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Licensee Contractor and Vendor Inspection Status Report

Quarterly Report
April - June 1997

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Office of Nuclear Reactor Regulation

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Licensee Contractor and Vendor Inspection Status Report

Quarterly Report
April - June 1997

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Division of Reactor Controls and Human Factors
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

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ABSTRACT

This periodical covers the results of inspections performed between April 1997 and June 1997 by the NRC's Special Inspection Branch, Vendor Inspection Section, that have been distributed to the inspected organizations.

CONTENTS

	<u>PAGE</u>
Abstract	iii
Introduction	vii
Inspection Reports	1
ABB Service Incorporated Regional Service Center Fenton, MO (99901281/97-01)	2
C&D Charter Power Systems, Inc. Conshohocken, PA (99901305/97-01)	7
Dubose National Energy Services, Inc. Clinton, NC (99900861/97-01)	21
General Electric Nuclear Energy Wilmington, NC (99900003/97-01)	42
SynTech Products Corporation Toledo, Ohio (99901313/97-01)	58
Nuclear Advanced Technology Division Westinghouse Electric Corporation (99900404/97-01)	74
Select Generic Correspondence on the Adequacy of Vendor Audits and the Quality of Vendor Products	88

INTRODUCTION

A fundamental premise of the U. S. 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 Federal government and nuclear industry have established a system for the inspection of commercial nuclear facilities to provide for multiple levels of inspection and verification. Each licensee, contractor, and vendor participates in a quality verification process in compliance with requirements prescribed by the NRC's rules and regulations (Title 10 of the *Code of Federal Regulations*). The NRC does inspections to oversee the commercial nuclear industry 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 quality verification programs.

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

The NRC 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 construction permits and operating licenses in vendor-related areas. These inspections are done to ensure that the root causes of reported vendor-related problems are determined and appropriate corrective actions are developed. The inspections also review vendors to verify conformance with applicable NRC and industry quality requirements, to verify oversight of their vendors, and coordination between licensees and vendors.

The NRC does inspections to verify 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 found, NRC ensures that affected licensees are informed through vendor reporting or by NRC generic correspondence such as information notices and bulletins.

This quarterly report 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 inspected. This information will also alert affected regional offices to any significant problem areas that may require special attention. This report also lists selected bulletins, generic letters, and information notices, and include copies of other pertinent correspondence involving vendor issues.

INSPECTION REPORTS

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

June 4, 1997

Mr. D. P. Polizzi
Manager, Regional Service
ABB Service Inc.
Regional Service Center
400 Biltmore, Suite 520
Fenton, MO 63026

SUBJECT: NRC INSPECTION REPORT NO. 99901281/97-01

Dear Mr. Polizzi:

This letter refers to the inspection conducted by Mr. K. R. Naidu and Mr. V. L. Beaston of this office on May 15, 1997. The inspection included a review of activities conducted at your facility in Fenton, Missouri. The enclosed report presents the results of that inspection.

The inspectors evaluated the program that ABB Service Inc. (ABB) established to implement the provisions of Part 21 of Title 10 of the Code of Federal Regulations (10 CFR Part 21) for reporting defects and noncompliances, and Appendix B to 10 CFR Part 50. The inspectors reviewed the documentation on selected metal-clad K-line circuit breakers that Illinois Power Company's Clinton Power Station sent to your Fenton shop for refurbishing. Within these areas, the inspection consisted of an examination of procedures and representative records, interviews with personnel, and observations by the inspectors. The inspectors identified one unresolved item relative to the availability of breaker specific drawings to verify the correct contact configuration and propose to obtain additional information on this item during a future inspection at your Houston Service Center.

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.

Sincerely,

A handwritten signature in black ink, appearing to read "Robert M. Gallo", is written over the typed name.

Robert M. Gallo, Chief
Special Inspection Branch
Division of Inspection and Support Programs

Docket No.: 99901321

Enclosure: Inspection Report 99901321/97-01

INSPECTION REPORT

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

ORGANIZATION: ABB Service Inc.
Fenton, Missouri

REPORT NO.: 99901321/97-01

ORGANIZATIONAL CONTACT: Mr. D. P. Polizzi, Manager, Regional Service
314 343 0232

NUCLEAR INDUSTRY ACTIVITY: ABB Service Inc. services switchgear
manufactured by I.T.E.

INSPECTION CONDUCTED: May 15, 1997

INSPECTORS: Kamalakar R. Naidu, NRR
Virgil L. Beaston, NRR

APPROVED BY: Gregory C. Cwalina, Chief
Vendor Inspection Section
Special Inspection Branch
Division of Inspection and Support Programs
Office of Nuclear Reactor Regulation

1 INSPECTION SUMMARY

ABB Service Inc., located in Fenton, Missouri, performs switchgear overhauling services for commercial and nuclear customers. Recently it performed services on 480 volt metal-clad circuit breakers installed at Illinois Power Company's (IPC) Clinton Power Station (Clinton). The circuit breakers were originally designed and manufactured by I.T.E Imperial Company (ITE). The ownership subsequently changed and the company became known as I.T.E.- Gould, Gould-Brown Boveri, Brown Boveri Electric and finally ASEA Brown Boveri (ABB). ABB manufactures low-voltage metal-clad circuit breakers, and medium-voltage circuit breakers at Florence, South Carolina. ABB at Sanford, Florida, assembles complete switchgear installations. ABB has established service centers at several locations in the U.S. The service center at Fenton currently services the circuit breakers installed in Clinton. Recently, ABB decided to service its nuclear customers from four locations, Columbia, Maryland; Cleveland, Ohio; Charlotte, North Carolina; and Houston, Texas. In the future, breakers which need service will be shipped to ABB Services, Houston, Texas.

The inspectors reviewed the documentation on selected metal-clad K-line circuit breakers that IPC's Clinton sent for refurbishment.

The inspection bases were:

- Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to Part 50 of Title 10 of the Code of Federal Regulations (10 CFR Part 50)
- 10 CFR Part 21, "Reporting of Defects and Noncompliance"

During this inspection, the NRC found no instance where ABB failed to meet NRC requirements. However, the inspectors identified one unresolved item regarding the availability of breaker specific drawings (Section 3.1).

2 STATUS OF PREVIOUS INSPECTION FINDINGS

This is the first inspection at ABB Service Inc., Fenton, Missouri.

3 INSPECTION DETAILS

3.1 Breaker Refurbishment

a. Scope

On May 15, 1997, the inspectors reviewed the records documenting the refurbishment performed on Clinton breakers and reviewed the refurbishment activities with the personnel who performed the work at the Fenton shop. The inspectors also reviewed the purchase order (PO) that IPC issued to ABB for the refurbishing services including selected revisions to the PO to determine if the work performed on selected Clinton breakers met the quality requirements.

b. Observations and Findings

IPC issued PO 554794 to ABB Sanford, Florida, to rework/refurbish a circuit breaker with serial number 51752A-9-02616 with SS-13 type solid state trip device in compliance with ABB Procedure MS 3.1.1.9-2D, "Maintenance and Surveillance, Low Voltage Switchgear Equipment." In subsequent revisions to the PO, Clinton added additional breakers to be refurbished.

IPC attached to the PO a copy of its "Supplier Quality Assurance Program Requirements," QAP-407-02F02, Revision 2, which invoked 10 CFR Part 50 Appendix B, and 10 CFR Part 21. IPC required ABB to obtain its approval for all nonconformance reports initiated by ABB during the refurbishment where ABB would recommend "use as is" or "repair." IPC required ABB to issue a Certificate of Rework or Repair certifying that the item was reworked using original equipment parts by a qualified technician, and that the item will function in accordance with the original design specification.

Revision 02 to the PO, dated June 23, 1995, required the replacement of all EQ sensitive (organic) items with less than 40-year qualified life. As a minimum, Agastat time delay relays, Gould auxiliary relays (J13PA4312), and control and power Shawmut type fuses were to be replaced.

Revision 09 to the PO, dated November 29, 1995, required ABB to test the breakers for "as-found" conditions. ABB was also to rework/refurbish and lubricate the breakers, and test the trip devices to verify the time/current curve.

Revision 12 to the PO, dated March 12, 1996, added the refurbishment of breaker Serial Number (S/N) 51752E-9-02616. ABB was to (1) reconfigure the breaker and update documentation as appropriate, (2) replace the electrically operated mechanism with a manually operated mechanism, (3) replace the lower molding and CT assembly with 600-A variety, (4) change the solid state trip device to 600-A (SS 14), (5) add an alarm switch, and other minor accessories as required to conform with Drawing 708 663, Revision 0.

The records on work performed on breakers with S/Ns 51752AB-109-201054, 51752B-9-11456, 51752E-9-02616, 51752B-9-01456, 51752F-11-02616, and 51752F-9-01616, indicate that ABB personnel had operated the Clinton breakers, disconnected the breaker mechanisms, and inspected the main roller and carrier and other major pins and moving components in the breakers. Records indicated that the operating mechanisms were dirty and had to be disassembled, cleaned, lubricated and reassembled. On receipt of the breakers from ABB, Clinton personnel performed receipt inspections and documented adverse findings (discussed below) in Condition Reports (CRs). The inspectors discussed the adverse findings in these CRs with the ABB personnel and reviewed the refurbishment records.

During receipt inspections, Clinton identified a deficiency related to incorrect wiring of leads 11 and 12 on the alarm switch in four breakers. Clinton corrected this error by switching the leads, and informed ABB during a meeting at the Clinton plant. The inspectors interviewed the ABB personnel

who worked on the breakers, and determined that the technician who wired the switch had made an error. ABB personnel stated that they could not verify the correct wiring of the alarm switch because Clinton did not send them the drawings for the individual breakers. At the time of the inspection, ABB personnel stated that this condition had not been documented in a nonconformance report because the technician who made the error had been away working on a job in Maine, and returned to the shop only the previous week. ABB personnel subsequently documented this in a nonconformance report.

Clinton also identified a problem related to the configuration of the 8-point auxiliary switch which is mounted on the "C" phase side below the Power Shield unit. The switch is connected through a right-hand link assembly to the jack shaft of the breaker. The contacts in the auxiliary switch change state when the breaker operates. Clinton personnel had documented that, when the breakers were receipt inspected, the contact configuration did not meet the breaker drawing requirement. ABB personnel stated that different breakers have different contact configurations. A 90-degree rotation of the operating lever will change the contact configuration. ABB personnel informed the inspectors that Clinton did not provide them with the drawings for the individual breakers. Therefore, ABB could not verify the correct contact configuration. Further, ABB did not identify the need for the drawings to perform safety-related refurbishments.

c. Conclusion

Initially, Clinton did not provide individual breaker drawings to ABB, and ABB did not request them. The inspectors considered this to be an indication of inadequate Licensee - Vendor interface. Adequate technical information exchange (e.g., circuit breaker drawings) between personnel at Clinton and ABB could have reduced the number of problems that were identified in the condition reports. Since the service center at Fenton will no longer refurbish safety-related breakers, this concern is being identified as an unresolved item and will be followed up at a future inspection of the ABB Service Center at Houston, where ABB proposes to refurbish the Clinton breakers in future. (Unresolved item 99901321/97-01-01)

4. PERSONS CONTACTED

ABB Service Company

D. P. Polizzi, Manager, Regional Service
R. Clostermann, Service Engineer
J. O. Webb, Director of Quality

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

99901321/97-01-01 URI unavailability of breaker drawings

UNITED STATES
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

May 16, 1997

Dr. Leslie S. Holden
Vice President Technology
C&D Charter Power Systems, Inc.
Washington & Cherry Streets
Conshohocken, PA 19428

SUBJECT: NRC INSPECTION REPORT 99901305/97-01

Dear Dr. Holden:

On January 9, 1997, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at the C&D¹ Charter Power Systems, Inc. (C&D) facilities at Leola, Pennsylvania, regarding cylindrical lead-acid battery cells, "round cells," that C&D manufactures and supplies to nuclear power plant facilities as a contractual manufacturing representative for Lucent Technologies, Incorporated, (Lucent). The round cells are designed, qualified and contractually controlled by Lucent, and are used in Class 1E electrical safety-related applications at five nuclear power plant facilities. The enclosed report presents the results of the inspection.

The NRC team determined that C&D has manufactured and controlled the nuclear power plant customer orders under its commercial manufacturing controls, in association with Lucent's specifications. C&D has established and implemented an International Organization for Standardization (ISO)-9001, "Quality Systems-Model for Quality Assurance in Design/Development, Production, Installation and Servicing" quality assurance program at its Leola facility through its corporate office in Blue Bell, Pennsylvania. Although the team assessed portions of your quality assurance program implementation, your activities were not assessed to Part 50 of Title 10 of the Code of Federal Regulations (10 CFR Part 50), Appendix B quality assurance requirements; therefore, no response to this letter is required.

However, the team determined that Lucent contractually accepted 10 CFR Part 50, Appendix B quality requirements from the Duke Power Company but did not pass those requirements on to C&D. Therefore, the team reviewed certain portions of C&D's quality activities to Appendix B quality requirements to assess Lucent's compliance with regulatory requirements. The results of that review are discussed separately in NRC's inspection report of Lucent Technologies, Report 99901309/96-01.

¹ C&D is a registered trademark of C&D Charter Power Systems, Inc.

Dr. L. S. Holden

-2-

In accordance with 10 CFR 2.790 of the NRC "Rules of Practice," a copy of this letter and enclosures will be placed in the NRC's Public Document Room (PDR). Should you have any questions concerning the issues discussed in this letter, we will be pleased to discuss them with you.

Sincerely,

A handwritten signature in black ink, appearing to read "Robert M. Gallo". The signature is fluid and cursive, with the first name "Robert" being more prominent than the last name "Gallo".

Robert M. Gallo, Chief
Special Inspection Branch
Division of Inspection and Support Programs
Office of Nuclear Reactor Regulation

Docket No.: 99901305

Enclosure: Inspection Report 99901305/97-01

cc: Mr. T.J. Kinden, Director
Quality Assurance
C&D Charter Power Systems, Inc.
Washington & Cherry Streets
Conshohocken, PA 19428

Mr. Greg Stoermer, Plant Manager
C&D PowerCom
82 East Main Street
Leola, PA. 17540-1940

U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION

Report No.: 99901305/97-01

Organization: C&D¹ Charter Power Systems, Incorporated
1400 Union Meeting Road
Blue Bell, Pennsylvania 19422-0858

Contact Address: Terry J. Kinden, Director of Quality Assurance
Washington & Cherry Streets
Conshohocken, PA 19428
(610) 825-2150 ext. 245

Facility Inspected: C&D PowerCom²
82 East Main Street
Leola, Pennsylvania

Nuclear Industry Activity at Facility: Manufacturers of Lucent Technologies cylindrical lead-acid battery cells, Lineage³ 2000 Round Cell batteries (round cells), that are supplied to nuclear power plant facilities for Class 1E electrical safety-related applications.

Inspection Date: January 6-9, 1997

Inspectors: Joseph J. Petrosino, Team Leader
Saba N. Saba, EELB:DE:NRR
Stephen D. Alexander, VIS:PSIB:DISP

Approved by: Gregory C. Cwalina, Chief
Vendor Inspection Section
Special Inspection Branch
Division of Inspection and Support Programs
Office of Nuclear Reactor Regulation

¹ C&D is a registered trademark of C&D Charter Power Systems, Inc.

² A division of C&D Charter Power Systems, Inc.

³ Registered trademark of Lucent technologies, Incorporated (formerly known as American Telephone and Telegraph Company [AT&T]).

1 INSPECTION SUMMARY

During this inspection, the NRC inspectors reviewed the implementation of selected portions of C&D Charter Power Systems, Incorporated (C&D) quality assurance (QA) program, reviewed activities associated with the manufacture of round cells, reviewed pertinent design, engineering and manufacturing documents, reviewed the Lucent Technologies, Incorporated (Lucent) manufacturer requirements regarding Lucent's control of C&D's Leola manufacturing activities, and compared the Lucent requirements with actual manufacturing procedures and practices. The team was aware that several nuclear plant round cell batteries experienced premature loss of capacity.

The inspection bases were:

- Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to Part 50 of Title 10 of the Code of Federal Regulations (10 CFR Part 50)
- 10 CFR Part 21, "Reporting of Defects and Noncompliance"
- The American National Standard Institute/The American Society of Mechanical Engineers (ANSI/ASME) Standard N45.2-1977, "Quality Assurance Program Requirements for Nuclear Facilities" (ANSI N45.2-1977), as endorsed by U. S. Nuclear Regulatory Commission Regulatory Guide (RegGuide) 1.28, "Quality Assurance Program Requirements (Design and Construction)," Revision 2, February 1979 (RegGuide 1.28)

Although C&D's quality program for its manufacture of round cells was found to be generally well established and implemented, the team found some weaknesses that are discussed in this report. Those weaknesses are also discussed in NRC Inspection Report 99901309/96-01, Lucent Technologies-Dallas, Texas.

2 STATUS OF PREVIOUS INSPECTION FINDINGS

This was the first NRC inspection of C&D's facilities at Leola, Pennsylvania.

3 INSPECTION FINDINGS AND OTHER COMMENTS

3.1 Quality Assurance Program and Requirements

a. Scope

The inspection team (team) reviewed the establishment and implementation of selected portions of the C&D quality program, which was documented in the C&D Quality System Program Manual (QSPM), Issue P, dated June 1995.

b. Observations and findings

The QSPM stated that its purpose was to establish the basic operating policies and procedures to be employed by C&D, and to meet applicable requirements of International Organization for Standardization (ISO)-9001, "Quality Systems-Model for Quality Assurance in

Design/Development, Production, Installation and Servicing," ANSI [N]45.2-1977 and other imposed specifications. The team noted that C&D's Leola facility had been certified to ISO-9001.

