is governed by the licensee's quality assurance program which is to conform to the requirements of 10 CFR Part 50, Appendix B. The NRC routinely inspects utilities and vendors to ensure that these requirements are being followed.

If you have any further questions on this subject, please contact me at (301) 492-0961, or Stewart Magruder of my staff at (301) 492-3220.

Leif J. Norrholm

Leif J. Norrholm, Chief
Vendor Inspection Branch
Division of Reactor Inspection
and Safeguards
Office of Nuclear Reactor Regulation

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

DEC 06 1991

Mr. Gary L. Hauze, Vice President
Sales and Marketing
Weschler Instruments
16900 Foltz Parkway
Cleveland, Ohio 44136

Dear Mr. Hauze:

SUBJECT: COMPETITIVE CONCERNS REGARDING SAFETY-RELATED VS COMMERCIAL GRADE PRODUCTS

In your letter of November 6, 1991, you expressed your concern regarding the effects on a competitive business environment when a manufacturer who makes a product to be used in a safety-related application under a quality assurance (QA) program that meets 10 CFR Part 50, Appendix B, and provides controls that satisfy 10 CFR Part 21 is forced to compete with a commercial grade manufacturer who tests its product to determine conformance with the IEEE seismic and environmental standards. The latter product is then sold to the nuclear industry as a qualified item that can be used in a safety-related application. You further state that the cost of supplying the product using the former process is clearly in excess of that using the latter process, and therefore makes the manufacturer of the safety-related product non-competitive.

In response to your concern, it is important initially to note that NRC unambiguously requires that parts and components installed in a nuclear power plant be qualified in accordance with that item's functional importance to safety. This means that those parts and components to be used in a safety-related application must either be originally produced under a Part 50, Appendix B QA program, or be produced as commercial grade and subsequently dedicated to assure proper qualification. NRC staff positions regarding commercial grade dedication are provided in Generic Letter 91-05, "Licensee Commercial-Grade Procurement and Dedication Programs," a copy of which is enclosed for your information. While there may be underlying differences in the implementation costs associated with each of the alternatives, the NRC's primary objective is to assure that only qualified parts and components are utilized in safety-related applications in nuclear power plants.

NRC requirements for the use of commercial grade parts and components in safety-related applications permit any qualified organization to perform the dedication activities, including the manufacturer itself, the supplier, the utility licensee, or a third party organization. In fact, the total dedication activity could be subdivided among two or more of these entities. The dedicating organization(s) must implement a quality assurance program that satisfies those requirements of Appendix B pertinent to the activities performed, and, of course, must also implement Part 21 requirements.

The dedicating organization is responsible for identifying the important design, material, and performance characteristics for each part, material, and service intended for safety-related applications, establishing acceptance criteria, and providing reasonable assurance of the conformance of items to these criteria. For complex items with important safety functions, there are clear advantages in terms of product quality and reliability to procuring such items that are manufactured under a process controlled by an Appendix B program. To provide adequate assurance that a complex item which is procured as commercial grade will be suitable for a safety-related application may be an equally costly alternative. However, in cases where a product manufactured under an Appendix B process is not available, dedication of a commercial grade item may be the only alternative.

We are aware that in past years the procurement practices of many licensees have been less than rigorous with respect to safety-related items. The NRC and the industry have taken a number of steps to improve licensee programs and their implementation. The NRC will continue to perform inspections of nuclear industry vendors regarding their manufacturing and distribution of parts and components, and their dedication activities for commercial grade items to be used for safety-related service. NRC inspection activities will also include the procurement and dedication programs of utility licensees. If you become aware of specific products whose attributes are not being properly evaluated in dedication programs, please inform the NRC. Should you have further questions on this matter, contact Leif J. Norrholm, Chief, Vendor Inspection Branch at (301) 492-0961.

Sincerely,

Brian K. Grimes, Director
Division of Reactor Inspection
and Safeguards
Office of Nuclear Reactor Regulation

Enclosure:
As stated

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555

April 9, 1991

TO: ALL HOLDERS OF OPERATING LICENSES AND CONSTRUCTION PERMITS FOR NUCLEAR POWER REACTORS

SUBJECT: LICENSEE COMMERCIAL-GRADE PROCUREMENT AND DEDICATION PROGRAMS (GENERIC LETTER 91-05)

This generic letter notifies the industry of the staff's pause in conducting certain procurement inspection and enforcement activities and identifies a number of failures in licensees' commercial-grade dedication programs identified during recent team inspections performed by the U.S. Nuclear Regulatory Commission (NRC). The pause, which began in March of 1990, will end in late summer of 1991. The purpose of the pause is to allow licensees sufficient time to fully understand and implement guidance developed by industry to improve procurement and commercial-grade dedication programs. This generic letter expresses staff positions regarding certain aspects of licensee commercial-grade procurement and dedication programs which would provide acceptable methods to meet regulatory requirements.

During the period from 1986 to 1989, the NRC conducted 13 team inspections of the licensees' procurement and commercial-grade dedication programs. During these inspections, the NRC staff identified a common, programmatic deficiency in the licensees' control of the procurement and dedication process of commercial-grade items for safety-related applications. In a number of cases, the staff found that licensees had failed to adequately maintain programs as required by 10 CFR Part 50, Appendix B, to assure the suitability of commercially procured and dedicated equipment for its intended safety-related applications. In addition, the staff identified equipment of indeterminate quality installed in the licensees' facilities.