The team was apprised by C&D that it assures that its components conform to the specified requirements through implementation of C&D's quality system program that is delineated in the QSPM. The QSPM's foreword explains that C&D's quality system program is implemented through the QSPM, departmental standard operating procedures, work instructions, drawings, bills of materials, material specifications, process specifications, and quality and test procedures. The team reviewed applicable licensee and Lucent procurement documents and did not find any instances where AT&T/Lucent had imposed any unique nuclear quality assurance requirements upon C&D.

The team noted that the C&D facilities that are under C&D's quality system program are specified in the QSPM, specifically: (1) Corporate Headquarters-Blue Bell, PA-Control and maintenance of design and qualification aspects of all C&D safety-related components; (2) Attica, IN-Class 1E station batteries; (3) Dunlap, TN-Class 1E station battery chargers; (4) Conshohocken, PA-seismically qualified, Class 1E station battery racks; (5) Leola, PA-Class 1E station batteries, round cell; (6) Conyers, GA-commercial products; (7) Huguenot, NY-commercial products; and (8) Ratelco, Incorporated, Seattle, WA-electronics, including battery charger assemblies used in safety-related applications of C&D battery chargers.

c. Conclusions

The team determined that C&D-Leola manufactured the round cells according to its commercial QA program. No nuclear qualification, manufacturing or testing requirements were imposed onto C&D by Lucent for the manufacture of the round cells.

3.2 10 CFR Part 21 Program

a. Scope

The inspectors evaluated the procedure adopted by C&D to implement the requirements of 10 CFR Part 21 by reviewing Standard Policy and Procedure Number A-14-4, "Reporting of Defects and Nonconformances in accordance with Federal Regulation 10 CFR 21 (US Nuclear Regulatory Commission)," dated March 18, 1997.

b. Observations and findings

Although C&D is not responsible for the requirements of 10 CFR Part 21 at its Leola facility, the team determined that C&D had implemented the provisions of Procedure A-14-4 into its Leola facility round cell

operation for nuclear power plant orders. Additionally, the team noted that documents required by Part 21 had been posted at various locations at the Leola facility.

During a previous inspection, in September 1996, at C&D's Attica, Indiana, facility, the team performed a review of Procedure A-14-4. The review determined that some weaknesses existed in the procedure and C&D committed to modify the procedure to address the NRC concerns within 90 days of the date of Inspection Report 99901304/96-01, (March 17, 1997). Procedure A-14-4 had not yet been revised and provided to the C&D-Leola facility.

c. Conclusions

The team did not identify any concerns in this area.

3.3 Implementation and Control Of Quality Program

a. Scope

During the inspection at the C&D-Leola facility, the team observed manufacturing activities and reviewed associated documents to assess the adequacy of the manufacture of the round cells.

b. Observations and Findings

Process Controls The team observed numerous manufacturing process control activities at C&D's facility and reviewed associated documents. The team noted that many of the C&D manufacturing work stations had key sections of the applicable process control work instructions posted for use of the area personnel. The team also noted that a Lucent required resident inspector is stationed at the C&D facility. The resident inspector is typically on the premises several days a week. The resident inspector witnesses testing activities of round cell battery strings, and performs in-process manufacturing verifications and random inspection of incoming material. No anomalies were noted by the team in the manufacturing process control activities that were observed.

Charging & Conditioning The team performed a comparison of the C&D procedures, practices and documentation used during the process of initial charging and conditioning of round cell strings with the charging and conditioning requirements (design bases) of Lucent's design and manufacturing specification KS-20472 and associated documents. The team reviewed the charging records for string 345-96 for McGuire Station and strings 223-92 and 224-92 for Oyster Creek.

C&D conducts all of its manufacturing activities (including charging and conditioning) in the same manner, in accordance with its documented ISO-9001 quality system in conjunction with Lucent's design and specification documents. However, the team identified several instances

in which C&D's procedures, practices and documentation for the charging and conditioning process departed from the requirements of the Lucent design specification. The following are examples of these departures:

- KS-20472, Section 5.25, Step (c), prescribed the initial formation charge for the string. The step included a cautionary note that stated that the cell temperature should not be allowed to exceed a certain value. Although C&D stated that the temperatures are monitored, they were not recorded, nor was there a provision in the C&D record forms to do so.
- KS-20472, Section 5.25, Step (d), prescribed the first conditioning discharge following the initial formation charge, per Table II for List 1S round cells, to be a certain amperage for a certain duration. This discharge removed a specific amount of ampere (ah) from each cell of the string. The step included the warning "No individual cell should be allowed to go below [specified] volts." KS-20472, Section 5.25, Step (e) required that, following the Discharge, the string be recharged to a specific percentage of the ampere-hours removed during the discharge for a minimum time duration. This charge then should have restored a minimum and a maximum value.

However, the overall charging record sheet, called "Procedure Sheet 1," was pre-printed with the annotation, "[specified number] amps for [certain number of] hours" for this charge. This charge would put in more ampere-hours than allowed by the specification. Although C&D produced a 1986 memorandum from Lucent (then AT&T/Bell Laboratory) authorizing this departure from KS-20472, the specification had not been updated, in over four years, to reflect this modification to the prescribed charging and conditioning (C&C) process. The charge records reflected that the string was, in fact, recharged per Procedure Sheet 1 instead of KS-20472.

- KS-20472, Section 5.25, Step (f), prescribed a "First Taper Discharge," per Table III for List 1S round cells, to be for a specific periods at certain current values to remove a specific number of ampere-hours. The first post-taper recharge per Step (g) was supposed to ensure that a certain percentage of the ampere-hours were removed in the previous discharge. However, Procedure Sheet 1 was pre-printed with the annotation, "[specified value] amps for [certain number of] hours" followed by "[specified value of] amps for [certain number of] hours," more than allowed by the specification. Although C&D produced another 1986 memorandum from Lucent (then AT&T/Bell Laboratory) authorizing this departure from KS-20472, the specification did not reflect this four-year old design basis change to the prescribed charging and conditioning (C&C) process. The charge records reflected that the string was recharged per Procedure Sheet 1 instead of KS-20472.

- KS-20472, Section 5.25, Steps (h) and (j), prescribed the required sequential "[specified value]-Amp Discharges." The steps stated "Discharge at the Table IV rate until the first cell reaches [specified value] volts." However, C&D OI-20-0900.2, "Charging" (Section 6.3.16, "Water Discharges"), did not provide for normal discharge termination upon reaching a prescribed voltage (on the first cell to reach it). Instead, Step 6.3.16.3 called for termination "at the normal discharge end time." The note above step 6.3.16.3 stated: "If any cell has a voltage of [certain number of] volts or less, terminate the discharge and notify your supervisor." Therefore, the C&D procedure called for discharging until an end time that is not defined as the termination point for this particular discharge in KS-20472. Also, the C&D procedure prohibited allowing any cell to go below a certain voltage, but did not require discharging until reaching a specified voltage on the first cell that reaches this voltage as the language of the Lucent specification states.

In view of the explicit language in Step (h) of the specification (as distinguished from language explicitly prohibiting discharging below a specified voltage elsewhere in the specification), the language in the C&D OI was contrary to the requirements of specification KS-20472. As a result, the charge records showed that both specified discharges went only to a certain voltage on the lowest cells. Although the practice of discharging until the first cell reached the specified voltage (instead of the prescribed voltage) had been authorized in 1986 on a limited, experimental basis, C&D could not provide documentation authorizing this departure from KS-20472 for general production use. This resulted in the string not being discharged in this step to the extent required by KS-20472.

- KS-20472, Section 5.25, Step (i), prescribed the recharges for the two sequential "[specified value]-Amp Discharges" of Steps (h) and (j) respectively. The recharges were supposed to be a specified percentage of the ampere-hours removed in the previous discharge. Since both discharges continued for several hours, they were discharged to a certain value. Therefore, according to the KS-20472 formula, a specified minimum of the ampere-hours should have been recharged. However, Procedure Sheet 1 was pre-printed with the annotation, "[specified value of] amps for [certain number of] hours," less than required by the KS-20472 formula using the abbreviated discharges. This was also much less than intended by KS-20472 because the recharge amount, even if calculated and performed in accordance with the KS-20472 formula, would have been based on a discharge to a nominal voltage, less than the amount of discharge specified by KS-20472 in Steps (h) and (j).
- KS-20472, Section 5.25, Step (k), prescribed a "Second Taper," or "[specified value]-amp Taper" discharge per Table V for List 1S round cells, to be conducted in several steps at specific values. Step (l) required discharge to "[a specified value of] volts per

cell average," or for a specified ampere-hour value with the caution that no cell should be allowed to go below a certain voltage. However the discharge record (Form RS533) showed that no cell went below the minimum allowed voltage during the phase and none reached the specified voltage during any part of the second taper discharge. Although the minimum total ampere-hours were discharged, no cell achieved the lowest voltage specified by KS-20472.

- The final capacity testing specified by KS-20472 following charging and conditioning was modified for Strings 223-92 and 224-92 by a procedure required by Lucent's customer, GPU Nuclear, licensee for Oyster Creek. GPU Nuclear had contracted National Technical Systems (NTS), Inc., of Acton, Massachusetts, to perform the dedication of the round cell strings for Oyster Creek purchased from Lucent as commercial grade items. NTS Procedure 60145-93N, Revision 2, was used as the basis for dedication of the strings. The NTS dedication procedure modified the standard capacity test discharge rate following the specified float period prescribed in KS-20472.

Instead, the NTS procedure called for a high-current discharge, recharge, and a several hour discharge, intended to better simulate design basis service conditions at Oyster Creek. The test record contained a notice of anomaly indicating that only 95-percent capacity had been demonstrated by the discharge tests, but that this was acceptable. The explanation of the reduced capacity was the interruption of the standard "conditioning" sequence to perform the NTS dedication tests. However, this language did not accurately characterize the circumstances in that the conditioning phase of the KS-20472 process, including the final several-day float charge, was, in fact, completed. Only the final capacity test discharge, not considered part of conditioning, was omitted in favor of the NTS multiple hour discharges.

- In reviewing the test and cell selection records for strings 223-92 and 224-92, the inspector noted that one test for 223-92 was terminated several minutes early. A notice of anomaly (NOA) also noted the early stop, but had the wrong time. In addition to the records having a number of other anomalies, such as not all forms being fully or correctly filled out and some erroneous operation ending times recorded. For example, one recharge for a specific discharge was listed as starting at a certain value on 11/21/92, but ending at the same value on 11/22/92, a longer period than specified on Procedure Sheet 1; yet, the second discharge was recorded as starting earlier on 11/22, and the inspector believed this entry to likely be the correct one. The charge end time entry of the first entry on 11/22 was apparently in error, but there was no indication that the record had been reviewed and the error identified by C&D QA, engineering or management or representatives of Lucent or GPU Nuclear.

- The inspector also noted that the cell in position 43 in string 223-92 (cell serial no. 78471) finished the test with a low-out-of-specification voltage, yet this cell was selected for shipment by GPU Nuclear according to the selection record. Conversely, although the cell in position 64 had a low voltage, but met the acceptance criterion, it was rejected. The record indicated no rationale for the apparently inappropriate cell selection, nor could C&D offer any explanation.
- The inspector also reviewed the charging and conditioning records for round cell string 345-96, produced for Lucent's customer, Duke Power for Class 1E service at McGuire Station. The same process was used for this string as for the Oyster Creek strings discussed above except that the standard final capacity test discharge was conducted. Therefore, this string underwent charging and conditioning with the same deviations from KS-20472 as occurred with the Oyster Creek strings, only some of which, as above, had ever been authorized by Lucent memorandum, and still without formal revision to KS-20472 (Issue 8 still in effect).

Chemical Analysis of Epoxy Mixture The team reviewed the applicable section of KS-20472 regarding preparation and mixture verification of epoxy used to seal the round cell jars around the terminal posts. Also reviewed were the Lucent epoxy titration procedure referenced by KS-20472 that was prescribed on AT&T Drawing L193472, Issue 5, and the C&D epoxy titration procedure, BT-4, Revision 0, dated March 7, 1995. The procedures specify the quantitative analysis by titration of percent resin in hardener (done on each new mixed batch) and of the equivalent weight of hardener (done on each lot of hardener and each shift), the results of which are used in the percent-resin-in-hardener analysis calculation.

Following this review, the team observed a routine set of epoxy titration analyses, performed by C&D's usual analyst in the C&D laboratory. The analyses observed were the determination of percent hardener in resin, and the determination of the equivalent weight of hardener. The team identified two instances in which C&D epoxy titration procedure BT-4 deviated from AT&T Drawing L193472, specifically:

- L193472 called for titrating into the sample in a 125-ml Erlenmeyer flask; whereas BT-4 prescribed a 250-ml flask, and
- L193472 required adding a specific number of drops of Brom Creosol green indicator; whereas, BT-4 specified a range of drops that could be added.

The team also determined that the size of the flask can affect the efficiency of mixing of the sample (by means of a magnetic stirrer) with the indicator, and more importantly, with the drops of titrant (sulfuric acid). The amount of indicator added can affect the visibility of the endpoint. Other deficiencies in C&D procedure BT-4 noted were:

- The C&D procedure inappropriately defined the titration endpoint as a color change from blue to yellow; however, the analyst correctly described the color change as being from blue to green.
- The acceptance criteria for percent-hardener-in-resin and for hardener equivalent weight given on L193472 were not in the C&D procedure for use by the analyst, although the analyst was familiar with them.
- No sample vortex characteristics were specified to ensure uniform mixing in the flask.

The team observed two instances in which the analyst deviated from C&D procedure BT-4:

- Instead of the 250-ml Erlenmeyer sample flask specified by BT-4, the analyst used a 125-ml flask as specified by the Lucent drawing; although the analyst was unaware of the drawing requirement. He explained, correctly, that for the specified 50-ml sample size, the smaller flask provided the depth of liquid necessary to achieve an adequate vortex (using the specified magnetic stirrer) for proper mixing of the indicator and the titrant in the sample.
- The C&D analyst stated that he typically adds more drops of indicator than that specified in BT-4, nearly twice as much indicator as specified in drawing L193472.

In addition, the analyst did not employ the standard titration technique when near the expected endpoint of so-called "drop splitting" or "drop transfer" using a glass rod to take each drop allowed to form at the burette nozzle as the titrant level is lowered by the smallest burette graduation and placing the drop in the sample. Instead, the analyst simply slowed the expected near-endpoint rate of titration to about 1 drop per second, which may not allow for complete mixing and reaction of the titrant with the sample and indicator so as to show the endpoint when it first occurs before the next drop falls into the sample. This practice, with a less experienced analyst, and also using the 250-ml flask if BT-4 were followed, could cause the actual endpoint to be missed, thus degrading the sensitivity of the analysis or the accuracy of the results.

Audits and Surveillance of C&D-Leola by AT&T/Lucent A review of the AT&T Quality Management & Engineering Department (QM&E) audits and surveys indicated that AT&T/Lucent performed on-site audits of C&D to observe their capabilities and performance as required by Lucent's quality manual and technical specifications and drawings. The team noted that the QM&E personnel identified numerous quality problems over a several year period. However, contrary to the 10 CFR Part 50, Appendix B, quality assurance requirements which were imposed upon AT&T/Lucent, the team determined that Lucent did not take prompt action to address the effectiveness of C&D's control of product quality. That is, although Lucent identified numerous examples of conditions adverse

to quality over a three year period at the C&D-Leola facility, Lucent did not promptly correct those conditions adverse to quality identified or assure that C&D addressed the ineffectiveness of its program implementation consistent with the importance and complexity of the round cell product. It was also noted that the quality and reliability of the product that was shipped to nuclear power plants did not appear to be addressed in the documents reviewed by the team.

Consequently, the team determined that Lucent did not assure that the manufacturing services that it contracted from C&D, for fabricating its round cells for at least the McGuire station, consistently conformed to the procurement document specifications and requirements during the charging and conditioning manufacturing activities.

For example, a November 2, 1994, AT&T Bell Laboratories letter to the C&D Leola facility quality control (QC) Manager and associated documents discussed the findings of a September 21, 1994, mini quality audit of the round cell manufacturing and quality systems. AT&T's correspondence indicated that 15 separate areas were investigated during a period when C&D was in the process of increasing production rates of its round cells. The correspondence indicated that 11 of the 15 areas audited did not conform to AT&T's specification requirements. The correspondence also indicated that in light of a recent problem encountered with 1992 series 1SH cells sold to Arizona Public Service (Palo Verde), "it would behoove C&D to spend additional time and effort on training new employees and increasing inspection" at those operations where these new employees are located. The conclusion reached by the AT&T auditors was that the overall round cell quality was not up to usual standards. The letter to C&D itemized specific areas of concern and requested C&D's corrective action plan.

A December 19, 1994, AT&T Bell Laboratories Trip report documenting a December 14, 1994, follow-up mini quality audit stated that C&D had not compiled or composed the required corrective action plan, and the overall manufacturing process quality was found to be lower than C&D's usual standards. The trip report stated that although the observed deficiencies were not critical, they indicated "a general relaxation in standards."

The December 1994 report stated that on December 14, the inspection of round cell manufacturing process quality indicated that the manufacturing quality standards were continuing to trend downward. The letter indicated that the observation had been made over a period of time, was not specific to any one area, and that C&D's emphasis on quality and the commitment to quality have diminished over the last six months. The staff engineer recommended that AT&T and C&D meet to address both Companies' concerns and to "refocus on the critical importance of quality to this product's continued success."

Three months later on March 15, 1995, another mini quality audit was conducted and identified findings in 18 areas at the C&D-Leola facility. The overall conclusion reached was that "quality is poor." The AT&T

staff performing the audit stated that work instructions need to be reviewed with both the operators and C&D quality control inspectors and the importance of producing good quality parts needs to be reinforced.

c. Conclusions

No anomalies were noted by the team in the manufacturing process control activities that were observed during the performance of this inspection. However, in the charging and conditioning process area, the team concluded that:

- C&D charging and conditioning procedures and practices deviated from KS-20472 and only some of the departures were authorized by Lucent which had not updated its specification in several years to reflect the different practices
- C&D procedures were not always followed and records were not always fully accurate, nor apparently carefully scrutinized by Lucent, the ultimate user or its representatives, and
- the 64 cells selected by GPU Nuclear from each of the 72-cell strings produced and tested, did not all meet the acceptance criteria following the final test discharge.

In the chemical analysis of epoxy mixture area, the team concluded that the anomalies from the AT&T/Lucent drawing as well as the quantitative analysis practices employed could affect the accuracy and repeatability of the epoxy titration analyses for percent-resin-in-hardener and equivalent weight of hardener.

Additionally, although there is a wide range in the acceptance criteria for the epoxy titration analyses, the team was given the understanding that neither Lucent nor its customers had identified any of the anomalies observed by the team in the titration process. Therefore, the effects of these anomalies had not been evaluated by Lucent or their customers to determine their significance.

The team concluded that the AT&T/Lucent auditors identified negative quality aspects that would be indicative of an ineffectively established or implemented quality program. However, the team noted that neither Lucent nor C&D took appropriate measures to determine the cause of the problem and implement corrective action.

Additionally, neither the product or process appeared to be appropriately questioned regarding quality and reliability of the product. These issues are also discussed in NRC's inspection results of Lucent's Dallas, Texas facility, Inspection Report 99901309/96-01-02.

3.4 Entrance & Exit Meeting

In the entrance meeting on January 6, 1997, the NRC Team Leader discussed the scope of the inspection, outlined the areas to be inspected, and established interfaces with C&D management. In the exit meeting on January 9, 1997, the inspectors discussed their findings and concerns.

3.5 PERSONS CONTACTED

C&D Charter Power Systems, Inc.

G. Stoermer, Plant Manager-Leola
T. Kinden, Director, Quality Assurance
D. Johnson, Q.C. Manager

Lucent Technologies-Bell Laboratories, Murray Hill, New Jersey Staff

M.C. Weeks, Technical Staff
J.B. Baldasty, Technical Staff

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

April 29, 1997

Mr. James Dailey, Manager,
Quality Assurance
DuBose National Energy Services, Inc.
900 Industrial Drive
Clinton, NC 28328

Subject: NRC INSPECTION REPORT 99900861/97-01 AND NOTICE OF
NONCONFORMANCE

Dear Mr. Dailey:

On January 24, 1997, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection of DuBose National Energy Services, Inc. The enclosed report presents the results of that inspection.

During this inspection, the NRC inspectors found that the implementation of your quality assurance program failed to meet certain NRC requirements imposed on DuBose by customers. Specifically, the inspection identified instances where DuBose accepted material from qualified suppliers without receiving all documentation required by the applicable ASME Code or your purchase order provisions. In several instances DuBose also supplied material under your ASME Quality Systems Certificate without providing all documentation required by the applicable ASME NCA-3800 quality assurance program. Additionally, the inspection identified that DuBose supplier audits did not consistently identify objective evidence to support the audit conclusions, and the audit conclusions were not always consistent with the approved vendor list scope restrictions or the purchase order conditions.

These nonconformances are cited in the enclosed Notice of Nonconformance (NON), and the circumstances surrounding them are described in detail in the enclosed report. You are requested to respond to the nonconformances and should follow the instructions specified in the enclosed NON when preparing your response.

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 NRC's Public Document Room.

Sincerely,

A handwritten signature in black ink, appearing to read "Robert M. Gallo", with a long horizontal flourish extending to the right.

Robert M. Gallo, Chief
Special Inspection Branch
Division of Inspection and Support Programs
Office of Nuclear Reactor Regulation

Docket No.: 99900861

Enclosures: 1. Notice of Nonconformance
2. Inspection Report 9990861/97-01

NOTICE OF NONCONFORMANCE

DuBose National Energy Services, Inc.
Clinton NC

Docket No.: 99900861

Based on the results of an inspection conducted on January 21 through 24, 1997, it appears that certain of your activities were not conducted in accordance with NRC requirements.

- A. Criterion V, "Instructions, Procedures and Drawings," of Appendix B to 10 CFR Part 50 requires, in part, that activities affecting quality shall be prescribed by documented instructions, procedures, or drawings and shall be accomplished in accordance with these instructions, procedures, or drawings.

Paragraph NCA-3861(b) states that the Material Organization shall transmit all certifications received from other Material Organizations or approved suppliers to the purchaser at time of shipment.

Paragraph NCA-3862.1(b) of Section III of the ASME Code states that "When required chemical analyses (including mill heat analysis), heat treatment, tests, examinations, or repairs are subcontracted, the approved supplier's certification for the operations performed shall be furnished as an identified attachment to the Certified Material Test Report."

The following examples demonstrate failure to comply with the above requirements and constitute Nonconformance 99900861/97-01-01

1. Contrary to the above, DuBose Certified Material Test Report (CMTR) for material supplied to San Onofre Generating Station (SONGS), under Purchase Order (PO) 6N236016, certified that this material was supplied in accordance with their ASME Quality Systems Certificate (QSC), but did not reference or include the mill heat analysis as an identified attachment.
2. Contrary to the above, DuBose CMTRs for material supplied to Union Electric Co. under PO 094006, dated June 24, 1996, and to Carolina Power & Light Co. (CPL), under PO 8M1717 CJ, dated November 1, 1996, certified that the material was supplied in accordance with their QSC, but did not reference or include certifications from approved suppliers as identified attachments to their CMTRs.

- B. Criterion VII, "Control of Purchased Material, Equipment, and Services," of Appendix B to 10 CFR Part 50, requires, in part, that purchased material conforms to procurement documents.

Paragraph 10.3.1.4 of DuBose quality systems program (QSP) requires, in part that QA will review the vendor documentation against requirements of the PO, material specification, and, when required, the ASME Code. When unacceptable documentation is received, the material will be segregated until proper documentation can be obtained.

Paragraph 2.3.4.1 of DuBose QSP requires, in part, that POs shall require certification that the material was furnished under a program accepted by DuBose.

The following examples demonstrate failure to comply with the above requirements and constitute Nonconformance 99900861/97-01-02

1. Contrary to the above, DuBose accepted material supplied under PO 2284-63, dated February 5, 1993, without the starting material supplier being identified on the CMTR as required by this PO.
2. Contrary to the above, DuBose accepted material under POs 2284-63 and 1546-63, dated February 5, 1993, and August 24, 1992, respectively, without documented evidence that all requirements of the material specification (macroetch test) had been completed.
3. Contrary to the above, DuBose accepted material under POs 11645-66 and 10612-62, dated December 9, 1996, and December 12, 1996, respectively, without certification that the material was furnished under a quality program accepted by DuBose.

- C. Criterion IV, "Procurement Document Control," of Appendix B to 10 CFR Part 50 requires, in part, that requirements necessary to assure adequate quality are included in the documents for procurement of material.

Paragraph 2.3.4.1 of the DuBose QSP requires, in part, that POs shall require certification that the material was furnished under a program accepted by DuBose.

Contrary to the above, DuBose issued POs 11495-61, and 10649-68, dated November 11, 1996, and November 15, 1996, respectively, without including a requirement that the material must be furnished under a program accepted by DuBose. These POs had been reviewed and approved by DuBose QA on November 12, 1996, and November 18, 1996, respectively. (Nonconformance 99900861-01-03)

- D. Criterion VII, "Control of Purchased Material, Equipment, and Services," of Appendix B to 10 CFR Part 50 requires, in part, that the effectiveness of the control of quality by contractors and subcontractors shall be assessed at intervals consistent with the importance, complexity, and quantity of the product

Paragraph 7.4.1 of DuBose QSP states, in part, that evaluation (of vendor) is performed to adequately evaluate the quality and technical capability of the vendor.

Paragraph 2.4.3 of DuBose QSP states, in part, that the approved vendor's list (AVL) shall be compiled on the basis of a site evaluation of the vendor's quality program and Paragraph 2.4.2 states that the AVL shall show the scope of activity approved with any limitations.

Paragraph 2.3.2 states that quality related material and services shall only be purchased from vendors appearing on the AVL.

The following examples demonstrate failure to comply with the above requirements and constitute Nonconformance 99900861/97-01-04.

1. Contrary to the above, DuBose audit of Colonial Machine Company on April 11, 1996, did not document that all areas of the AVL approved scope of activity had been evaluated and determined to be adequately controlled. Specifically, the audit documentation did not describe what was reviewed in the areas of NDE, heat treatment, upgrading of unqualified source material, and control of suppliers of source material and weld repair activities were not addressed.
2. Contrary to the above, DuBose audit of Capitol Manufacturing Company on February 13, 1996, did not document that all areas of the AVL approved scope of activity had been evaluated and were adequately controlled. Specifically, the audit documentation did not

describe what was reviewed in the areas of material testing and NDE, and did not address heat treatment and the upgrading of unqualified source material.

3. Contrary to the above, on November 11, 1996, and on November 15, 1996, DuBose issued POs 11495-61 and 10649-68, respectively, to Marmon/Keystone Corporation for material that was not included in the product scope of the AVL.

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, Special Inspection Branch, Division of Inspection and Support Programs, 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 ____ day of ____ 1997

Enclosure 1

U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION

Report No: 99900861/97-01

Organization: DuBose National Energy Services, Inc.

Contact: James Dailey, Quality Assurance Manager
(910) 590 2151

Nuclear Industry Activity: Supplier of threaded fasteners, bars, tubular products, forgings, plates, flanges, fittings, and other items used primarily for nuclear applications.

Dates: January 21 through 24, 1997

Inspectors: Uldis Potapovs, Senior Reactor Engineer
Steven M. Matthews, Quality Assurance Engineer

Approved by: Gregory C. Cwalina, Chief
Vendor Inspection Section
Special Inspection Branch
Division of Inspection and Support Programs

Enclosure 2

1 INSPECTION SUMMARY

During this inspection, the inspectors reviewed the implementation of selected portions of DuBose National Energy Services, Inc. (DuBose) quality assurance (QA) program for supplying material under the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code) requirements, and for providing dedicated commercial grade material. The inspection was focused on the review of DuBose activities related to the supply of nonconforming material to Southern California Edison for use in the San Onofre Generating Station (SONGS).

The inspection bases were:

- Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to Part 50 of Title 10 of the Code of Federal Regulations (10 CFR Part 50).
- 10 CFR Part 21, "Reporting of Defects and Noncompliance"
- ASME Code, Section III, Subarticle NCA 3800.

During this inspection, four instances where DuBose failed to conform to NRC requirements imposed upon them by NRC licensees were identified. These nonconformances are discussed in Sections 3.2 and 3.3 of this report.

2 STATUS OF PREVIOUS INSPECTION FINDINGS

This was the first NRC inspection of DuBose at its present location and under the present management. The last NRC inspection of DuBose was conducted on May 21 through 25, 1984, at Roseboro, NC. The status of findings from that inspection were not reviewed.

3. INSPECTION FINDINGS AND OTHER COMMENTS

3.1 Description of Facilities and Activities

DuBose has been accredited by the ASME as a Material Organization (MO), supplying a wide range of metallic materials, including bars, threaded fasteners, castings, forgings, plates, fittings, flanges, tubular products, structural shapes, and weld filler material. According to DuBose management, approximately 70-80% of sales volume consists of safety related material supplied to nuclear utilities. Of that amount, approximately 50% is sold under their ASME Quality Systems Certificate as complying

with the requirements of NCA 3800. The company has an on site laboratory facility capable of performing spectrochemical analyses, tensile testing, hardness testing, and hydrostatic testing. No manufacturing operations, other than subdividing of material, are performed.

3.2 Follow up on Nonconforming material supplied to SONGS

a. Background

On May 10, 1996, DuBose issued a Certificate of Conformance/Compliance/CMTR (CMTR) to SONGS for forty six 3/4-10 ASME SA-194, Grade 7, heavy hex nuts, supplied as item 2 of SONGS purchase order (PO) 6N236016. SONGS receipt inspection of these nuts resulted in a nonconformance report (NCR) for failure to meet System 22 dimensional inspection requirements, as specified in the PO. It was also identified that chemical analysis of ten nuts showed that, while they complied with the specification limits, the nuts apparently came from two different heats of material (all 46 nuts were certified as coming from a single heat). SONGS performed a 10 CFR PART 21 reportability evaluation and determined that this event was not reportable.

Review of documentation obtained from SONGS indicated that the material was shipped from T&T Enterprises, Corona California, a supplier qualified by DuBose. DuBose provided the CMTR for this material, referencing their ASME QSC number and certifying compliance with the PO and ASME Code requirements. Attached to the DuBose CMTR was a CMTR from T&T Enterprises, certifying the performance of dimensional inspection (System 22), visual inspection, and macroetch (ASTM E-381), in accordance with their DuBose-approved QA program. Also furnished with the material was a CMTR from A&G Engineering II, Inc. (A&G), dated February 8, 1993 and issued to DuBose. The CMTR certified that the material was provided under A&G's QSC and contained the results of chemical and mechanical tests, apparently transcribed from Korea Bolt Ind. Co., LTD., Inspection Certificate, dated October 10, 1991, attached to the A&G CMTR. The certifications did not include a CMTR from the producing steel mill, and there was no indication of who produced the steel.

On September 12, 1996, NRC contacted DuBose and requested information concerning the apparent loss of traceability for this material. DuBose responded on September 19, 1996, by stating that, based on their review and additional chemical analyses, they determined that there was no conclusive evidence to indicate that the nuts were from mixed heats of material. This conclusion was based primarily on the fact that the heat code was forged into each nut by the manufacturer and that the chemical

overcheck results (15 samples) were within acceptable variance limits of ASTM A-29.

b. Observations and Findings

Documentation available at DuBose for the material discussed above did not contain a CMTR from the producing mill. Also, other than the macroetch that was apparently performed by T&T Enterprises, as discussed above, on a finished nut, there was no indication that macroetch testing was performed as a part of the steel producer's quality procedures, as required by the applicable material specification, ASME SA-194. A macroetch test on a forged nut, performed after the completion of manufacturing is not considered an acceptable method of achieving compliance with the material specification requirement. With respect to the missing CMTR from the steel producer, the inspector noted that, for material supplied under DuBose's QSC, paragraph NCA 3862.1(b) of the ASME Code requires that certifications of approved suppliers be furnished as identified attachments to the QSC holder's CMTR. In this case, the steel mill was considered an approved supplier, and the mill CMTR, or heat analysis, should have been available, and should have been provided to the recipient of the nuts.

With respect to DuBose's comment, as discussed above, that forging of the heat code into each nut during the manufacturing process assures heat traceability, the inspector noted that the forged-in heat markings could not be relied upon to provide full heat traceability for this situation, since a material mixup may have occurred at the producing mill or at an intermediate supplier to the nut manufacturer.

With respect to DuBose statement that, since the results of their chemical analyses of 15 nuts were within acceptable product analysis limits of ASTM A-29, there was no conclusive evidence that the nuts were from mixed heats, the inspector noted the applicable variance limits in A-29 were not intended to verify heat homogeneity, and that multiple analyses of a single heat of material would be expected to show less variability than indicated in the tables referenced in A-29.

Review of the nonconforming thread issue identified during SONGS receiving inspection showed that DuBose issued Non-Conformance Report (NCR) No. 1039 on June 18, 1996, as a result of communication from SONGS. Based on the NCR, a Corrective Action Report was issued to T&T Enterprises on June 19, 1996, describing the unsatisfactory condition, and requesting a response by July 19, 1996. On September 6, 1996, T&T Enterprises provided a response by stating that the internal threads were gaged with GO-NOGO plug gages and GO-NOGO cylinder gages which satisfied the

functional requirements of System 22. They identified the cause of the nonconformance as unavailability of the cone and vee type internal variable gages to appraise the values of the internal pitch diameters over the full length of the thread. The described corrective action was to assure the proper equipment is used to make these measurements on future orders. DuBose accepted the proposed corrective action on September 9, 1996.

The inspector also reviewed several procurement documents related to DuBose's acquisition of material from A&G, as summarized below:

- The nuts discussed above were purchased as a part of DuBose PO 2284-63, dated February 5, 1993 for approximately 85,000 ASME SA-194 nuts in sizes ranging from 5/8-inch to 1 1/2- inches. The nuts were to be provided under A&G's QSC. The inspector noted that PO contained an attached Form D-2. Paragraph 6. of this form stated that "The starting material manufacturer is to be identified on the CMTR produced by your company." Paragraph 7. of the same form stated that the use of foreign starting material is not permitted without DuBose's approval and that, when approval is given, backup certification is to be provided. The PO was amended on February 8, 1993, to allow foreign starting material. All other conditions were to remain the same. There was no further explanation concerning "backup certification." The inspector's review of documentation supplied by A&G did not identify any reference to "backup certification," and did not show any evidence that the starting material manufacturer had been identified as specified in the attachment to the DuBose PO for this material.
- On August 24, 1992, DuBose issued PO 1546-63 to A&G for 20 tons of threaded rod in accordance with ASME SA-193, Grade B7 in 12-foot lengths, and diameters ranging from 1/2 to 1 inch, to be supplied under A&G's QSC. The A&G CMTR for this material contained apparently transcribed results of the required chemical and mechanical tests and certified the material as being provided in accordance with their QSC. The CMTR did not include certification from the steel mill or include any certifications by approved suppliers. Also, there was no indication that a macroetch test, as required by the material specification, was performed during the steelmaking process.

c. **Conclusions**

As discussed above, the inspectors determined that, for SONGS PO N236016, DuBose did not provide all of the documentation required by the ASME Code provisions governing the application of their QSC when certifying Code material. Specifically, contrary to the requirements of ASME

Code, SC III, paragraph NCA 3862.1(b), DuBose did not include the producing mill heat analysis as an identified attachment to their CMTR. This item was identified as an example of Nonconformance 99900861/97-01-01.