Because of a decrease in the number of qualified nuclear-grade vendors, the NRC staff is aware that there has been a change in the industry's procurement practices. Ten years ago, licensees procured major assemblies from approved vendors who maintained quality assurance programs pursuant to Appendix B of Part 50 of Title 10 of the Code of Federal Regulations (10 CFR). Currently, due to the reduction in the number of qualified nuclear-grade vendors, licensees are increasing the numbers of commercial-grade replacement parts that they procure and dedicate for use in safety-related applications. This is a substantial change from the environment in which 10 CFR Part 50, Appendix B was promulgated. This has necessitated an increased emphasis by licensees and the NRC staff to maintain procurement and dedication programs that adhere to the requirements of 10 CFR Part 50, Appendix B, and thus assure the quality of items purchased and installed in safety-related applications. Therefore, dedication processes for commercial-grade parts have increased in importance and NRC inspections have determined that a number of licensees have not satisfactorily performed this procurement and dedication process.

The industry has been made fully aware of the NRC's concerns in this program area. In the past, escalated enforcement cases have provided notice to the affected licensees and to the industry of NRC's findings, concerns, and expectations in the implementation of procurement and dedication programs.

Further, the NRC staff continues to participate in numerous industry meetings and conferences at which the NRC's positions in this area have been presented. The Nuclear Utility Management and Resources Council (NUMARC) Board of Directors recently approved a comprehensive procurement initiative as described in NUMARC 90-13, "Nuclear Procurement Program Improvements," which commits licensees to assess their procurement programs and take specific action to enhance or upgrade the program if they are determined to be inadequate. The initiative on the dedication of commercial-grade items, which is part of NUMARC 90-13, was to be implemented by January 1, 1990. The staff is monitoring implementation of licensee program improvements by conducting assessments of their procurement and commercial-grade dedication programs and maintaining close interaction with the nuclear industry through participation in conferences, panels, and meetings.

The staff will continue to perform reactive inspections relating to plant specific operational events or to defective equipment and, as required, will continue to initiate resultant enforcement actions. In addition, the staff will continue to perform inspections of vendors. The staff expects to resume procurement and dedication inspection activities in the late summer of 1991. These resumed inspections will be conducted using 10 CFR Part 50, Appendix B (not the NUMARC initiatives) as the applicable regulatory requirement. Licensee programs must assure the suitability of commercially procured and dedicated equipment for its intended safety-related application.

The staff position is that the staff will not initiate enforcement action in cases of past programmatic violations that have been adequately corrected. In addition, the staff does not expect licensees to review all past procurements. However, if during current procurement activities, licensees identify shortcomings in the form, fit, or function of specific vendor products, or if failure experience or current information on supplier adequacy indicates that component may not be suitable for service, corrective actions are required for all such installed and stored items in accordance with Criterion XVI of 10 CFR Part 50, Appendix B. Also in accordance with Criterion XVI, licensees must determine programmatic causes when actual deficiencies in several products from different vendors are identified during current procurement activities and these deficiencies lead to the replacement of installed items as part of the corrective action. In such cases, a further sampling of previously procured commercial-grade items may be warranted.

In NRC Generic Letter (GL) 89-02, "Actions to Improve the Detection of Counterfeit and Fraudulently Marketed Products," the staff described its perspective on good practices in procurement and dedication and provided the NRC's conditional endorsement of an industry standard (EPRI NP-5652) on methods of commercial-grade procurement and dedication. A number of recent inspection findings, as discussed in Enclosure 1, indicate that licensees have failed to include certain key activities, as appropriate, in the implementation of the dedication process. The NRC staff's positions on the successful implementation of licensees' programs for commercial-grade dedication with respect to critical characteristics and like-for-like replacements are as follows. (These are also included in Enclosure 1.)

The term "critical characteristics" is not contained in Appendix B and has no special regulatory significance beyond its use and definition in various industry guides and standards. The NRC first used the term critical characteristics in GL 89-02 as constituting those characteristics which need to be identified and verified during product acceptance as part of the procurement process. The NRC has not taken the position that all design requirements must be considered to be critical characteristics as defined and used in EPRI NP-5652. Rather, as stated in Appendix B, Criterion III, licensees must assure the suitability of all parts, materials, and services for their intended safety-related applications (i.e., there needs to be assurance that the item will perform its intended safety function when required). The licensee is responsible for identifying the important design, material, and performance characteristics for each part, material, and service intended for safety-related applications, establishing acceptance criteria, and providing reasonable assurance of the conformance of items to these criteria.

A like-for-like replacement is defined as the replacement of an item with an item that is identical. For example, the replacement item would be identical if it was purchased at the same time from the same vendor as the item it is replacing, or if the user can verify that there have been no changes in the design, materials, or manufacturing process since procurement of the item being replaced. If differences from the original item are identified in the replacement item, then the item is not identical, but similar to the item being replaced, and an evaluation is necessary to determine if any changes in design, material, or the manufacturing process could impact the functional characteristics and ultimately the component's ability to perform its required safety function. If the licensee can demonstrate that the replacement item is identical, then the licensee need not identify the safety function or review and verify the design requirements and critical characteristics. Engineering involvement is necessary in the above activities. Reliance on part number verification and certification documentation is insufficient to ensure the quality of commercially procured products.

The other matters discussed in Enclosure 1 do not constitute NRC staff positions, but provide information on inspection findings and clarify the characterization of effective procurement and dedication programs previously described in GL 89-02.