The inspectors also determined that, contrary to Paragraph 10.3.1.4 of their QA Manual, A&G certifications for material supplied to fill DuBose POs 2284-63 and 1546-63 were either not reviewed by DuBose QA, or the review was not effective. Specifically, this material was accepted without identification of "starting material manufacturer" on these certifications, as required by Form D-2, attached to the DuBose POs. Additionally, the A&G certifications did not indicate that all of the testing, required by the material specification (macroetch), had been performed. These items were identified as examples of Nonconformance 99900861/97-01-02.

With respect to the mixed heat issue, based on review of the results of DuBose chemical analyses of 15 nuts, it appears likely that more than one heat of material was represented in the sample. However, as discussed above, since none of the samples tested by DuBose or SONGS failed to meet the requirements of the material specification, co-mingling of heats, if it did occur, appears to have been limited to the same grade of material. Additionally, a July 15, 1996, memorandum from the DuBose QA Manager to its President indicates that this material was being moved to the DuBose commercial inventory. The dimensional nonconformance of these nuts apparently resulted from the subcontractor's failure to perform all of the required measurements, and was dispositioned through the DuBose corrective action process.

3.3 QA Program Implementation

3.3.1 Program Description

The DuBose quality assurance program is described in their Quality System Program (QSP) and in Quality Control Procedures (QCPs). Revision 5 of the QSP, dated January 10, 1996, was in effect at the time of the NRC inspection. The QSP was written to comply with the ASME Code, Section III requirements applicable to Material Organizations, and also indicates compliance with 10 CFR 50, Appendix B, MIL I 45208, MIL Q 9858, NQA 1, ANSI 45.2, And ISO 9002.

Only selected areas of the QA program and its implementation were reviewed during this inspection.

3.3.2 Procurement Control

a. Inspection Scope

The inspectors reviewed DuBose approved vendors list (AVL) dated January 21, 1997, and selected several suppliers from the AVL to evaluate DuBose capability to qualify vendors for placement on the AVL.

b. Observations and Findings

b.1 Approved Vendors

According to Section 2.4, "Approved Vendors List," of DuBose QSP, vendors are placed on the AVL either on the basis of a site evaluation of the vendor's QA program in accordance with Section 7.4, "Vendor Surveys and Audits," of the QSP, or on the basis of verification that the vendor has an ASME issued QSC or an N-type Certificate of Authorization. Vendors that are placed on the AVL based on a DuBose site evaluation are qualified to one of two levels: For material traceability only, or as a DuBose qualified MO with QA program meeting the requirements of Subarticle NCA-3800 of Section III of the ASME Code.

To evaluate DuBose capability to qualify vendors for placement on the AVL as an approved supplier, the inspectors reviewed the following audits:

(1) Marmon/Keystone Corporation, Charlotte, North Carolina

The last DuBose audit of Marmon/Keystone was performed on October 13, 1994. The scope of the audit identified Marmon/Keystone as a supplier of ferrous and non-ferrous, seamless, and welded without filler metal, tubular products. Based on a review of the audit report, the inspectors determined that DuBose had adequately evaluated Marmon/Keystone, Charlotte, North Carolina, as a supplier of source material with controlled traceability.

However, the AVL's approved scope for purchases from Marmon/Keystone was, "MS - carbon welded tubular products in accordance with QA manual, 1st Edition, Revision 0, dated January 27, 1988." Therefore, in this instance, the AVL approved scope for purchases was inconsistent with the scope of DuBose's audit of Marmon/Keystone since it did not include nonferrous or seamless tubular products.

(2) Alloy Rods Incorporated

The last DuBose audit of Alloy Rods Inc., was performed on April 15, 1994. The scope of the audit was, "MO — ferrous and nonferrous bare and covered wire." On the basis of their review of the audit, the inspectors determined that DuBose had adequately evaluated Alloy Rods Inc. as a qualified MO.

However, the AVL's approved scope for purchases from Alloy Rods Inc. was, "MO — ferrous and nonferrous brazing material, bare and covered flux cored electrodes, and bare wire." Therefore, the AVL's approved scope for purchases was not consistent with, and was expanded beyond the scope of the DuBose audit of Alloy Rods Inc. Specifically, the audit scope did not include brazing material or bare and covered flux cored electrodes. This condition would permit DuBose buyers to procure material that was not included in the audited, and therefore, qualified capability of Alloy Rods Inc.

(3) Colonial Machine Company, Inc., Pleasantville, Pennsylvania

The last DuBose audit of Colonial Machine Company was performed on April 11, 1996. The scope of audit was: "MO — ferrous and nonferrous fittings, flanges and pipe hangers — machining and processing of DuBose supplied material." However, the Vendor Quality Assurance Survey/Audit Cover Sheet (Form D-46), also listed additional items including the following:

- bars
- plates
- seamless fittings
- forgings
- flanges
- seamless tubing product
- NDE (nondestructive examination)
- HT (heat treatment)
- weld repair
- material testing
- upgrading unqualified source material
- approval & control of suppliers of source material
- approval & control of suppliers of services

On the basis of their evaluation of DuBose April 11, 1996, audit of Colonial Machine Company, the inspectors determined that the audit report did not contain objective evidence that the audit had adequately evaluated the following areas:

- for NDE, HT, upgrading unqualified source material, and approval & control of suppliers of source material, the DuBose auditor did not document objective evidence of what was audited
- weld repair was not addressed
- for approval & control of suppliers of services, the DuBose auditor did not document objective evidence that supplier audits were evaluated.

Additionally, the AVL's approved scope for purchases from Colonial Machine Company was, "MO — ferrous and nonferrous fittings, flanges and pipe hangers — machining and processing of DuBose supplied material — welding in accordance with ASME B31.1 Code." Therefore, the AVL's approved scope for purchases was not consistent with and was expanded beyond the scope of DuBose's audit of Colonial Machine Company. Specifically, welding in accordance with ASME B 31.1 Code was not included in the audit scope. This condition would permit DuBose buyers to procure material that was not included in the audited, and therefore, qualified capability of Colonial Machine Company.

(4) Capitol Manufacturing Company

The last DuBose audit of Capitol Manufacturing Company was performed on February 13, 1996. The scope of audit was: "MO — manufacturing carbon and stainless fittings." However, DuBose Form D-46, also listed additional items including:

- seamless fittings
- NDE
- HT
- material testing
- upgrading unqualified source material
- approval & control of suppliers of source material
- approval & control of suppliers of services

On the basis of its evaluation of DuBose February 13, 1996, audit of Capitol Manufacturing Company, the inspectors determined that the audit failed to adequately document evaluation of the following areas:

- for NDE and material testing, DuBose did not document objective evidence of what was evaluated
- HT was not addressed
- for upgrading unqualified source material, DuBose did not document a review of upgrading activities.

b.2 Procurement Document Control

To evaluate DuBose capability to control procurement documents, the inspectors reviewed the following purchase orders (POs):

(1) PO 11495-61

DuBose issued PO 11495-61, dated November 11, 1996, to Marmon/Keystone Corporation, Charlotte, North Carolina, for 20-feet (ft.), random length, 8-inch nominal diameter, schedule 160, A-106 Grade B, seamless pipe. The PO was reviewed and approved by DuBose QA on November 12, 1996.

However, the PO failed to impose on Marmon/Keystone the requirement that material must be controlled in accordance with the quality control system and procedures audited by DuBose. Marmon/Keystone also failed to provide DuBose certification that the material was furnished under a quality program accepted by DuBose.

Additionally, the AVL approved scope for purchases from Marmon/Keystone was, "MS - carbon welded tubular products in accordance with QA manual, 1st Edition, Revision 0, dated January 27, 1988." Since this PO procured seamless pipe, the PO did not comply with the limitations of the DuBose AVL.

(2) PO 10649-68

DuBose issued PO 10649-68, dated November 15, 1996, to Marmon/Keystone Corporation, Charlotte, North Carolina, for 60-ft., 5/8-inch outside diameter (OD) x .083-wall x 20-ft., A-269 type 304 stainless steel tubing. The PO was reviewed and approved by DuBose QA on November 18, 1996.

However, the PO failed to impose on Marmon/Keystone the requirement that material must be controlled in accordance with the quality control system and procedures audited by DuBose. Marmon/Keystone also failed to provide DuBose certification that the material was furnished under a quality program accepted by DuBose.

Additionally, the AVL approved scope for purchases from Marmon/Keystone was, "MS - carbon welded tubular products in accordance with QA manual, 1st Edition, Revision 0, dated January 27, 1988." Since this PO procured stainless steel tubing, the PO did not comply with the limitations of DuBose AVL.

(3) PO 11645-66

DuBose issued PO 11645-66, dated December 9, 1996, to TAD USA, Inc., for one piece of 2-inch, schedule 80 x 10-ft., SA-335, P22, seamless pipe. The PO was reviewed and approved by DuBose QA on December 11, 1996.

Even though DuBose imposed on TAD USA the requirement that material furnished must be controlled in accordance with the quality control system and procedures audited by DuBose, TAD USA failed to provide DuBose certification that the material was furnished under a quality program accepted by DuBose.

(4) PO 10612-62

DuBose issued PO 10612-62, dated December 12, 1996, to Castle, A.M. & Company for one piece of 2 3/4-inch thick x 35-inch wide x 36-inch long, SA-516 Grade 70, plate.

Even though DuBose imposed on Castle, A.M. & Company the requirement that material furnished must be controlled in accordance with the quality control system and procedures audited by DuBose, Castle, A.M. & Company failed to provide DuBose certification that the material was furnished under a quality program accepted by DuBose.

c. Conclusions

The inspectors determined that the DuBose material traceability audits of suppliers appeared to be adequate for their intended purpose.

However, the inspectors determined that the audits of DuBose-qualified NCA-3800 suppliers (MOs) were lacking in detail and programmatic in their conduct and/or documentation. The inspectors identified two instances (Colonial Machine Company, Inc., and Capitol Manufacturing Company) where DuBose audits of its vendors failed to (a) adequately assess the effectiveness of the control of quality by its vendors and (b) compile its AVL, for all vendors, on the basis of an adequate site evaluation of the vendors quality program for the AVL's approved scope for purchases. These audits often lacked objective evidence that upgrading and dedication activities were adequately verified or that the implementation of these activities was evaluated. These findings were identified as examples of Nonconformance 99900861/97-01-04.

Additionally, in certain instances identified by the inspectors and described above, DuBose AVL approved scope for purchases was expanded beyond the scope of DuBose's audit and therefore permitted DuBose buyers to procure material that was not included in the audited and qualified capability of the supplier.

In other instances identified by the inspectors and described above, DuBose procured material from vendors on its AVL that was not included in the AVL approved product scope (POs 11495-61 and 10649-68). These instances were identified as examples of Nonconformance 99900861/97-01-04.

The inspectors identified two instances (POs 11645-66 and 10612-62) where DuBose accepted material from its vendor without certification that the material was furnished under a quality program accepted by DuBose. These items were identified as examples of Nonconformance 99900861/97-01-02.

On the basis of its review of the POs described above, the inspectors identified two instance (POs 11495-61 and 10649-68) where Dubose failed to require its vendors to certify that the material was furnished under a quality program accepted by DuBose. These items were identified as examples of Nonconformance 99900861/97-01-03.

3.3.3 Review of Recent Material Sales To NRC Licensees

a. Scope

The inspectors reviewed selected documentation packages for safety related material recently supplied to NRC licensees under the DuBose's QSP to verify the implementation of the applicable QA program requirements and compliance with 10 CFR 50, Appendix B, provisions.

b. Observations and Findings

Document packages for material supplied to Appendix B requirements, as well as material certified under DuBose QSC, were reviewed. Significant observations and findings are summarized below.

- Union Electric PO 094006, dated June 24, 1996, Item (2) for twenty ASME SA-564 Grade 630 studs (3/4-10, 5 1/2in long), with 1100 F aging treatment, and 302 BHN minimum hardness.

This material was certified under DuBose QSC as complying with the applicable Code and PO requirements. Appended to DuBose CMTR was a certification from Walker Bolt, a DuBose-qualified supplier. Attached to the Walker Bolt certification was certification from Ugine Savoie (French company) containing chemical and tensile test results, satisfactory macroetch statement and statement that the material was provided in solution treated condition. No quality program statement was attached to this certification, indicating that Ugine Savoie was not an approved supplier and that the material was upgraded by Walker Bolt. However, no test reports, indicating that upgrading of this material was performed were attached to the Walker Bolt certification. There was also no indication of what organization performed the required aging treatment on this material, or the actual time and temperature of the heat treatment.

The inspector noted that Paragraph 3.3.10 of the DuBose QSM section on utilization of unqualified source material states that "... the lab test report shall be attached to the DuBose Certificate of Conformance." Paragraph 3.3.11 states that the Certificate will contain a statement "upgraded per NCA 3855.5."

Before the completion of this inspection, Walker Bolt telefaxed an amended certification to DuBose indicating that upgrading tests were performed at their facility and including a certification of the heat treatment.

- Carolina Power & Light Co. PO 8M1717 CJ, dated November 1, 1996 for thirty four 1-8, 2 1/2inch long ASME SA-193, Grade B7 Cap screws.

This material was certified under DuBose QSC, as complying with the applicable Code and PO requirements. Appended to the DuBose CMTR was a certificate from T&T Enterprises (T&T), a DuBose-qualified supplier, containing chemical analyses, results of tensile and hardness tests, description of heat treatment, visual inspection, and a statement

indicating that a macroetch test had been performed with satisfactory results. The T&T certification also contained a quality program statement that all activities had been performed in accordance with their DuBose-approved QA program. A Republic Steel Co. CMTR for this heat of material was attached. The Republic Steel certification was sent to Fry Steel Co., a distributor, indicating that T&T obtained this material as unqualified source material and upgraded it.

The inspector noted that, since the starting material was in the form of 1-inch bar, cold or hot heading operations, as well as heat treatment would have been involved in the manufacturing process, requiring the use of approved suppliers. However, no certifications for these operations were in the data package.

- Public Service Electric & Gas Co. PO P2 0902993 1850 0000 for four 10 gage, 4 by 8 foot steel sheets. 10 CFR 50, Appendix B QA requirements and 10 CFR Part 21 were invoked by the PO.

DuBose certified this material as complying with their QSP and the PO requirements. DuBose obtained the material from NUCOR Steel Co., a commercial supplier, and dedicated it under their program. The dedication consisted of performing complete chemical analysis on each of the four sheets, and tensile and bend tests on one sheet. The laboratory report, including the test results and the NUCOR Steel Co. material certification were attached to the DuBose CMTR. The chemical analyses of samples from the four sheets showed close agreement to the NUCOR Steel Co. CMTR, supporting the bases for verifying mechanical properties of only one sample.

c. Conclusions

Failure to include certifications from approved suppliers as identified attachments to DuBose CMTRs issued to Union Electric (PO 8M1717 CJ) and Carolina Power and Light (PO 8M1717 CJ), were identified as examples of Nonconformance 99900861/97-01-01.

3.4 Entrance and Exit Meetings

In the entrance meeting on January 21, 1997, the NRC inspectors discussed the scope of the inspection, outlined the areas to be inspected, and established interfaces with DuBose management. In the exit meeting, on January 24, 1997, the inspectors discussed their findings and concerns.

PARTIAL LIST OF PERSONS CONTACTED

Carl M. Rogers, President & CEO
John Hottel, Vice President
James Dailey, Manager, Quality Assurance
Allen Jones, Manager, Sales & Marketing
Laurie Meyer-Dickson, Certification engineer

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

99900861/97-01-01	NON	Failure to provide required documentation
99900861/97-01-02	NON	Acceptance of material with incomplete documentation
99900861/97-01-03	NON	Inadequate procurement Documents
99900861/97-01-04	NON	Inadequate supplier audits

UNITED STATES
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

June 11, 1997

Mr. Craig P. Kipp
Plant Manager
General Electric Nuclear Energy
P.O. Box 780
Wilmington, NC 28402-0780

SUBJECT: NONPROPRIETARY VERSION OF NRC INSPECTION REPORT 99900003/97-01 AND
NOTICE OF NONCONFORMANCE

Dear Mr. Kipp:

This letter transmits the nonproprietary version of the U.S. Nuclear Regulatory Commission's (NRC's) inspection report at the General Electric (GE) Nuclear Energy facility. Our letter to you dated May 20, 1997, transmitted the original (proprietary) version of the report. On the basis of our discussions and review of the information in your letter (RJR-97-076) of June 6, 1997, attached affidavit, and attached Proprietary Information Summary Sheet, we have concluded that the specific items identified in your letter could be regarded as proprietary and, as such, were removed from the inspection report. In the revised nonproprietary (public) version of the report, we have deleted or revised the text.

Your response to either this letter or our letter dated May 20, 1997, and their enclosures 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 Section 2.790(a) of the NRC "Rules of Practice," of Title 10 of the Code of Federal Regulations, a copy of this letter and its enclosures will be placed in the NRC Public Document Room. Should you have any questions concerning the matter, please contact Anil S. Gautam of my staff at 301/415-2988.

Sincerely,

A handwritten signature in black ink, appearing to read "Robert M. Gallo", is written over the typed name.

Robert M. Gallo, Chief
Special Inspection Branch
Division of Inspection and Support Programs
Office of Nuclear Reactor Regulation

Docket No. 99900003
Enclosures: NRC letter to GE, May 20, 1997

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

May 20, 1997

Mr. Craig P. Kipp
Plant Manager
General Electric Nuclear Energy
P.O. Box 780
Wilmington, NC 28402-0780

SUBJECT: NRC INSPECTION REPORT 99900003/97-01 AND NOTICE OF NONCONFORMANCE

Dear Mr. Kipp:

On March 14, 1997, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at the General Electric (GE) Nuclear Energy facility. The enclosed report presents the results of that inspection.

The inspection was conducted to assess GE's design interface with licensees that implemented the average power range monitor-rod block monitor-technical specification (referred to as ARTS) modification, that allowed licensees to bypass the rod block monitor (RBM) for a rod withdrawal error (RWE) event if the core had sufficient minimum critical power ratio margin. The inspectors assessed RBM operability and related technical specifications actions with respect to protecting the fuel cladding in the boiling water reactor cores of ARTS plants for an RWE event. The inspectors also assessed GE's monitoring of the effectiveness of its design control program.

During the inspection, the inspectors determined that GE did not adequately inform ARTS licensees of the need to consider the fuel cladding plastic strain limits and the associated mechanical overpower (MOP) limits in addition to the minimum critical power ratio limits when considering RBM operability for potential RWE events. This inadequate interface between GE and ARTS licensees contributed to (1) the failure of licensees to ensure through their technical specifications that the RBM was operable to protect fuel cladding at applicable plants, and (2) occasions during certain operational cycles of the Fermi, Hatch, Brunswick, and Duane Arnold nuclear plants when, based on GE's RWE analyses, the fuel cladding had exceeded its MOP limits and had the potential of exceeding its plastic strain limits.

The inspectors determined that GE modified certain design parameters used in the RWE analysis without procedures or other documented basis, and did not assess the overall effectiveness of GE's design control program after Detroit Edison Company (DECo) identified deficiencies in design adequacy. Based on the above, the inspectors concluded that the implementation of GE's quality assurance program did not meet certain NRC requirements imposed on GE by its customers.

C. Kipp

-2-

These issues are cited in the enclosed Notice of Nonconformance (NON), and the circumstances surrounding them are described in detail in the enclosed report. You are requested to respond to the nonconformances and should follow the instructions specified in the enclosed NON when preparing your response.

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's Public Document Room.

Sincerely,

Original signed by

Robert M. Gallo, Chief
Special Inspection Branch
Division of Inspection and Support Programs
Office of Nuclear Reactor Regulation

Docket No. 99900003

Enclosures: 1. Notice of Nonconformance
2. Inspection Report 99900003/97-01

NOTICE OF NONCONFORMANCE

General Electric Nuclear Energy
Wilmington, NC

Docket No.: 99900003

On the basis of an inspection by the staff of the U.S. Nuclear Regulatory Commission (NRC) from March 10 through 14, 1997, it appears that the following activities were not conducted in accordance with NRC requirements:

- 1 Criterion III of Appendix B to 10 CFR Part 50, "Design Control," requires, in part, that measures shall be established for the identification and control of design interfaces and for coordination among participating design organizations. These measures shall include the establishment of procedures among participating design organizations for the review, approval, release, distribution, and revision of documents involving design interfaces.

Paragraph 3.3 of Section 3, "Design Control," General Electric (GE) Nuclear Energy Quality Assurance Manual NEDO-11209, dated March 31, 1989, requires, in part, that GE design documents be furnished to the customer to provide for interface compatibility review and coordination by owner design organizations.

Contrary to the above requirements, GE did not adequately inform licensee design organizations implementing the average power range monitor-rod block monitor-technical specification (ARTS) modification of the need to consider the 1 percent fuel plastic strain limits and the associated mechanical overpower (MOP) limits in addition to the minimum critical power ratio limits when evaluating rod block monitor (RBM) operability for a rod withdrawal error (RWE) event. GE's supplemental reload licensing reports for ARTS plants did not adequately address requirements for RBM operability with regard to the MOP limits. This inadequate interface between GE and ARTS licensees contributed to (1) the failure of licensees to ensure through their plant technical specifications that the RBM was operable to protect fuel cladding at applicable plants, and (2) occasions during Fermi Cycles 4, 5 and 6, Hatch Unit 1 Cycles 16 and 17, Hatch Unit 2 Cycles 13 and 14, Brunswick Cycle 10, and Duane Arnold Cycle 14 when based on GE's RWE analyses the fuel cladding had exceeded its MOP limits and had the potential of exceeding its plastic strain limits. (99900003/97-01-01)

- 2 Criterion V of Appendix B to 10 CFR Part 50, "Instructions, Procedures, and Drawings," requires, in part, that activities affecting quality shall be prescribed by documented instructions and procedures of a type appropriate to the circumstances, and shall include appropriate quantitative or qualitative acceptance criteria for determining that important activities have been satisfactorily accomplished.

GE Nuclear Energy Quality Assurance Manual NEDO-11209, Section 5, "Instructions, Procedures, and Drawings," dated March 31, 1989, requires, in part, that documented instructions, procedures, and drawings be utilized to communicate quality requirements throughout all phases of design.

Enclosure 1

Contrary to the above requirements, GE (1) modified peaking factors when the MOP limits were exceeded in the RWE analyses, (2) applied alternate rod patterns in addition to normal rod patterns in the RWE analyses, and (3) revised the theoretical density values used in the peak cladding temperature (PCT) analysis to reduce the calculated PCT, without documented instructions or procedures. (99900003/97-01-02)

- 3 Criterion XVIII of Appendix B to 10 CFR Part 50, "Audits," requires, in part, that periodic audits shall be carried out to determine the effectiveness of the quality assurance program. Followup action, including reaudit of deficient areas, shall be taken where indicated.

GE Nuclear Energy Quality Assurance Manual NED0-11209, Section 18, "Audits," dated March 31, 1989, requires, in part, that the audit program provide for followup action, including any necessary reaudit of deficient areas.

Contrary to the above requirements, Detroit Edison Company (DECo) audited GE in 1992 and 1993 and observed several deficiencies regarding design control, including GE's failure to inform DECo (and other ARTS licensees) that the MOP limits would be exceeded if the RBM was not operable during an RWE event. GE took corrective actions for specific deficiencies but did not conduct followup action, including reaudit of the design control area, to determine the effectiveness of the program. (99900003/97-01-03)

Please send a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C. 20555-0001, with a copy to the Chief, Special Inspection Branch, Division of Inspection and Support Programs, Office of Nuclear Reactor Regulation, within 30 days of the date of the letter transmitting this Notice of Nonconformance. Your reply should be clearly marked as a "Reply to a Notice of Nonconformance" and should contain for the nonconformances (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 of these items, and (3) the dates your corrective actions and preventive measures were or will be completed.

Dated at Rockville, Maryland
this 20th day of May 1997

U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION

Report No: 99900003/97-01

Organization: General Electric Nuclear Energy
Wilmington, North Carolina

Contact: Ralph J. Reda, Manager
Fuels & Facility Licensing
910/675-5000

Nuclear Industry Activity: Nuclear fuel assemblies and related reload core designs, core components, safety analyses, and services

Dates: March 10-14, 1997

Inspectors: Anil S. Gautam, Team Leader, NRR
Laurence E. Phillips, NRR
Kombiz Salehi, NRR
Edward D. Kendrick, NRR
Geoffrey R. Golub, NRR
John F. Carew, Brookhaven National Laboratory
Carl E. Beyer, Pacific Northwest National Laboratory

Approved by: Gregory C. Cwalina, Chief
Vendor Inspection Section
Special Inspection Branch
Division of Inspection and Support Programs

Enclosure 2

1 INSPECTION SUMMARY

During this inspection, the NRC inspectors reviewed activities associated with General Electric (GE) Nuclear Energy's design interface with licensees that implemented the average power range monitor-rod block monitor-technical specifications (hereafter referred to as ARTS) modification. The ARTS modification allowed licensees to bypass the rod block monitor (RBM) for a rod withdrawal error (RWE) above 30 percent power (hereafter referred to as RWE event) if the core had sufficient minimum critical power ratio (MCPR) margin.

The inspectors focused on evaluation and implementation of RBM operability to prevent exceeding fuel cladding 1 percent plastic strain limits (hereafter referred to as strain limits) in the boiling water reactor fuel cores of the ARTS plants during an RWE event. The inspectors examined technical specifications (TS) actions to ensure RBM operability during an RWE event to keep fuel cladding from exceeding the strain limits and associated MOP limits. The inspectors also assessed GE's monitoring of the effectiveness of its design control program.

The inspection bases were as follows:

- Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to Part 50 of Title 10 of the Code of Federal Regulations (10 CFR Part 50).
- 10 CFR Part 21, "Reporting of Defects and Noncompliance."
- GE Nuclear Energy Quality Assurance Program Description NEDO-11209-04A, Revision 8, dated March 31, 1989, and associated implementing procedures.

During this inspection, the inspectors noted three instances in which GE failed to conform to NRC requirements imposed upon it by NRC licensees. These nonconformances are discussed in Section 3.1 and 3.3 of this report.

2 STATUS OF PREVIOUS INSPECTION FINDINGS

This inspection was limited in scope to address GE's design interface with licensees. Previous inspection findings were not evaluated.

3 INSPECTION FINDINGS AND OTHER COMMENTS

3.1 Design Interface with ARTS Licensees

a. Inspection Scope

The inspectors assessed the adequacy of GE's design interface with ARTS licensees regarding RBM operability during an RWE event. The inspectors examined GE's RWE analyses and supplemental reload licensing reports (SRLRs) and GE's interaction with licensees regarding the assumptions and results of its analyses.

b. Observations and Findings

The RWE event assumes erroneous withdrawal of the highest worth rod from full in to full out at any time during the operating cycle. To protect against this event and keep the fuel from reaching a 1 percent plastic strain during an RWE event, the RBM monitors control rod movements and initiates a rod block during a RWE in which the local power exceeds a predetermined setpoint. The 1 percent plastic strain of the cladding is conservatively defined as the threshold below which fuel damage due to fuel clad overstraining is not expected to occur.

GE uses conservative mechanical overpower (MOP) limits to assure compliance with strain limits. GE started using MOP limits in 1987 after a study showed that the fuel assemblies in the error cell in newer fuel designs could potentially exceed the strain limits during an RWE event. Using the MOP limits in the RWE analysis added a margin of protection against exceeding the strain limits. GE determined that if fuel assemblies did not exceed the MOP limits during an RWE event, they would not exceed the strain limits. If the RWE analysis indicated that the MOP limits would be exceeded, licensees could take credit for RBM operability, perform an exact site-specific analysis to ascertain whether the strain limits would be exceeded without RBM operability, or reconfigure the core design to avoid exceeding the MOP limits during an RWE event.

The MCPR limits were imposed to avoid fuel damage due to severe overheating of the fuel cladding. The ARTS modification allowed licensees to bypass the RBM for an RWE event if the core had sufficient MCPR margin. GE determined that for certain ARTS plants during certain fuel cycles the RBM needed to be operable to prevent exceeding the MOP limits during an RWE event, even if the MCPR margin was within the design parameters established by the ARTS modification.

The inspectors reviewed activities associated with GE's design interface with ARTS licensees regarding RBM operability during a potential RWE event at ARTS plants. The inspectors assessed GE's interaction with Detroit Edison Company (DECo) for Fermi Atomic Nuclear Plant Unit 2 (Fermi); with Southern Nuclear Operating Company (SNOC) for Edwin I. Hatch Nuclear Plant, Units 1 and 2 (Hatch); with Carolina Power & Light Company (CP&L) for Brunswick Steam Electric Plant, Units 1 and 2 (Brunswick); with Philadelphia Electric Company for Limerick Generating Station, Units 1 and 2 (Limerick); with Nebraska Public Power District for Cooper Nuclear Station (Cooper); with IES Utilities (IES) for Duane Arnold Energy Center (Duane Arnold); and with Boston Edison Company for Pilgrim Nuclear Power Station, Unit 1 (Pilgrim). The inspectors' review of factors pertaining to RBM operability at ARTS plants is summarized below:

(1) FERMI

Cycle 3 commenced June 1, 1991. Cycle 4 commenced November 1, 1992 and concluded with the turbine trip event in December 1993. In April 1992, DECo audited GE's activities regarding fuel design control

for Fermi Cycle 4 (DECo Report 92-018, dated May 6, 1992). DECo determined that based on GE's RWE analysis there was a potential for the fuel cladding exceeding its MOP limits if the RBM was not operable and control rod patterns deviated from GE's recommended normal operation cycle patterns. GE had not informed DECo that the MOP limits at Fermi could be exceeded if the RBM was bypassed, and that the Fermi TS 3/4.1.4.3 (in accordance with the ARTS modification) allowed bypassing of the RBM. DECo recommended that GE analyze both Cycle 3 and 4 cores to either affirm or refute the validity of the RWE analysis with respect to MOP limits in intermediate control rod patterns, and whether the Fermi TS 3/4.1.4.3 "contained adequate operational restraints."

GE analyzed Fermi Cycles 3 and 4 and informed DECo that for Cycle 3 the MOP limits were not exceeded. GE also informed DECo that, for Cycle 4, the MOP limits for GE-11 fuel would be exceeded but that the strain limits would not be exceeded because of a substantial conservative margin between the MOP limits and the strain limits. GE concluded that for Cycle 4 the RBM did not need to be operable, and that the TS 3/4.1.4.3 RBM operational requirements were adequate.

DECo audited GE on December 7 through 10, 1993 (DECo Report QA-94-1006, dated January 10, 1994), and again determined that GE had not adequately communicated design changes to DECo. GE had not informed DECo that Fermi's TS basis for RBM operability required consideration of the MOP limits. The inspectors determined that the Fermi reload analysis for Cycle 4 provided in the SRLR 23A7075 Revision 0, dated April 1992, did not address RBM operational requirements for not exceeding the MOP limits. In November 1994, as part of its response to DECo's audit observation, GE issued letters to inform all ARTS licensees that they should consider the strain limits and associated MOP limits when evaluating RBM operability for the ARTS modification.

For Cycle 5, GE informed DECo that the MOP limits could be exceeded. In preparation for Cycle 5, GE's RWE analyses, dated November 11, 1993, and June 22, 1994, indicated that the RBM needed to be operable to prevent the MOP limits from being exceeded. Cycle 5 commenced on December 17, 1994. In May 1995, DECo requested GE to further evaluate the need for RBM operability. On August 22, 1995, during Cycle 5, GE completed an RWE analysis using the actual core loading and control rod patterns and concluded that the MOP limits were not exceeded and that the RBM did not need to be operable.

For Cycle 6, GE informed DECo that the RBM was required to be operable. Based on the PANACEA analyses, GE informed DECo that the MOP limits for fuel GE-11 would be exceeded within the error cell during an RWE event if the RBM was not operable. The SRLR for Cycle 6, issued in November 1996, stated: "At least one RBM channel must be operable when moving rods in order to protect for mechanical overpower limits." The inspectors considered the SRLR to be inadequate in that it did not reference the 30% power level for RBM operability and addressed operability of only one RBM channel.

During the inspection, GE informed the inspectors that the strain limits were not exceeded at Fermi during the above operational cycles. However, the inspectors concluded that GE did not adequately inform DECo of the need to consider the strain limits and the associated MOP limits in addition to the MCPR limits when evaluating RBM operability for an RWE event. DECo actions regarding implementation of appropriate TS revisions for Cycles 5 and 6 are addressed in section 3.2 b of this report.

(2) HATCH

For Hatch Unit 1 Cycles 16 and 17, and Unit 2 Cycles 13 and 14, GE informed SNOC that the MOP limits would be exceeded during an RWE event if the RBM was not operable. A GE memorandum to SNOC, dated October 31, 1994, stated that the "1 percent plastic strain is met, if one channel of the RBM remains operable." In addition, on October 31, 1994, GE informed SNOC by letter that they should consider the strain limits and associated MOP limits when evaluating RBM operability for the ARTS modification. GE's SRLR for Hatch 1 Cycle 16 and 17, and Hatch 2 Cycles 13 and 14 informed Hatch of necessary protective measures but failed to clearly address the conditions under which the RBM should be operable. During the inspection, GE informed the inspectors that based on its analyses the MOP limits had been exceeded for Hatch Unit 1 Cycles 16 and 17, Unit 2 Cycle 13, and Cycle 14. The strain limits were not exceeded during these cycles. SNOC's actions regarding implementation of appropriate TS revisions are addressed in section 3.2 b of this report.

(3) PILGRIM, LIMERICK, COOPER

Based on the SRLRs for these plants, the RBM did not need to be operable for Pilgrim Cycle 12, Limerick Unit 1 Cycles 6 and 7, Limerick Unit 2 Cycle 4 and 5, and Cooper Cycle 18. The inspectors determined that the MOP limits were not exceeded during these cycles. In November 1994, GE issued letters to these licensees indicating that they should consider the strain limits and associated MOP limits when evaluating RBM operability for the ARTS modification.

(4) BRUNSWICK AND DUANE ARNOLD

In January 1995, GE conducted an RWE analyses for the Brunswick Cycle 10 and Duane Arnold Cycle 14 and determined that the MOP limits would be exceeded if the licensees bypassed the RBMs. Based on the inspectors review of GE's design documents, GE did not inform these licensees that the MOP limits would be exceeded. Based on GE's RWE analysis, the MOP limits were exceeded at Brunswick. On April 1, 1997, CP&L issued a 50.72 notification (Event No. 32058) regarding RBM operability.