BACKFIT DISCUSSION:

Based on past inspection findings and the resulting enforcement actions, the NRC staff has determined that licensee commercial-grade procurement and dedication programs needed to be improved to comply with the existing NRC requirements as described in 10 CFR Part 50, Appendix B, Criterion III (Design Control), IV (Procurement Document Control), VII (Control of Purchased Material, Equipment and Services), and XVIII (Audits). Specifically, licensees have failed to adequately maintain programs to assure the suitability of commercially procured and dedicated equipment for its intended safety-related application. Since the generic letter presents staff positions regarding implementation of existing regulatory requirements, as contained in Appendix B to 10 CFR Part 50, the staff has concluded, that this is a compliance backfit and has prepared the generic letter in accordance with 10 CFR 50.109 (a)(4)(i). In light of the inadequacies identified in the procurement and dedication programs of a large number of licensees, the issuance of this generic letter is necessary to express the staff's position on the key element that licensees must include as part of the dedication process, specifically that commercial-grade procurement and dedication programs must assure the suitability of equipment for its intended safety-related application. This generic letter is also intended to clarify the elements of effective procurement and commercial-grade dedication programs that were previously provided to licensees in GL 89-02. Since licensees' procurement and dedication programs may contain programmatic deficiencies, the staff has included in the generic letter the necessary licensee corrective action to address shortcomings identified in specific vendor products or components that directly lead to the component not being suitable for safety-related service.

Although no response to this letter is required, if you have any questions regarding this matter, please contact the persons listed below.

Sincerely,

J. G. Partlow

James G. Partlow
Associate Director for Projects
Office of Nuclear Reactor Regulation

Enclosures:
1. Characteristics of Effective Commercial-Grade Procurement and Dedication Programs
2. List of Recently Issued Generic Letters

Technical Contacts: Richard P. McIntyre, NRR
(301) 492-3215

Uldis Potapovs, NRR
(301) 492-0959

CHARACTERISTICS OF EFFECTIVE COMMERCIAL-GRADE PROCUREMENT AND DEDICATION PROGRAMS

Background

Appendix B to 10 CFR Part 50 contains the NRC's regulations for procurement quality assurance (QA) and quality control (QC) for products to be used in safety-related applications. In addition, the NRC has provided further guidance in Regulatory Guides 1.28, 1.33, and 1.123. These requirements and guides, if properly implemented, provide a measure of assurance for the suitability of equipment, including commercial-grade items for use in safety-related systems. Criterion III of Appendix B requires licensees to select and review for suitability of application materials, parts, equipment, and processes that are essential to the safety-related functions of the structures, systems, and components. Criterion IV requires that procurement documents specify the applicable requirements necessary to ensure functional performance. Criterion VII requires licensees to assure that the following are sufficient to identify whether specification requirements for the purchased material and equipment have been met: source evaluation and selection, objective evidence of quality, inspection of the source, and examination of products upon delivery. The process used to satisfy these requirements when upgrading commercial-grade items for safety-related applications is commonly called "dedication." The process of ensuring compliance with 10 CFR Part 50, Appendix B, must include all those activities necessary to establish and confirm the quality and suitability of commercially procured and dedicated equipment for its intended safety-related application. Some of the dedication activities may occur early in the procurement cycle, before the item is accepted from the manufacturer. Generic Letter (GL) 89-02, "Actions to Improve the Detection of Counterfeit and Fraudulently Marketed Products," discussed commercial-grade dedication in terms of engineering involvement in the procurement process, product acceptance, and the dedication process as identified in the EPRI NP-5652 guidelines. This enclosure further discusses the characteristics of effective procurement and dedication programs previously discussed in GL 89-02 and provides examples of specific failures by licensees to effectively implement these characteristics for dedicating and ensuring the suitability of commercial-grade products for safety-related applications. Appropriate implementation of these characteristics would have avoided many of the failures to meet 10 CFR Part 50, Appendix B requirements in licensee procurement and commercial-grade dedication programs which were identified during past NRC inspections.

Inspection Observations and Findings

From 1986 to 1989, headquarters and regional personnel conducted 13 team inspections of licensees' procurement and dedication programs. These inspections have identified a common, broad programmatic deficiency in licensees' control over the process of procurement and dedication of commercial-grade items. In a number of cases, licensees have not maintained programs to ensure the suitability of equipment for use in safety-related applications as required by 10 CFR Part 50, Appendix B, Criterion III. These 13 inspections resulted in findings with significant safety implications. The staff identified eight findings that were considered to be Severity Level III violations and three findings that were Severity Level IV violations. At one plant, the staff did not assign a severity level to individual violations. Instead, the staff considered the entire group to be a Severity Level III problem and used enforcement discretion, as provided under the enforcement policy, based on the licensee's corrective actions (see 10 CFR Part 2, Appendix C, Section V.G.2). Only one of the plants that were inspected did not receive violations in this program area.

In GL 89-02, the NRC has conditionally endorsed the dedication methods described in EPRI NP-5652 guidelines. The staff believes that licensees who implement these dedication methods, in accordance with the NRC's endorsement, can establish a basis for satisfying the existing requirements of Appendix B to 10 CFR Part 50 as these requirements apply to the dedication process for commercial-grade items. An effective commercial-grade dedication program must include provisions to demonstrate that a dedicated item is suitable for safety-related applications. For a licensee to adequately establish suitability, certain key activities must be performed, as appropriate, as part of the dedication process. This generic letter is intended to clarify the dedication approaches described in GL 89-02.

During each of the 13 inspections, the staff identified a common element in each of the inspection findings. This element was the failure of the licensee to assure that a commercially procured and dedicated item was suitable for the intended safety-related application. A dedicated commercial-grade item must be equivalent in its ability to perform its intended safety function to the same item procured under a 10 CFR Part 50, Appendix B QA program. The following is a list of the 13 licensees inspected and the inspection report numbers. A summary of the general inspection findings and NRC observations on these findings follows the list of licensee inspections.