In March 1997 (before the NRC inspection), GE reviewed reload design documents to determine which ARTS plant cycles resulted in exceeding the strain limits. Based on its review of prior RWE analyses, GE

notified CP&L and IES by letter dated March 11, 1997, that the Brunswick Cycle 10 and Duane Arnold Cycle 14 GE-10 fuel had exceeded the MOP limits. GE did not inform the inspectors during the inspection that the MOP limits were exceeded for these two plants.

Subsequent to the inspection, GE performed a cycle-specific analysis for both plants. In a letter dated April 25, 1997, GE informed the NRC that the strain limits were not exceeded at Brunswick and Duane Arnold. On May 9, 1997, the inspectors contacted GE staff by telephone to ask why licensees were not informed in January 1995, and why the inspectors were not informed during the March 1997 inspection that based on GE's RWE analyses, Brunswick and Duane Arnold had exceeded the MOP limits. GE stated that it did not inform the licensees or the NRC because GE's "generic" RWE analysis had indicated that the strain limits would not be exceeded. CP&L and IES's actions regarding implementation of appropriate TS revisions are addressed in section 3.2 b of this report.

Based on the above review, the inspectors determined that GE did not adequately inform licensee design organizations implementing the ARTS modification of the need to consider the strain limits and the associated MOP limits in addition to the MCPR limits when evaluating RBM operability for an RWE event. GE's SRLRs for ARTS plants did not adequately address requirements for RBM operability with regard to the MOP limits. This inadequate interface between GE and ARTS licensees contributed to (1) the failure of licensees to ensure through their TS that the RBM was operable to protect fuel cladding at applicable plants, and (2) occasions during Fermi Cycles 4 and 5, Hatch Unit 1 Cycles 16 and 17, Hatch Unit 2 Cycles 13 and 14, Brunswick Cycle 10, and Duane Arnold Cycle 14 when based on GE's RWE analyses the fuel cladding had exceeded its MOP limits and had the potential of exceeding its strain limits. This constitutes Nonconformance 99900003/97-01-01.

In its March 19, 1997, letter to the NRC, GE stated that its "communications to licensees in the SRLR have not been adequate." GE also stated that, in part, it (1) had sent letters to all customers apprising them that the RBM is required to ensure that the MOP limits were not exceeded, (2) had revised technical design procedure (TDP) 0035 to clarify required utility communications, and (3) planned to review the SRLR format and revise the GESTAR II standard format, if necessary, and make further revisions to TDP-0035 if necessary to be consistent with the final SRLR format.

c. Conclusions

The strain limits were not exceeded at the ARTS plants. GE's design interface with licensees was weak, as noted in the nonconformance herein. GE did not adequately inform ARTS licensees of the conditions for RBM operability, contributing to the ARTS licensees' failure to implement RBM protection for fuel during potential RWE events. SRLRs did not clearly identify conditions for RBM operability. Based on GE's RWE analyses, the

fuel cladding had exceeded its MOP limits and had the potential of exceeding its strain limits at Fermi, Hatch, Brunswick, and Duane Arnold.

3.2 TECHNICAL SPECIFICATIONS (TS) ACTIONS

a. Inspection Scope

The inspectors examined TS actions taken by GE and ARTS licensees to ensure RBM operability during an RWE event to protect exceeding the strain limits and associated MOP limits.

b. Observations and Findings

DECo audited GE in 1992 and 1993 and observed GE's failure to inform DECo (and other ARTS licensees) that the MOP limits would be exceeded if the RBM was not operable during an RWE event. In November 1994, GE informed all ARTS licensees of the need to consider RBM operability to not exceed strain limits.

During Cycle 5, GE informed DECo that the RBM must be operable. In Section 10 of the Cycle 5 SRLR, dated December 1993, GE stated that "at least one channel of the RBM must be operable when moving rods in order to meet the MOP limits for an RWE event." GE's memorandum to DECo, dated June 22, 1994, regarding the Cycle 5 analysis stated: "GE still recommends that at least one RBM channel be operable when moving rods." However, DECo did not revise the Fermi TS; rather, in May 1995 DECo requested GE to further evaluate the need for RBM operability. On August 22, 1995, GE concluded that the MOP limits were not exceeded during Cycle 5.

In preparation for Cycle 6, DECo addressed RBM operability by placing a statement in the core operating limits report (COLR). The NRC resident inspectors became aware of DECo's use of the COLR in this manner and on November 22, 1996, the NRC informed DECo by telephone that the addition of this statement to the COLR without a corresponding request to amend the TS would not comply with the requirements of 10 CFR 50.36. The NRC permitted DECo to start up using administrative controls after the licensee submitted the TS amendment request on December 2, 1996, to require RBM operability above 30 percent power. The TS amendment (No. 112 to facility operating license No. NPF-43) was issued on May 15, 1997.

For Hatch Unit 1 Cycles 16 and 17, and Unit 2 Cycles 13 and 14, GE informed SNOC that the MOP limits would be exceeded during an RWE event if the RBM was not operable. A GE memorandum to SNOC dated October 31, 1994, stated that the "1 percent plastic strain is met, if one channel of the RBM remains operable." SNOC did not revise the Hatch TS.

In January 1995, GE's RWE analysis indicated that the Brunswick Cycle 10 and Duane Arnold Cycle 14 GE-10 fuel would exceed the MOP limits. Based on documents provided to the inspectors, GE did not inform licensees of the potential for exceeding the MOP limits. In March 1997, GE informed

CP&L and IES that based on its RWE analyses the fuel at Brunswick and Duane Arnold had exceeded its MOP limits. CP&L and IES did not revise the Brunswick and Duane Arnold TS.

The inspectors asked GE why they did not explicitly inform ARTS licensees to revise their TS to ensure RBM operability for an RWE event. On May 1, 1997, during a telephone conversation with the inspector, GE agreed to inform licensees of the need to examine or consider revisions to their TS, as applicable, with respect to RBM operability.

c. Conclusions

Fermi and Hatch apparently knew that the RBM must be operable for a potential RWE but did not revise their TS to require RBM operability for an RWE event. Other ARTS licensees, including Brunswick and Duane Arnold, were informed by GE in November 1994 of the need to consider RBM operability to not exceed strain limits but did not revise their TS. GE's failure to explicitly inform licensees to revise their TS to ensure RBM operability during an RWE is considered a weakness.

3.3 DESIGN CONTROL

a. Inspection Scope

The inspectors reviewed the adequacy of GE's RWE analyses and GE's assessment of its design control program.

b. Observations and Findings

The inspectors determined that GE modified peaking factors when the MOP limits were exceeded in the RWE analyses, and applied alternate rod patterns in addition to normal rod patterns in the RWE analyses without documented instructions or procedures. The inspectors also determined that GE changed design parameters for its peak cladding temperature (PCT) analysis by revising the theoretical fuel pellet density values without procedures for tracking the removal of conservatisms in the PCT analysis. GE's use of the incorrect fuel pellet densification value had resulted in a lower peak cladding temperature. When GE corrected the densification value, the Loss of Coolant Accident analysis of the BWR-6 plant indicated an unacceptable increase of the PCT. GE revised the theoretical density values to reduce the PCT without issuing any documented instructions or procedures for using the revised density values. This constitutes Nonconformance 99900003/97-01-02.

Subsequent to the inspection, in its March 19, 1997, letter to the NRC, GE stated that, as part of its corrective actions, it (1) revised TDP 0035 to improve its communication with licensees on the need for RBM operability, (2) implemented an explicit requirement for MOPs calculations for all fuel types, (3) plans to review TDPs for other areas of improvement, e.g., added guidance on local peaking factor adjustments, and (4) plans to document conservatisms used in its analyses.

DECo audited GE in 1992 and 1993 and observed several deficiencies regarding design control, including GE's failure to inform DECo (and other ARTS licensees) that the MOP limits would be exceeded if the RBM was not operable during an RWE event. The inspectors determined that GE took corrective actions for specific deficiencies but did not conduct followup action, including reaudit of the design control area, to determine the effectiveness of the program. This constitutes Nonconformance 99900003/97-01-03. During the inspection, GE stated that it planned to perform an internal audit to address the effectiveness of its design program. In its March 19, 1997 letter to the NRC, GE stated that its corrective actions included (1) strengthening its requirements for annual adequacy reviews of TDPs; planning to perform adequacy reviews during the second quarter of 1997, and (2) performing a QA followup audit of a revised adequacy review process scheduled for late 1997.

The inspectors observed that GE's generic analysis of MOP limits for RWE events at ARTS plants may not be valid for cores containing GE 8x8 fuel or GE-10, -11, -12, and -13 fuel not included in the 1987 assessment of generic MOP limits. GE informed the inspectors that in March 1997 it began conducting cycle-specific RWE analyses for all plants and all fuel types. No immediate safety concerns were identified.

The inspectors reviewed GE's PANACEA analysis and observed that GE evaluated UO_2 rods rather than Gadolinium (Gd) rods in an error cell for an RWE event. The generic GESTR-M strain analysis indicated that the Gd rods were more limiting than the UO_2 rods. Consideration of the UO_2 rods but not the Gd rods in the error cell for the PANACEA analyses may not identify the limiting rod for the strain limits. The inspectors also observed that the PANACEA analyses considered planned rod patterns for certain cycles but did not include possible alternate rod patterns. Use of only planned rod patterns for certain analyses may not identify the most limiting operation within the error cell for the analyzed cycle because alternate rod patterns may be used. The inspectors determined that exclusion of Gd rods and alternate rod patterns was a weakness in GE's PANACEA analyses.

The inspectors assessed the initial conditions assumed in cycle-specific accident analyses. One example reviewed involved a Fermi turbine trip event with nominal reactor steam dome pressure assumed for the start of the transient. The inspectors examined whether the safety analysis was bounding and the MCPR limit was sufficient if a transient would be initiated from a higher pressure within the bounds of the TS operating limits. In response to questions by the inspectors, GE performed a sensitivity study to evaluate the effect on the thermal margin of pressure variations of plus or minus 20 psi, including cases with GE-9 and GE-13 fuel. The results indicated a pressure sensitivity of a small delta critical power ratio (CPR)/initial critical power ratio (ICPR) over this pressure range. Higher initial pressure resulted in a lower delta CPR/ICPR. In reviewing safety analysis methods, the NRC examines assumptions regarding the initial conditions of the analyses and whether operating limits derived from the analyses provide bounding protection for all operating conditions permitted by the plant TS. Since the

thermal margin is dependent on several operating parameters that do not vary independent of pressure, thermal margin sensitivity to pressure reduction is not necessarily indicative of the thermal margin sensitivity to overall off-nominal plant operating conditions for large pressure increments. No concerns were identified.

The inspectors observed that in late February 1997, Tennessee Valley Authority determined that the Browns Ferry Nuclear Plant Emergency Operating Procedures (EOPs) revision for GE 9x9 fuel had not considered all the input parameters affected by the new fuel design. The input parameters are specific to fuel type and would be used by the licensee to calculate plant specific curves or limits to maintain Emergency Procedure Guidelines (EPGs) specified action levels. Input parameters for EOP calculations are contained in Appendix C of NEDO-31331, Revision 4, issued March 1987. At the time of issuance of revision 4, GE 9x9 fuel was not in use by any licensee. Upon incorporation of 9x9 fuel, licensees apparently did not recognize that certain parameters identified as "generic data" in EPG Appendix C were affected by fuel type. The parameters were four steam-cooling-related input parameters and two shutdown boron weight-related input parameters. In response to the event, GE issued Services Information Letter (SIL) 529, Supplement 1, on March 14, 1997, informing BWR customers of the fuel type-specific nature of the input parameters and recommending that potentially affected plants reevaluate their EPG calculations if the fuel design has changed since the Appendix C calculations. The SIL also provided a list of calculations which may be impacted by revised input parameters.

c. Conclusions

GE did not have documented instructions or procedures to control modifications in RWE analyses when MOP limits were exceeded. GE's generic MOP limits evaluations need to be replaced with cycle-specific analyses. The PANACEA fuel strain analysis was weak.

3.4 Entrance and Exit Meetings

In the entrance meeting on March 10, 1997, the NRC inspectors discussed the scope of the inspection, outlined the areas to be inspected, and established interactions with GE management. In the exit meeting on March 14, 1997, the inspectors discussed their findings and observations.

4 PARTIAL LIST OF PERSONNEL CONTACTED

General Electric Nuclear Energy

Chris Monetta, Manager, Nuclear Quality Assurance
Glen Watford, Manager, Nuclear Fuel Engineering
James Klapproth, Manager, Product Definition
Steve Congdon, Manager, Nuclear Technology
Chuck Papandrea, Manager, SC Quality
Jerry Potts, Manager, Fuel Performance
Kevin Theriault, Manager, Fuel QA
Anne Sullivan, Manager, Fuel Engineer, QA
Paul Sick, Manager, Nuclear Quality Assurance
Elwood Mobley, Manager, Quality Assurance
Rendy Hannelt, Manager, Nuclear Fuel Projects
Ralph Reda, Manager, Fuel & Facility Licensing
Caroline Smith, Sr. Engineer, Fuel & Facility Licensing
John Embley, Program Manager, Fuel & Facility Licensing
Jim Rash, Sr. Engineer, Fuel & Facility Licensing
Robert Rand, Principal Engineer, Nuclear Fuel
Fran Bolger, Principal Engineer, Nuclear Fuel
Barry R. Fischer, Technical Program Engineer, Nuclear Fuel

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

99900003/97-01-01	Para 3.1 b	NON	inadequate design interface
99900003/97-01-02	Para 3.3 b	NON	inadequate procedures
99900003/97-01-03	Para 3.3 b	NON	inadequate assessment of design effectiveness

ACRONYMS USED

ARTS	Average Power Range Monitor-Rod Block Monitor-Technical Specifications
GE	General Electric
RBM	Rod Block Monitor
RWE	Rod Withdrawal Error
RWE Event	Rod Withdrawal Error above 30 percent power
MCPR	Minimum Critical Power Ratio
TS	Technical Specifications
SRLR	Supplemental Reload Licensing Report
MOP	Mechanical Over Power
TDP	Technical Design Procedure
COLR	Core Operating Limits Report
PCT	Peak Cladding Temperature
Gd	Gadolinium
UO ₂	Uranium Dioxide
CPR	Critical Power Ratio
ICPR	Initial Critical Power Ratio
EPOs	Emergency Operating Procedures
EPGs	Emergency Procedure Guidelines
SIL	Services Information Letter

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

April 22, 1997

Mr. John M. Leslie, President
SynTech Products Corporation
520 East Woodruff Avenue
Toledo, Ohio 43624

SUBJECT: NRC INSPECTION REPORT 99901313/97-01

Dear Mr. Leslie:

On February 4-6, 1997, the U.S. Nuclear Regulatory Commission (NRC) conducted an inspection at your Woodruff Avenue facility in Toledo, Ohio. The enclosed report presents the results of that inspection.

The NRC inspection team evaluated the commercial quality program that SynTech established and implemented to control the manufacture and supply of various cleaning and maintenance chemical products. Although SynTech supplies several of its products to NRC-licensed nuclear power plants, the inspectors determined that those products are not basic components as defined in Section 21.3 of Part 21 of Title 10 of the Code of Federal Regulations (10 CFR Part 21) because, for facilities licensed under 10 CFR Part 50, the products are not designed or manufactured under a quality assurance program meeting the provisions of 10 CFR Part 50, Appendix B, nor are they treated as basic components for procurement purposes by the NRC licensees to whom you supply them.

The inspection consisted of an examination of selected procedures, purchase orders, test reports, certificates of compliance and other associated records, interviews with personnel and observations by the inspectors. No violation of NRC requirements was identified. Also, during this inspection, the inspectors reviewed the circumstances surrounding SynTech's submission to Consumers Power Company (Palisades) of what appeared to be a Detroit Edison Company chemical test report, but which reported data of indeterminate origin and cited a sample lot for which Detroit Edison or its subsidiary, Utility Technical Services, had no record of testing. Prior to the inspection, the information available to the inspectors suggested a fraudulent SynTech report. However, your explanation of the circumstances surrounding the creation of the report in its unusual form was plausible, if not conclusive, and was supported by other information obtained by the inspectors. Although you could not offer a satisfactory explanation for the report's not being effectively screened through management review before issue, the incident appeared to have been isolated. The inspectors could not conclusively determine that there was any deliberate intent to mislead the recipient of the report and found no evidence of a pattern of similar activity.

J. Leslie

-2-

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's Public Document Room (PDR).

Sincerely,

A handwritten signature in black ink, appearing to read "Robert M. Gallo", with a long horizontal flourish extending to the right.

Robert M. Gallo, Chief
Special Inspection Branch
Division of Inspection and Support Programs
Office of Nuclear Reactor Regulation

Docket No. 99901313

Enclosures: 1. Inspection Report 99901313/97-01

U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION

Report No.: 99901313/97-01

Organization: SynTech Products Corporation
520 East Woodruff Avenue
Toledo, Ohio 43624

Contact: D. Moore, Quality Assurance Manager
(419) 241-1215

Nuclear Industry Activity: Manufactures and supplies industrial cleaners, solvents, and other maintenance products such as penetrating oils, cutting fluid, gasket/paint strippers, etc., in bulk quantities or in aerosol cans.