LICENSEE and PLANT	INSPECTION REPORT NO.
1. Tennessee Valley Authority (Sequoyah)	50-327/86-61 50-328/86-61
2. Southern California Edison (San Onofre)	50-206/87-02 50-361/87-03 50-362/87-04
3. Alabama Power (Farley)	50-348/87-11 50-364/87-11
4. Louisiana Power and Light (Waterford)	50-382/87-19

LICENSEE and PLANT	INSPECTION REPORT NO.
5. Sacramento Municipal Utility District (Rancho Seco)	50-312/88-02
6. Maine Yankee Atomic Power (Maine Yankee)	50-309/88-200
7. Northern States Power (Prairie Island)	50-282/88-201 50-306/88-201
8. Portland General Electric (Trojan)	50-344/88-39 50-344/88-46
9. Connecticut Yankee Atomic Power (Haddam Neck)	50-213/89-200
10. Washington Public Power Supply System (WNP-2)	50-397/89-21 50-397/89-28
11. Florida Power (Crystal River)	50-302/89-200
12. Gulf States Utilities (River Bend)	50-458/89-200
13. Commonwealth Edison (Zion)	50-295/89-200 50-304/89-200

1. Inspection Findings

a. Failure to identify the methods and acceptance criteria for verifying the critical characteristics, such as during receipt inspection, dedication process, or post-installation testing.

b. Failure to establish verifiable, documented traceability of complex commercial-grade items to their original equipment manufacturers in those cases where the dedication program cannot verify the critical characteristics.

c. Failure to recognize that some commercial-grade items cannot be fully dedicated once received on site. Certain items are manufactured using special processes, such as welding and heat treating. Dedication testing of these items as finished products would destroy them. For these items, licensees may need to conduct vendor surveillances or to witness certain activities during the manufacturing process.

Discussion

The NRC staff has met on several occasions with NUMARC and licensee representatives to discuss "critical characteristics" as used in the context of commercial-grade procurement and dedication. The term "critical characteristics" is not contained in Appendix B and has no special regulatory significance beyond its use and definition in various industry guides and standards. The NRC first used the term critical characteristics in GL 89-02 as constituting those characteristics which need to be identified and verified during product acceptance as part of the procurement process. The NRC has not taken the position that all design requirements must be considered to be critical characteristics as defined and used in EPRI NP-5652. Rather, as stated in Appendix B, Criterion III, licensees must assure the suitability of all parts, materials, and services for their intended safety-related applications (i.e., there needs to be assurance that the item will perform its intended safety function when required). The licensee is responsible for identifying the important design, material, and performance characteristics for each part, material, and service intended for safety-related applications, establishing acceptance criteria, and providing reasonable assurance of the conformance of items to these criteria. There is no minimum or maximum number of critical characteristics that need to be verified. Further, the critical characteristics for an item may vary from application to application depending on the design and performance requirements unique to each application.

A licensee may take different approaches for the verification of the critical characteristics, depending on the complexity of the item. In many cases, the licensee can verify the critical characteristics of each item during receipt inspection testing. However, for a complex item with internal parts which receive special processing during manufacturing, the licensee may need to conduct a source verification of the manufacturer during production to verify the critical characteristics identified as necessary for the item to perform its safety function. When these methods cannot verify the critical characteristics related to special processes and tests, certification by the original equipment manufacturer may be an acceptable alternative provided documented, verified traceability to the original equipment manufacturer has been established and the purchaser has verified by audit or survey that the original equipment manufacturer has implemented adequate quality controls for the activity being certified.

For items with critical characteristics that can be verified for the most severe or limiting plant application, the licensee might prefer to identify and verify the item's critical characteristics to qualify that item for all possible plant applications. For complex items that would be purchased for specific plant applications, it may be appropriate to address the acceptance criteria for each item individually. Engineering involvement is important in either method because the technical evaluation will identify the critical characteristics, acceptance criteria, and the methods to be used for verification.

2. Inspection Findings

   a. Failure to demonstrate that a like-for-like replacement item is identical in form, fit, and function to the item it is replacing. Part number verification is not sufficient because of the probability of undocumented changes in the design, material, or fabrication of commercial-grade items using the same part number.

b. Failure to evaluate changes in the design, material, or manufacturing process for the effect of these changes on safety function performance (particularly under design basis event conditions) of replacement items that are similar as opposed to identical to the items being replaced.

c. Failure to ensure that items will function under all design requirements. On some occasions, licensees only ensured that the commercial-grade item would function under normal operation conditions.

d. Failure to verify the validity of certificates of conformance received from vendors not on the licensee's list of approved vendors/suppliers. An unverified certificate of conformance from a commercial-grade vendor is not sufficient.

Discussion

A like-for-like replacement is defined as the replacement of an item with an item that is identical. For example, the replacement item would be identical if it was purchased at the same time from the same vendor as the item it is replacing, or if the user can verify that there have been no changes in the design, materials, or manufacturing process since procurement of the item being replaced. If differences from the original item are identified in the replacement item, then the item is not identical, but similar to the item being replaced, and evaluation is necessary to determine if any changes in design, material, or the manufacturing process could impact the functional characteristics and ultimately the component's ability to perform its required safety function. If the licensee can demonstrate that the replacement item is identical, then the licensee need not identify the safety function or review and verify the design requirements and critical characteristics.

Engineering involvement is necessary in the above activities. The extent of this involvement is dependent on the nature, complexity, and use of the items to be dedicated. Participation of engineering personnel is appropriate in the procurement process, and product acceptance, to develop purchase specifications, determine specific testing requirements applicable to the products, and evaluate the test results. When engineering personnel specify design requirements for inclusion on the purchase documents for replacement components, they need not reconstruct and reverify design adequacy for procurement purposes, but need only ensure that the existing design requirements (which may reference the original design basis) are properly translated into the purchase order.

Reliance on part number verification and certification documentation is insufficient to ensure the quality of commercially procured products. Effective product acceptance programs have as elements, receipt and source inspection, appropriate testing criteria, effective vendor audits and surveillances (including witness/hold points as appropriate), special tests and inspections, and post-installation tests. Procedures and adequate qualifications and training for implementing personnel are also necessary factors in successful implementation.

Enclosure 2

LIST OF RECENTLY ISSUED GENERIC LETTERS

Generic Letter No.	Subject	Date of Issuance	Issued To
91-04	CHANGES IN TECHNICAL SPECIFICATION SURVEILLANCE INTERVALS TO ACCOMMODATE A 24-MONTH FUEL CYCLE (GENERIC LETTER 91-04)		ALL HOLDERS OF OL OR CONSTRUCTION PERMITS FOR NUCLEAR POWER REACTORS
91-03	REPORTING OF SAFEGUARDS EVENTS	03/06/91	ALL HOLDERS OF OLs OR CPs FOR NUCLEAR POWER REACTORS AND ALL OTHER LICENSED ACTIVITIES INVOLVING A FORMULA QUANTITY OF SPECIAL NUCLEAR MATERIAL (SNM)
91-02	REPORTING MISHAPS INVOLVING LLW FORMS PREPARED FOR DISPOSAL	12/28/90	ALL OPERATORS OF LOW-LEVEL RADIOACTIVE WASTE (LLW) DISPOSAL SITES, WASTE PROCESSORS, & ALL HOLDERS OF LICENSES FOR NUCLEAR FUELS, NUCLEAR MATERIALS & NUCLEAR POWER REACTORS
91-01	REMOVAL OF THE SCHEDULE FOR THE WITHDRAWAL OF REACTOR VESSEL MATERIAL SPECIMENS FROM TECHNICAL SPECIFICATIONS	01/04/91	ALL HOLDERS OF OLs OR CPs FOR NUCLEAR POWER PLANTS
90-09	ALTERNATIVE REQUIREMENTS FOR SNUBBER VISUAL INSPECTION INTERVALS AND CORRECTIVE ACTIONS	12/11/90	ALL LIGHT-WATER REACTOR LICENSEES AND APPLICANTS
89-10 SUPP. 3	CONSIDERATION OF THE RESULTS OF NRC-SPONSORED TESTS OF MOTOR-OPERATED VALVES	10/25/90	ALL LICENSEES OF OPERATING NUCLEAR POWER PLANTS AND HOLDERS OF CONSTRUCTION PERMITS FOR NUCLEAR POWER PLANTS
90-08	SIMULATION FACILITY EXEMPTIONS	08/10/90	ALL HOLDERS OF OPERATING LICENSES OR CONSTRUCTION PERMITS FOR NUCLEAR POWER REACTORS
90-07	OPERATOR LICENSING NATIONAL EXAMINATION SCHEDULE	08/10/90	ALL POWER REACTOR LICENSEES AND APPLICANTS FOR AN OPERATING LICENSE
89-10 SUPP. 2	AVAILABILITY OF PROGRAM DESCRIPTIONS	08/03/90	ALL LICENSEES OF OPERATING NPPs AND HOLDERS OF CPs FOR NPPs

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

December 16, 1991

Docket No. 999001232

Mr. Mike Sollie
North Brothers Company
3751 C Peach Orchard Road
Augusta, Georgia 30906

Dear Mr. Sollie:

SUBJECT: RESPONSE TO 10 CFR PART 21 INQUIRY

In a letter dated October 1, 1991, you requested that the U.S. Nuclear Regulatory Commission respond to two questions concerning the applicability of Title 10 of the Code of Federal Regulations (CFR). Specifically, you asked whether plants which received their operating license prior to the issuance of 10 CFR Part 21 are required to abide by its provisions and whether it is beneficial from a quality standpoint for a licensee to perform an audit or evaluation of a material supplier to determine that 10 CFR Part 21 procedures are in place. I have enclosed answers to your questions which are based on previous staff positions contained in NUREG-0302, Revision 1, "Public Regional Meetings to Discuss Regulations for Reporting Defects and Noncompliance", published in October 1977.

If you have any further questions, please contact Mr. R. N. Moist of my staff at (301) 504-2981.

Sincerely,

for Leif J. Norrholm, Chief
Vendor Inspection Branch
Division of Reactor Inspection
and Safeguards
Office of Nuclear Reactor Regulation

Enclosure:
As stated

Enclosure 1

RESPONSE TO NORTH BROTHERS COMPANY

QUESTION 1: For those plants which obtained operating licenses prior to issue of 10 CFR Part 21, are they still required to abide by the provisions of this document?

NRC RESPONSE: Yes. The obligation to provide the notification required by 10 CFR Part 21 became effective on August 10, 1977, for all reactor licensees. The July 6, 1977, date was changed to August 10, 1977, by 42 Federal Register 34886. Between this date and January 6, 1978, entities subject to 10 CFR Part 21 should have accomplished actions so they were fully in compliance by January 6, 1978. In the event that a director or responsible officer obtains information after August 10, 1977, reasonably indicating a defect or failure to comply, such individual is required to notify the U.S. Nuclear Regulatory Commission (NRC). This has been the NRC's position since it promulgated the 10 CFR Part 21 regulation as presented in "Public Regional Meetings to Discuss Regulations for Reporting Defects and Noncompliance," NUREG-0302, Revision 1, published in October 1977 (See Item 3 on page P-2).