Dates: February 4-6, 1997

Inspectors: Stephen D. Alexander, Reactor Engineer (Team Leader)
Kamalakar R. Naidu, Senior Reactor Engineer

Approved by: Gregory C. Cwalina, Chief
Vendor Inspection Section
Special Inspection Branch
Division of Inspection and Support Programs
Office of Nuclear Reactor Regulation

Enclosure 1

1 INSPECTION SUMMARY

During this inspection of SynTech Products Corporation, the NRC inspectors reviewed selected procurement documents, test certificates and other documents, examined products and storage facilities, and interviewed SynTech staff regarding the supply of industrial cleaning and maintenance products to NRC-licensed nuclear power plants. The inspection bases were Part 21 of Title 10 of the Code of Federal Regulations (10 CFR Part 21) and Appendix B to 10 CFR Part 50.

Based on a SynTech purchase order (PO) to a licensee-operated testing laboratory for analysis of a SynTech product that invoked 10 CFR Part 50, Appendix B, and 10 CFR Part 21, SynTech may have supplied some of its products as basic components as defined in 10 CFR 21.3. However, the inspectors subsequently determined that SynTech products are not designed (developed) or manufactured under a 10 CFR Part 50, Appendix B, quality assurance (QA) program and SynTech has not supplied, nor does it currently supply its products as basic components. Although many of SynTech's nuclear plant customers required certificates of conformance (CoC) to their PO requirements and a certified chemical contaminant analysis test report traceable to the batches or lots of the products supplied, the inspectors found no instances in which NRC licensees imposed nuclear-unique design or QA requirements on SynTech or invoked 10 CFR Part 21 in their procurement documents.

On the basis of a review of SynTech's commercial quality controls and review of independent analyses of SynTech products, the inspectors concluded that the contaminant content of SynTech products is variable enough to require batch- or lot-traceable certified chemical contaminant analysis reports. Such reports would confirm that levels of undesirable substances such as halides, sulfur and heavy metals are within acceptable limits before using SynTech products on safety-related equipment or allowing them to come in contact with safety-related systems.

The inspectors also reviewed the circumstances surrounding SynTech's 1995 submission of what appeared to be a Detroit Edison (DE) Company chemical analysis report, but which reported data of indeterminate origin and cited a sample lot for which DE or its subsidiary, Utility Technical Services (UTS), had no record of testing. Prior to the inspection, the information available to the inspectors suggested a fraudulent SynTech report. However, SynTech's explanation of the circumstances surrounding the creation of the report in its unusual form was plausible, if not conclusive, and was supported by other information obtained by the inspectors. Although SynTech could not offer a satisfactory explanation for the report's not being effectively screened through management review before issue, the incident appeared to have been isolated. The inspectors could not conclusively determine that there was any deliberate intent to mislead the recipient of the report and found no evidence of a pattern of similar activity.

2 STATUS OF PREVIOUS INSPECTION FINDINGS

This was the first NRC inspection of SynTech.

3 INSPECTION FINDINGS AND OTHER COMMENTS

3.1 Commercial Quality Controls/Chemical Contaminant Control

a. Scope

In order to evaluate SynTech commercial quality controls, particularly regarding control of chemical contaminants in SynTech products sold to NRC-licensed facilities, the inspectors toured the SynTech facility, interviewed personnel, examined raw materials and finished products in various forms and in various stages of preparation. Also examined were products awaiting shipment either to customers or subcontractor manufacturing or packaging facilities. The inspectors also reviewed numerous chemical analysis reports on the contaminant content of SynTech products as well as correspondence with the materials engineer at General Electric Nuclear Energy (GE NE) regarding the eligibility of SynTech products for GE NE's "nuclear grade" designation.

b. Findings and Observations

SynTech manufactures several industrial cleaning and maintenance chemical products including the following which are used in nuclear power plants. SynTech supplies these products in aerosol cans, in bulk containers, or both:

Easy Tap:	Cutting and tapping fluid (aerosol and squeeze bottles)
Parts Kleen:	Solvent and degreaser (aerosol and bulk containers)
N-Grade:	Gasket and paint stripper (aerosol)
NOC:	(Non-organic Cleaner) All purpose cleaner
Rust Buster II:	Penetrating oil
Titanic C:	All purpose floor cleaner (bulk)
Touch It Up:	All purpose cleaner (aerosol and bulk)

SynTech manufactures (blends) a batch of a product supplied in bulk from raw materials or receives finished product in bulk form from one of its suppliers or contract manufacturers. It then sends a sample of that numbered batch to a subcontractor laboratory, currently Philadelphia Electric Company's (PECO Energy's) Wayne, Pennsylvania, laboratory, for chemical analysis to determine if the levels of total halogens/halides, sulfur, and other undesirable elements, mostly heavy metals (e.g., As, Bi, Sn, Pb, Hg, etc.), are within specified acceptance levels. For products in aerosol cans, the finished products are sent in bulk form to a SynTech subcontractor for packaging in the aerosol cans. Samples from numbered lots of aerosol cans (which are supposed to be filled from one batch of bulk product) are also sent to PECO's laboratory for analysis. SynTech has samples of aerosol can lots analyzed after repackaging because SynTech has found that the packaging process or cans themselves may introduce some of the contaminants of concern.

Batches or lots of products routinely sold to nuclear plants as well as other customers that are awaiting results of chemical analysis are stored in a locked cage designated the "Commercial Quality" area with QA hold tags or

labels affixed. If the results of the chemical analysis indicate that the levels of the contaminants of concern are within acceptable limits, the batches of chemicals are released for shipment to nuclear power plants. If the levels are above the acceptance limits, the products are removed from the "Commercial Quality Area" and stored in general storage for sale to non-nuclear facilities.

As discussed in correspondence with and from GE NE's materials engineer, SynTech established the acceptance limits to maintain a "nuclear grade" rating in accordance with GE NE Material Specification D50YP12 and Appendix A of NEDE-31295P, GE's "BWR Operator's Manual for Materials and Processes," June, 1986. However, individual licensees sometimes specify their own limits, either explicitly or by reference to a material standard or specification (e.g., those of the American Society for Testing and Materials (ASTM)). For nuclear customers, SynTech stated that it checks that the batch/lot analysis report indicates the customer's specific limits are met before shipping the product unless specifically requested otherwise by the customer. Review of numerous lot analysis reports on file at SynTech indicated that the amounts of contaminants or undesirable substances such as halides, sulfur, and heavy metals (e.g., mercury, bismuth, arsenic, lead, tin, etc.) are somewhat variable, sometimes being marginal or even exceeding GE NE nuclear grade or customer-specific limits.

SynTech brought two such instances to the inspectors' attention. In one case, SynTech had discovered that tin was leaching out of aerosol cans into the product. This was corrected by SynTech requiring their aerosol can packaging subcontractor henceforth to use cans with a non-metallic coating inside. Subsequent analysis reports indicated that this measure corrected the problem and did not introduce additional problems such as adding halides. In the other instance, the NRC licensee, Philadelphia Electric Company (PECo) requested that SynTech ship a batch of product for which the analysis results had not yet been obtained because it was PECO's laboratory that was currently performing the contaminant analyses for SynTech. As Murphy's Law would have it, sure enough, this particular batch of the product contained excessive sulfur and was of course captured and sent back to SynTech. Shipping records reviewed by the inspectors confirmed this and also indicated that, as stated by SynTech, it routinely provides copies of the batch/lot chemical analysis test reports to nuclear customers whether or not they are required.

In the Commercial Quality Area, the inspectors noted information on the tags affixed to 55-gallon drums containing Titanic C, NOC, and Parts Kleen, and a tag affixed to a box containing Part Kleen aerosol cans, and reviewed the documents associated with their manufacture. The inspectors observed that the access to this storage area was controlled with a lock and key.

One of the products, Titanic C floor cleaner, was manufactured on February 28, 1996, and stored in a 55-gallon drum. A tag attached to this drum identified the product as belonging to Lot 095, and Batch 1089. The batch manufacturing sheet for Lot 095, dated February 28, 1996, indicated the various ingredients that were used to manufacture this lot of Titanic C. The SynTech QA manager stated that all this material was stored in an area designated for commercial quality products. The inspectors observed some of the ingredients used in the

manufacture of Titanic C stored in their original bags in the Commercial Quality Area. SynTech issued PO 15201 on February 4, 1997, to PECO Energy, its current independent testing laboratory, to analyze a sample of Lot 095 for contaminant content including halogens, sulfur and heavy metals.

The tag attached to a 55-gallon drum of NOC (non-organic cleaner) was marked Lot NOC 01, Batch 10994. The tag indicated that a sample of the contents of the drum had been tested. SynTech received certification on October 3, 1996, that the levels of halogens, sulfur and heavy metals were within the acceptable limits.

A 55-gallon drum of Lot 0408942 of Parts Kleen, blended for SynTech by Chem Central in Toledo had a hold tag attached to it indicating that it was awaiting the results of chemical analysis of a sample of it that had been sent to one of SynTech's contract laboratories for chemical analysis. The laboratory report, dated August 23, 1994, indicated the content of halogens, sulfur and heavy metals were within the usual prescribed limits, but the hold tag was left on so that the report would be checked against specific customer requirements prior to shipment.

A hold tag was attached to a pallet of 90 cases of Parts Kleen aerosol cans, Lot 6m30, in the commercial quality area packaged for SynTech by American Jetway of Detroit, Michigan. The hold tag indicated that SynTech had sent one can of Lot No. 6m30 to the PECO Energy laboratory for chemical analysis.

The inspectors reviewed the documents on a shipment of 1 dozen aerosol cans of Touch It Up for Niagara Mohawk Power Company's Nine Mile Point site. The documents included a SynTech CoC that certified that the contents were from Lot #4K31 which conformed to Specification 15586/94-004215, and the halides, sulphur and heavy metals were within acceptable limits. SynTech's certification was based on a certified laboratory report providing the chemical contaminant analysis results.

c. Conclusions

SynTech has implemented commercial quality controls to provide reasonable assurance that its products shipped to NRC-licensed facilities typically contain less than the maximum acceptable levels of chemical contaminants of concern. SynTech had established measures to routinely control the release of products to nuclear plant customers pending receipt of certified chemical contaminant analysis reports from SynTech's contract laboratory. According to SynTech, this had become their standard practice, regardless of whether such reports were required by a particular customer. No further concerns were identified in this area.

3.2 Review of Procurement Documents.

a. Scope

The inspectors reviewed SynTech customer procurement document files to determine if NRC-licensees had imposed the requirements of 10 CFR 50, Appendix B, or 10 CFR Part 21 on SynTech, i.e., if licensees had treated

SynTech products as basic components. In addition, the inspectors examined selected files of SynTech procurement documents to determine if SynTech had passed these requirements to its suppliers of materials and services.

b. Observation and Findings

Prior to the inspection, the inspectors had obtained a copy of SynTech PO No. 10022, dated January 28, 1993, and a letter accompanying a sample of Lot A050-303 of "Touch-It-Up" to a subsidiary of Detroit Edison (DE), Utility Technical Services (UTS), which stated that "Appendix B and Part 21 apply, 10 CFR 50" [sic]. This suggested that SynTech may have supplied some of its products to nuclear power plants as basic components as defined in 10 CFR 21.3. According to SynTech and documents on file at SynTech, when this PO was issued, SynTech had been contracting DE's Technical and Engineering Services laboratory for several years to perform the contaminant analyses on its products being shipped to nuclear plants. However, the DE lab reports, notably in the form of letters on DE letterhead, had covered multiple products and multiple samples. The inspectors found three such reports in SynTech's files, dated March 26, 1990, December 6, 1990, and January 15, 1992. In addition, there had historically been significant time delays in obtaining results from DE.

SynTech stated that at about the same time that DE's Technical and Engineering Services laboratory was put under the new DE subsidiary organization, UTS, SynTech was advised by the QA manager at UTS that if SynTech invoked 10 CFR Part 50, Appendix B, and Part 21 in the PO, then UTS would be able to perform the analyses expeditiously in addition to the added benefits of a certified analysis report for one lot of one product at a time. Although in translating these unfamiliar requirements, SynTech cited them incorrectly, the inspectors observed that subsequently, UTS test reports were for one lot of one product each and contained the statement "the work was performed in accordance with the Technical and Engineering Services quality assurance program." The inspectors identified no other instances in which SynTech had invoked 10 CFR Part 21 or imposed 10 CFR Part 50, Appendix B, on any of its suppliers or subcontractors.

The inspectors reviewed POs issued to SynTech by several NRC licensees including Boston Edison Company, Centerior Services Company, Niagara Mohawk Company, Detroit Edison Company, Consumers Power Company, and Commonwealth Edison Company between 1992 and 1996 for the supply of various quantities of different SynTech products. Although many of SynTech's nuclear plant customers required CoCs to their PO requirements or a certified chemical contaminant analysis test report, traceable to the batches or lots of the products supplied, the inspectors found no instances in which NRC-licensees had imposed nuclear-unique QA requirements on SynTech or had invoked 10 CFR Part 21 in their procurement documents to SynTech.

In addition, the inspectors determined through information obtained from some licensees that they typically procure SynTech products as commercial grade material, although some handle them under their augmented quality programs in order to maintain certain controls, such as requiring analyses for contaminant exclusion, when they are used in maintenance of safety-related systems and equipment.

Finally, during discussions with SynTech personnel and review of procedures and records, the inspectors also determined that SynTech had established a commercial quality program, but did not have a 10 CFR Part 50, Appendix B, quality assurance program. SynTech was not familiar with the requirements of 10 CFR Part 50, Appendix B, and 10 CFR Part 21.

c. Conclusion

The inspectors concluded that SynTech's commercial quality program does not, nor was it intended to meet Appendix B QA requirements. Therefore, the inspectors concluded that SynTech products have not and are not being designed or manufactured under a 10 CFR Part 50, Appendix B, quality assurance program. Further, SynTech products have no nuclear-unique design requirements, they are used in non-nuclear applications and they may be purchased on the basis of SynTech's published product descriptions. Therefore, SynTech products meet the definitions of commercial grade items in 10 CFR 21.3 for both 10 CFR Part 50 licensees and non-Part 50 licensees, and are not procured or supplied as basic components.

3.3 Questionable SynTech Analysis Report and CoC

a. Scope

In preparation for this inspection, the inspector reviewed documentation provided by UTS and Consumers Power Company (CPCo) at Palisades relevant to the circumstances surrounding SynTech's submission to Consumers Power Company (CPCo), Palisades' licensee, of what appeared to be a DE chemical analysis report, dated May 15, 1995, that was not issued by DE. Although SynTech did not have a copy of this report in its files at the time of the NRC inspection, the inspectors had reviewed a copy along with other SynTech-related documentation obtained prior to this inspection. During this inspection, SynTech brought this issue to the attention of the inspectors before being asked about it specifically. The inspectors reviewed relevant documentation on file at SynTech and interviewed SynTech personnel on this issue.

b. Observations and Findings

b.1 Report Anomalies

The report exhibited several anomalies, most notably that, although it appeared to have been printed on DE letterhead or stationery, unlike the genuine DE reports that SynTech had on file, this report contained results of analysis of only one lot of only one product, specifically Lot 761-055 of SynTech N-Grade Gasket Remover and Paint Stripper. The report was in the form of a letter that was typed on what initially appeared to be DE letterhead, and contained a signature block indicating the name of the analyst who had signed the previous DE reports, but his signature itself was not present on the report in question. In addition, the report provided data for a sample lot for which UTS stated it had no record of testing.

b.2 The Palisades Response

Upon receipt of the product, Palisades conducted its own analyses on a sample from Lot 761-055, as is their routine practice, but obtained unacceptable results, most notably excessive chlorides. This prompted Palisades Procurement Engineering to obtain SynTech's CoC and the attached analysis report for comparison. Although the report was on what appeared to be DE letterhead, the procurement engineer involved stated that she did not notice that the report was not in the usual format because normally only receiving sees them and they didn't identify that as an anomaly. Nevertheless, due to the significantly differing results, Palisades procurement engineering called the named analyst at DE/UTS in order to resolve the differences. She also telefaxed to the analyst a copy of the report.

The Palisades procurement engineer further stated that she later contacted the QA Manager at SynTech who reportedly told her that the report was a mistake by a new person. The SynTech QA manager also reportedly requested that Palisades send back all the product and the original CoC. Palisades informed the inspectors that they did this except for the one Lot 761-055 can from which the CPCo sample was taken.

With respect to 10 CFR Part 21 evaluation, the Palisades procurement engineer explained to the NRC inspector that UTS had told her that they would make any reports required to the NRC; therefore CPCo did not evaluate the deviation under Part 21 procedures (a) because of this assurance from DE/UTS, (b) because the products were not considered basic components, and (c) because CPCo had never used this batch in Palisades. Previous batches used, she stated, would have been verified satisfactory or rejected.

b.3 The UTS Reply

According to an August 24, 1995, handwritten memo to Palisades from the DE/UTS analyst named in the report, written in response to Palisades' call and fax, DE did not issue that report. The memo also stated that the report was not in the standard format of current UTS reports in that it did not have a report number or supervisory signatures, and if "nuclear related," was missing a traveller number and QA review signatures. However, the inspectors noted that the memo did not mention the fact that DE had provided similar reports (although covering multiple products and lots) on its letterhead until 1993.

b.4 UTS Correspondence with SynTech

In an August 29, 1995, letter to SynTech in response to the apparent unauthorized use of DE letterhead, and after a reported telephone conversation between a UTS QA representative and a SynTech sales representative, UTS demanded that SynTech stop using DE stationery, inform UTS of every instance in which SynTech had published product analysis results on DE stationery, and inform all its affected customers that DE did not perform the analyses. Again, there was no mention of the earlier reports DE had provided SynTech on DE letterhead before the establishment of UTS.

b.5 SynTech Reply to UTS

The inspectors also reviewed a copy of a SynTech letter, also dated August 29, 1995, from the SynTech QA director, addressed to the UTS QA representative, in reply to the UTS letter of the same date, that denied any possession or use of DE stationery. However, this letter also did not clearly answer the UTS questions. Its explanation of the circumstances surrounding the issuance of the report in question was vague and still did not explain how SynTech would have had legitimate possession of DE letterhead, not blank stationery.

b.6 UTS Contact with NRC

In February 1996, in response to the inspector's inquiries to DE and UTS, a UTS QA representative informed the inspector that a SynTech sales representative had stated to him (in the telephone conversation mentioned above prior to issuance of the UTS August 29, 1995, letter) that SynTech had "routinely reported results of chemical analyses of its products to licensees and others on Detroit Edison letterhead." This statement was construed by UTS as an admission by SynTech. In addition, to compound the misunderstanding, during this reported conversation, the SynTech sales representative allegedly could not recall, when asked by UTS, how SynTech came into possession of DE stationery.

b.7 NRC Review at SynTech

When the NRC inspectors first learned of this issue, the inspectors were not aware of the DE letterhead reports on file at SynTech and the UTS QA representative did not mention them. However, in light of the DE reports and other documents reviewed by the inspectors at SynTech, the telephone conversation statement attributed by UTS to SynTech's sales representative (confirmed during the inspection), was consistent with the circumstances.