QUESTION 2: Would it be beneficial from a quality standpoint for a licensee to perform an audit/evaluation of a material supplier to determine that the procedures are in place and are effectively implemented for those receiving purchase orders where 10 CFR Part 21 was invoked.

NRC RESPONSE: Although evaluations of vendors' Part 21 procedures by licensees are beneficial, these are not required by 10 CFR Part 21. Each supplier is independently responsible and must assure itself that the appropriate 10 CFR Part 21 procedures are established and adequate posting has been implemented. This has been the NRC's position since it promulgated the 10 CFR Part 21 regulation as presented in "Public Regional Meetings to Discuss Regulations for Reporting Defects and Noncompliance," NUREG-0302, Revision 1, published in October 1977 (See Item 9 on page 21.21(a)-3 and -4).

While the supplier is responsible for establishing and implementing Part 21 procedures, examinations by licensees may improve the licensee/vendor interface which the NRC feels is important. Also, a connection exists between 10 CFR Part 21 and quality assurance in that a quality assurance program would provide assurance that deviations and noncompliances (such as related to the lack of a Part 21 program) do not occur and if they do occur, provide assurance that they are detected and properly dispositioned.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

OCT 08 1991

Dr. Bertram Wolfe, Vice President
and General Manager
GE Nuclear Energy
175 Curtner Avenue
San Jose, California 95125

Dear Dr. Wolfe:

The NRC has recently received a copy of a press release dated August 21, 1991 in which it is stated that a suit was filed by the five Ohio and Pennsylvania utility owners of the Perry Nuclear Power Plant alleging that General Electric is liable for damages in connection with the design and construction of the Perry Plant. The five utilities are Cleveland Electric Illuminating Company and Toledo Edison Company (both of which are subsidiaries of Centerior Energy Corporation), Ohio Edison Company and its subsidiary Pennsylvania Power Company, and Duquesne Light Company. The damages, it is alleged, were caused by the need to correct defective design information provided by General Electric for the plant's containment building, which need resulted in extensive delays and cost increases for the construction of the Perry plant. In addition, it is NRC's understanding that other utilities, including Nebraska Public Power District, Washington Public Power Supply System, Long Island Lighting Company, and Cincinnati Gas and Electric Company, are litigating the same containment problem with General Electric for their respective nuclear power plants.

Since no safety concerns were identified, the NRC has no position on the merits of the licensees' allegations. However, we wish to remind you of General Electric's responsibilities under 10 CFR Part 21 for the review and evaluation and/or any necessary notifications to customers of deviations in safety-related equipment, materials, and services and the notification to NRC of defects in such products that may be identified by General Electric at any time, including during the review and discovery process, resulting from these and any other allegations.

Sincerely,

Brian Grimes

Brian K. Grimes, Director
Division of Reactor Inspection
and Safeguards
Office of Nuclear Reactor Regulation

cc: See next page

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

September 30, 1991

Mr. William H. Rasin, Director
Technical Division
Nuclear Management and Resource Council
1776 Eye Street, NW
Suite 300
Washington, DC 20006-2496

Dear Mr. Rasin:

SUBJECT: RESPONSE TO NUMARC LETTER

This is in response to NUMARC's letter of June 20, 1991, in which concerns were expressed regarding procurement issues identified in NRC's Plant Hatch assessment report and as were discussed during our public meeting on May 30, 1991. As stated in your letter, NUMARC's general concerns are (1) that NRC generic letters (GLs) and assessment reports are being used to establish new and changing regulatory positions, (2) that the latest NRC staff positions relative to procurement programs have greatly exceeded the concept of reasonable assurance, and (3) that upon resumption of NRC inspection activity in the fall, the evolving nature of the staff's interpretations of Appendix B will lead to confusion and potential enforcement and legal challenges.

As background, the staff has completed eight assessments and, in general, has determined that licensees have made significant programmatic efforts to upgrade and strengthen their procurement and commercial-grade dedication programs. However, implementation of the improved programs was slower and varied depending on the degree of management commitment. In addition, implementation weaknesses were identified in each assessment and included inadequate identification and verification of the safety functions and related critical characteristics of items purchased commercial-grade; inappropriate application of commercial-grade surveys; poorly substantiated downgrading of safety-related equipment; and the use of sampling plans without an adequate basis. Even with these deficiencies, however, the staff has concluded that the pause has been successful. The staff has issued the first four assessment reports and is presently preparing the balance for issuance.

The following is in response to the three general concerns identified above. Specific implementation issues regarding critical characteristics, traceability, sampling and like-for-like replacements are addressed in the enclosure to this letter by giving additional examples relevant to the positions of previous GLs.

Assessment reports are not intended to establish new or changing regulatory positions. The positions expressed in GLs may be used to comply with existing NRC requirements or licensees may adopt alternative measures equivalent to those referenced in the GLs that are acceptable to the staff for implementing the requirements of Appendix B. The four assessment reports issued to date provide information to licensees on staff application of the GL positions to the facts of a specific case. For example, GL 89-02 promulgated staff positions as to what were considered to be appropriate elements of licensee programs to adequately address the issue of counterfeit or fraudulent products. It was not the staff's intention to require that licensee procedures be revised to incorporate all GL provisions.

Regarding GL 91-05, staff positions were provided regarding implementation of existing regulatory requirements, as contained in Appendix B. Since these positions had not been previously provided to licensees, the staff concluded that this was a compliance backfit and the GL was prepared in accordance with 10 CFR Part 50.109 (a)(4)(i). It was subsequently reviewed and approved for issuance by the NRC's Committee to Review Generic Requirements (CRGR) and by NRC management.

With regard to the concept of reasonable assurance, dedicated commercial-grade items (CGIs) used in safety-related applications must meet the applicable requirements of 10 CFR 50 Appendix B to assure items are capable of performing their intended safety functions. It should be noted that commercial-grade dedication is not a substitute for Appendix B, but is only an alternative acceptable to the staff for complying with existing regulatory requirements.

Section 1.2 of Electric Power Research Institute (EPRI) NP-5652 states that a technical evaluation in combination with an appropriate acceptance process can provide the assurance that the specified item is adequate to meet Appendix B requirements. This philosophy is also depicted in Figure 1-1 of EPRI NP-5652 and equates a CGI dedicated under the EPRI guidelines to a basic component purchased under Appendix B requirements. This is one method, acceptable to the staff, which can be used in meeting the requirements of Appendix B.

During our August 26, 1991 management meeting, NUMARC discussed the performance of an upfront engineering analysis, in combination with appropriate acceptance activities, as a proposed method for dedication of CGIs. As stated in the meeting, the NRC would consider this method acceptable if it provides an adequate basis that the CGI will perform its intended safety function in accordance with the design requirements (e.g., plant safety analysis and regulatory commitments) appropriate for the specified safety-related application. This appears to be similar to the EPRI NP-5652 technical evaluation and acceptance process described above for meeting Appendix B requirements.

Upon resumption of NRC's procurement and commercial-grade dedication inspection activity this fall, the NRC will continue to inspect the implementation of licensees' programs against the requirements of Appendix B. As mentioned above, since the pause in programmatic inspection activity, the NRC has performed eight assessments to determine improvements and progress made by licensees in their procurement and commercial-grade dedication programs. Specific application examples which have resulted from these assessments have been discussed with NUMARC and its members on several occasions and have resulted in a useful exchange of ideas, viewpoints and suggestions.

Presently, the staff is developing inspection procedures which will be used to conduct several pilot inspections over the next six months. NRR will provide the NRC regional offices training on the new inspection procedures and the lessons learned from the assessments and early inspections prior to transfer of the inspection effort to the regions. The staff will continue to interact with NUMARC to clearly state NRC's expectations and positions on effective licensee procurement and dedication programs and to receive feedback on industry perceptions of the effectiveness and relevance of the inspection methods used. The staff, like NUMARC, also believes it is important to continue our dialogue to aid in the resolution of the differences in interpretation that have developed.

Our previous meetings and industry workshops have been important in developing an understanding of key concepts which are necessary to ensure effective implementation of licensees' procurement and commercial-grade dedication programs. This dialogue, supplemented by the GLs, assessment reports, and this letter, should help NUMARC and its members to better understand existing staff positions and future inspection objectives and should help the NRC staff maintain awareness of the effects of its inspection activities.

The substance of this response was discussed with you in a public meeting on August 2, 1991, and a follow-up management meeting on August 26, 1991.

Sincerely,

for [signature]

William T. Russell
Associate Director for Inspection
and Technical Assessment
Office of Nuclear Reactor Regulation

Enclosure:
NRC Staff Responses to Specific
Implementation Concerns of NUMARC

ENCLOSURE

NRC STAFF RESPONSES TO SPECIFIC IMPLEMENTATION CONCERNS OF NUMARC

Critical Characteristics

As stated in GL 91-05 and Criterion III of Appendix B, licensees must assure the suitability of all parts, materials, and services for their intended safety-related applications. Implicit in this requirement is that the item will perform its intended safety function. The EPRI NP-5652 definition of critical characteristics states that reasonable assurance must be provided to assure that the item received is the item specified. Although the staff agrees with the EPRI definition, we interpret the "item specified" to encompass those attributes which are necessary for that item to perform its safety function. For example, if a particular model circuit breaker is specified and the tripping characteristics needed for an application are enveloped by the catalog description of that CGI, it is not sufficient to only verify the physical attributes (e.g., part number) as a basis for accepting this item as suitable for service. Implicit in verifying that this item meets the specification is assuring that it performs within the specified parameters. This position has been stated previously in Paragraphs 3 and 4 of our February 27, 1990 letter and in GL 91-05.

It should be noted that although the first assessment report identified implementation weaknesses in key programmatic areas such as critical characteristics and commercial-grade surveys, the remaining seven assessments identified licensees which employed interpretations and positions generally consistent with the discussion above.

Traceability

Traceability is not aimed at introducing additional or unnecessary paperwork into the procurement process but rather to validate documentation supplied from the original equipment manufacturer (OEM). Generic Letter 89-02 states in Section B that in addition to receipt/source inspections and tests, effective licensee programs normally verify traceability to the OEMs of procured materials, equipment, and components in those cases where OEM certifications are elements of the licensee's commercial-grade dedication program.

Generic Letter 91-05 states in Section 2(d) of Enclosure 1 that during NRC's procurement inspections, performed prior to the pause in programmatic inspections, the NRC identified several deficiencies including certifications which were accepted by licensees from vendors whose basis had not been verified by the licensee. Additionally, the basis for employing EPRI acceptance Method 2 activities is based on a supplier certificate of conformance (CoC) which has been verified by audit or survey.

Sampling

The staff agrees with Section 3.1.3 of EPRI NP-5652 which states that tests and inspections may be performed utilizing a sampling plan when appropriate. This position is also expressed in Section B of GL 89-02 for suppliers with an acceptable quality assurance program as confirmed by audit or survey. One approach is to (1) establish batch or lot homogeneity, particularly with respect to the control of critical characteristics, and (2) verify through audit or survey the basis for accepting certifications regarding lot homogeneity. Licensees may implement alternative measures to audit or survey which would be acceptable to the staff for demonstrating lot homogeneity. One such method would be the procurement of consecutive serial numbered items or items produced from the same manufacturing run or time period. However, confidence in the substance of certification to this effect would have to be established.

In the case of commodity items (resistors, terminal lugs, fuses, etc.), which have a generic application and lend themselves to bulk procurement, sampling plans could be developed based on statistical methods which are generally appropriate to such procurements. Any such plans must provide a high level of assurance that the materials/items are suitable for their safety-related use. Licensees may adjust their sampling plans accordingly to account for their knowledge and past performance history of the supplier's ability to manufacture and control the items supplied. Such judgments should be rational and documented.

Like-For-Like Replacements

Generic Letter 91-05 defines a like-for-like replacement as the replacement of an item with an item that is identical (e.g., purchased at the same time from the same supplier as the item it is replacing, or if the purchaser can verify that there have been no changes in the design, materials or manufacturing process since initial procurement of the item being replaced).

If the licensee can demonstrate that the replacement item is identical, then the licensee need not identify the safety function or review and verify the design requirements and critical characteristics. However, if differences from the original item are identified in the replacement item, then the item is not identical, but similar to the item being replaced, and an evaluation is necessary to determine if any changes in design, material, or the manufacturing process could impact the functional characteristics and ultimately the component's ability to perform its required safety functions. Acceptance of both identical and similar items (excluding items purchased at the same time from the same supplier) could be based on a documented survey of the supplier's commercial quality program and controls for the applicable item. If this approach is used, it should confirm and document that the technical requirements of the replacement item are the same as those of the original item being replaced. The purchase order for the replacement item should also reference and invoke the quality program and controls surveyed which are applicable to the item purchased, and there should be reasonable assurance that the supplier's program controls in-place, as observed during the survey, are likely to continue.

Section 3.2.3 of EPRI NP-5652 states that when conducting a commercial-grade survey, the purchaser must (1) confirm that the selected CGI's critical characteristics are controlled under the scope of the supplier's commercial quality system activities, and (2) that the purchaser must also be reasonably assured that the commercial supplier's activities adequately control the CGIs supplied. Assessment teams identified that some licensees relied on broad-based commercial-grade surveys for product acceptance (often performed by other organizations) and that such surveys did not provide sufficient basis that the supplier controlled the required critical characteristics of the specific items supplied. GL 89-02 states in Section C.1 that acceptance Method 2 of EPRI NP-5652 should not be employed as the basis for accepting items from suppliers with programs that do not effectively implement their own necessary controls.

Sampling

The staff agrees with Section 3.1.3 of EPRI NP-5652 which states that tests and inspections may be performed utilizing a sampling plan when appropriate. This position is also expressed in Section B of GL 89-02 for suppliers with an acceptable quality assurance program as confirmed by audit or survey. One approach is to (1) establish batch or lot homogeneity, particularly with respect to the control of critical characteristics, and (2) verify through audit or survey the basis for accepting certifications regarding lot homogeneity. Licensees may implement alternative measures to audit or survey which would be acceptable to the staff for demonstrating lot homogeneity. One such method would be the procurement of consecutive serial numbered items or items produced from the same manufacturing run or time period. However, confidence in the substance of certification to this effect would have to be established.

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Like-For-Like Replacements

Generic Letter 91-05 defines a like-for-like replacement as the replacement of an item with an item that is identical (e.g., purchased at the same time from the same supplier as the item it is replacing, or if the purchaser can verify that there have been no changes in the design, materials or manufacturing process since initial procurement of the item being replaced).

If the licensee can demonstrate that the replacement item is identical, then the licensee need not identify the safety function or review and verify the design requirements and critical characteristics. However, if differences from the original item are identified in the replacement item, then the item is not identical, but similar to the item being replaced, and an evaluation is necessary to determine if any changes in design, material, or the manufacturing process could impact the functional characteristics and ultimately the component's ability to perform its required safety functions. Acceptance of both identical and similar items (excluding items purchased at the same time from the same supplier) could be based on a documented survey of the supplier's commercial quality program and controls for the applicable item. If this approach is used, it should confirm and document that the technical requirements of the replacement item are the same as those of the original item being replaced. The purchase order for the replacement item should also reference and invoke the quality program and controls surveyed which are applicable to the item purchased, and there should be reasonable assurance that the supplier's program controls in-place, as observed during the survey, are likely to continue.

Section 3.2.3 of EPRI NP-5652 states that when conducting a commercial-grade survey, the purchaser must (1) confirm that the selected CGI's critical characteristics are controlled under the scope of the supplier's commercial quality system activities, and (2) that the purchaser must also be reasonably assured that the commercial supplier's activities adequately control the CGIs supplied. Assessment teams identified that some licensees relied on broad-based commercial-grade surveys for product acceptance (often performed by other organizations) and that such surveys did not provide sufficient basis that the supplier controlled the required critical characteristics of the specific items supplied. GL 89-02 states in Section C.1 that acceptance Method 2 of EPRI NP-5652 should not be employed as the basis for accepting items from suppliers with programs that do not effectively implement their own necessary controls.

NRC FORM 335
(2-89)
NRCM 1102,
3201, 3202

U.S. NUCLEAR REGULATORY COMMISSION

BIBLIOGRAPHIC DATA SHEET

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