During this inspection, the SynTech sales representative stated that he had admitted at the time of the reported telephone conversation that he could not offer a satisfactory explanation for the issuance of the analysis report in question (a) on what appeared to be DE letterhead during a period when UTS had taken over analysis of SynTech products, and (b) reported results on a lot of N-grade that neither UTS, nor apparently DE, had a record of analyzing. He stated that his remark about routinely issuing reports on DE letterhead was made in an effort to explain to the UTS QA representative how SynTech came to have possession of DE letterhead. However he failed to make it clear that the letterhead to which he was referring was what the DE reports had been printed on, not blank DE stationery. SynTech stated during this inspection that it never had blank DE stationery. Nevertheless, the unclear explanation provided by the SynTech Sales representative, interpreted by UTS as an admission by SynTech, served to confirm UTS's suspicion that SynTech was routinely sending out fraudulent reports on DE letterhead (presumably using blank DE stationery), thus prompting UTS's August 29, 1995, letter. The inspectors found no evidence to suggest that SynTech had done more than send a single report on what appeared to be DE letterhead, and apparently only to Palisades on the one occasion in question.

As mentioned above, the inspectors found three reports on DE letterhead that had been sent to SynTech by DE, during the period before the formation of UTS, when DE's Technical and Engineering Services group had been the name of the organization whose laboratory was performing contaminant analyses of SynTech products. The reports, dated in 1990 and 1992, were all signed by the analyst whose name, but not his signature, appeared on the report in question. The inspectors noted that none of the analysis reports from DE on file at SynTech contained results of analysis of N-grade, and the UTS report on file at SynTech that did contain N-grade analysis results was for lot 761-193, not lot 761-055 as in the SynTech report to Palisades.

Review of associated records during this inspection confirmed that SynTech had in fact routinely reported its product test results to its customers simply by forwarding copies of the DE reports which included results for the products and lots being shipped, among others. UTS had also stated that it had never given SynTech permission to use its stationery, letterhead, name or logo, but the inspectors found no evidence that either DE or UTS had ever prohibited SynTech from forwarding DE or UTS analysis results to SynTech customers on the original reports. UTS also confirmed the inspectors' findings at SynTech that, although the UTS laboratory had performed a number of analyses for SynTech on its products over the last two years, the lot listed on the apparently fraudulent report was never analyzed by UTS.

b.8 SynTech Internal Investigation and Explanation

Presumably in anticipation of questions about this issue by the inspectors, SynTech disclosed the issue of the questionable report to the inspectors and offered their explanation of the circumstances. SynTech stated that in response to the August 29, 1995, letter from UTS, it had conducted an internal investigation to establish the facts and circumstances surrounding the issuance of the report in question. On the basis of the results of this investigation, SynTech developed the following explanation: At the time the report in question was sent to Palisades, May 1995, SynTech was using UTS to perform its product contaminant analysis for nuclear customers. However, on this particular occasion, in response to an order from Palisades for some of the N-Grade Gasket Remover and Paint Stripper (hereinafter referred to as "N-Grade"), SynTech discovered that it did not have a UTS analysis report on file for the lot of N-grade it had in stock, Lot 761-055. SynTech stated that upon informing Palisades of this fact, Palisades agreed to accept so-called "typical" results for this order, because they would be testing a sample of the received product themselves anyway. Therefore, according to SynTech, instructions were given to a clerk (who was reportedly new at the time and who is no longer with the company) to prepare a report for Palisades of typical contaminant analysis results for N-Grade Lot 761-055. SynTech explained (and produced examples from their files in support of the explanation) that after sending out DE reports with multiple product and lot results on them, it had become their practice for a while to scan into their computer the letter reports from DE. The reports could then be conveniently edited to produce customized reports containing only the data for the product and lot being shipped under the report and the accompanying CoC. The rationale was that this practice would result in fewer, if any, transcription errors, less

confusion, and admittedly, would not disclose unnecessarily the few results not pertinent to the shipment being certified that did not meet contaminant specifications.

During this inspection, the inspectors examined some of these edited reports and found that they were printed out on plain paper and in a font not resembling the font of the original DE letters, but some were left partially in the form of letters from one of SynTech's contractor laboratories addressed either to the SynTech QA Manager or to the SynTech sales representative who was involved, depending on the vintage. The inspectors pointed out to SynTech that while it would have been appropriate to quote the results of the product and lot of interest from the test report and/or to refer to the report or even to attach a copy, it was not appropriate to edit the original report to isolate the desired set of results, yet leave it partially in the form of a letter report to SynTech which would result in a document that was fundamentally misleading as to its origin, if not the content. SynTech agreed, but stated that they had discontinued this practice entirely when their investigation to determine how the report in question could have been produced revealed that the scanning and editing practice was a significant contributing factor.

SynTech stated that as nearly as they were able to determine, the clerk who had been told to produce a report for the Palisades N-grade order in question citing typical results for this product had called up an old DE report that had been scanned into the computer to obtain the results of analysis of a previous lot of the same product. However, instead of using the report (not scanned) provide by UTS in 1992 of Lot 761-193 of N-Grade that SynTech had on file, the clerk reportedly deleted the data for products not being shipped, leaving only the N-grade data and then edited the date of the report and the lot number to read May 15, 1995 and Lot 761-055 that was being shipped. SynTech stated that they were not able to find the original report from which the "typicals" presumably were taken so the origin or correctness of the data could not be verified. Then, SynTech explained, and as is apparent when examining the report, for an unknown reason, the clerk did not edit out the DE logo that appeared in the upper left hand corner of the page. The logo consisted of printed words in a stylized version of a bold block letter font and it had been scanned as part of the document by the optical character recognition (OCR) software being used by SynTech as part of the text of the letter instead of as a graphic, in a font as close to the one scanned as the software could reproduce. Upon close examination, the inspectors were able to see that in fact, what had appeared to UTS and CPCo to be DE letterhead, was a computer reproduced facsimile of the logo that had reportedly been on the stationery on which the original report (similar to ones seen by the inspectors in SynTech's files) had been written. Close examination of the letters revealed that the reproduced font differed slightly from the actual DE logo in the thickness, spacing and proportions of the letters, the alignment of the words, and in particular, in the form of the letter "t" as it appeared in the word "Detroit" in the name and address of DE in the logo. In the actual DE logo, the stylized "t" is not fully crossed. In the custom DE font, the cross of the "t" extends from the vertical part only to the right, not to the left as on a conventional "t." This feature, once noticed was evident on all the actual DE reports on file. Whereas, the scanned document, exhibited a

similar font, but, as previously stated with slightly differently formed and aligned letters and with normal t's on which the cross piece extended fully from the left to the right sides. This information tended to support SynTech's explanation of how the report in question had been produced. Also, SynTech assured the inspectors that although it no longer had the scanning software used so that could not demonstrate the effect, it was named and described as readily available so that the NRC could test SynTech's explanation.

Nevertheless, SynTech was not able to offer a satisfactory explanation of why the scanned and incorrectly edited report was sent out in that form and not at least edited to the extent that others had been. Even the error of a new clerk would not explain why supervisors had not caught the error. SynTech could only postulate that in their haste to fill the order and deliver the paperwork quickly in response to customer pressure, they had failed to adequately review all the submitted documentation, including the accompanying CoC letter which also referenced the lot number instead of stating that the accompanying results were supposed to be typical.

c. Conclusion

Prior to the inspection, the information available to the inspectors, as discussed above, suggested a fraudulent SynTech report. However, SynTech's explanation of the circumstances surrounding the creation of the report in its unusual form, was plausible, if not conclusive, and was supported by other information obtained by the inspectors. Although SynTech could not offer a satisfactory explanation for the report's not being effectively screened through management review prior to issue, the incident appeared to have been isolated. The inspectors could not conclusively determine that there was any deliberate intent to mislead the recipient of the report and found no evidence of a pattern of similar activity.

3.4 Procurement Status and Chemical Analysis Results

a. Scope

To determine the validity of SynTech reported contaminant content of Lot No. 761-055 (as well as other products), and the consistency of contaminant content in SynTech products, the inspectors interviewed analysts at two of SynTech's former contract laboratories, both NRC licensee subsidiaries, had the results evaluated by the NRC Chemical Engineering and Materials Branch, reviewed numerous analysis reports on SynTech products and reviewed the nuclear-grade evaluation of SynTech products by GE NE Materials Engineering.

b. Observations and Findings

During a telephone conversation on July 15, 1996, between the inspector and a representative of Consumers Power (CPCo), Palisades Procurement Engineering, the Palisades procurement engineer stated that Syntech Products are treated under CPCo's consumables program as Augmented Quality items because SynTech is not a qualified/approved supplier. CPCo had, for a number of years, purchased

the product in question ("N-Grade Gasket Remover and Paint Stripper - Certified Non-Chlorinated, Clinging Gel") among other SynTech products as non-safety-related. However, because the products are used on safety-related plant components, CPCo said it always independently tested a sample of each lot/batch in its own Trail Street Labs (owned by CPCo) to verify the product meets CPCo's safety-related or Category A requirements. For consumables used for cleaning, etc., even though they are not allowed to remain in safety-related systems, CPCo conservatively prefers not to allow any undesirable substances (e.g., fluorides, chlorides, sulfides, heavy metals, etc.) to come in contact with safety-related metals. Therefore, a sample of each received lot is routinely sent to the CPCo lab by the Palisades receiving department for analysis. In September of 1995, CPCo's Trail St. Labs obtained results reported as "total chloride"[sic] of 10,492 ppm on the sample of lot 761-055. This was significantly higher than the 120 ppm "Cl" [sic] results reported on the May 15, 1995 SynTech report in question. In accordance with CPCo procedures, the issue was then referred to Procurement Engineering for resolution.

On August 6, 1996, the inspector talked to a chemist at CPCo's Trail Street Labs, about the analysis report provided by SynTech to Palisades of Lot No. 761-055 of its "N-Grade" solvent/ cleaner and gasket remover. Discussed were the differences between her lab's analysis of the product, and the SynTech reported results, which differed widely as discussed previously. She confirmed the inspector's concern that the SynTech results of heavy metal analysis may be questionable because many of the heavy metals (e.g., As, Bi, Pb, Sn, At, Hg, etc.) were reported by SynTech on the order of <1 to <5 ppm, whereas, CPCo's analyses of these same elements were reported typically as <50 or <100 ppm because of the minimum sensitivity of the analyses. At the time, the inspector was concerned that unless SynTech (or its contract laboratories) had more sensitive instruments and processes for analyzing for these elements, the SynTech-reported results may have been below what is typically achievable, and would therefore, be questionable.

During this inspection, however, the inspectors found comparable results on another lot of the same product in a test report by UTS. Also, the report was reviewed by the NRC's Chemical Engineering and Materials Branch who stated that the SynTech-reported results were not below the sensitivity of the more sophisticated techniques in common use in the industry.

During subsequent conversations with the analyst at UTS who had signed the old DE reports to SynTech and also the analyst who had performed the analyses for UTS, they indicated that results of analyses could vary widely depending on analytical method used if only minimums are being reported due to minimum sensitivity or detectable qualities. Also, for halides, sulfur, it is necessary to know whether the analysis was for total amounts or leachable amounts. If being analyzed for "total" content, chlorinated or fluorinated compounds will release large quantities of halides when certain analytical methods are employed.

The second conversation the inspector had with the CPCo chemist at the Trail Street Labs confirmed that her analysis was for total chlorides, yielding 10,492 ppm, indicating that the product contained chlorinated compound(s). On

August 29, 1996, the Palisades procurement engineer faxed the NRC copies of previous reports of analyses of SynTech products done by the CPCo lab for themselves and said they would locate the records of analyses they used to do for SynTech several years ago, just as UTS had done until recently. The inspectors found some of these old (pre DE) CPCo reports on file at SynTech.

c. Conclusion

On the basis of the information from the UTS and CPCo laboratories, the NRC Chemical Engineering and Materials Branch review, the GE NE nuclear-grade evaluation, and the analysis reports reviewed, the inspectors concluded that although N-Grade, Lot 761-055, contained excessive chloride, even for total (vice leachable) content, the results of the other substances analyzed for were consistent with the other analyses of N-Grade. The inspectors further concluded that the SynTech reported results, although their specific origin was indeterminate, appeared to be typical of N-Grade and were consistent with the capabilities of the analytical methods used.

However, on the basis of review of many SynTech product analysis reports and review of GE NE Materials Engineering recommendations in their nuclear-grade evaluation, the inspectors concluded that the contaminant content of SynTech products is variable enough such that "typical" analyses are not useful. Therefore, the practice of most of SynTech's nuclear customers to require batch-traceable or lot-traceable certified chemical contaminant analysis reports is prudent. Such reports would ensure that levels of undesirable substances such as halides, sulfur and heavy metals are within acceptable limits.

4. PERSONS CONTACTED

- *+J. Leslie, President
- +M. Bramson, Executive Vice President
- *+D. Moore, Quality Assurance Manager
- J. Broderick, Sales
- T. Mosier, Assistant QC Coordinator

- + Attended the entrance meeting on February 4, 1997.
- * Attended the exit meeting on February 6, 1997.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

May 2, 1997

Mr. Nicholas J. Liparulo, Manager
Nuclear Safety and Regulatory Activities
Nuclear and Advanced Technology Division
Westinghouse Electric Corporation
P.O. Box 355
Pittsburgh, Pennsylvania 15230

SUBJECT: NRC INSPECTION NO. 99000104/97-01

Dear Mr. Liparulo:

On April 17, 1997, the U. S. Nuclear Regulatory Commission (NRC) completed an inspection of AP600 design control quality assurance activities at the Westinghouse Energy Center in Monroeville, Pennsylvania. The enclosed report presents the results of that inspection.

The purpose of the inspection was to evaluate the Westinghouse technical and quality oversight of Empresa Nacional de Ingenieria y Tecnologia, S.A. (INITEC) design activities in general, and to assess Westinghouse's evaluation and disposition of the audit findings identified in the August 24, 1994, NRC "Summary of Audit of the AP600 Structural Design," report concerning NRC-identified errors in INITEC calculations.

During this inspection, the NRC determined that the implementation of the Westinghouse quality assurance program for AP600 design certification activities failed to meet certain NRC requirements. Specifically, the team identified nonconformances with program implementation with respect to your: (1) failure to initiate appropriate root cause determination and corrective actions for findings described in the August 24, 1994, NRC Audit Summary report, and (2) failure to adequately evaluate and assess INITEC's performance during your annual quality assurance review of AP600 suppliers, and to conduct an evaluation of INITEC's February 15, 1995, response to the NRC audit findings as requested in Westinghouse's August 3, 1994, letter, during your triennial audit. During the required triennial supplier audit of INITEC performed in February 1995, Westinghouse's audit plan and scope did not include the calculation audit findings identified in the August 1994 NRC Audit Summary report, and any associated INITEC corrective action activities, as issues that needed to be addressed to verify the effectiveness of INITEC's quality assurance program implementation.

Based on the nonconformances identified above, the NRC is concerned that these quality assurance deficiencies may have introduced a level of uncertainty on the acceptability of design deliverables provided by AP600 technical cooperation agreement participants. Of particular concern to the NRC, is Westinghouse's failure to recognize and appropriately address a condition adverse to quality, requiring a root cause evaluation and determination and appropriate corrective actions, even when such a condition was identified by an NRC audit and resulted in re-design of the AP600 foundation basement.

Accordingly, the NRC requests that Westinghouse: (1) determine and evaluate the impact of these nonconformances on completed or related design deliverables and/or activities performed by all AP600 technical cooperation agreement participants; (2) identify the steps that it has taken, or intends to take, to demonstrate that other design deliverables provided by AP600 technical cooperation agreement participants do in fact achieve the level of integrity in design verification and quality assurance necessary to satisfy the design certification provisions of 10 CFR Part 52; and (3) provide a list of all AP600 technical cooperation agreement participants, including a description of their AP600 program work scope and involvement. The NRC is identifying these concerns as an unresolved item. Please provide the above requested information within 30 days of receipt of this letter.

The responses requested by this letter and the enclosed Notice of Nonconformance 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.

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

Sincerely,

Robert M. Gallo, Chief
Special Inspection Branch
Division of Inspection and Support Programs
Office of Nuclear Reactor Regulation

Docket No.: 52-003

Enclosures:

1. Notice of Nonconformance
2. Inspection Report No. 99900404/97-01

cc w/encls: See Next Page

Mr. Nicholas J. Liparulo
Westinghouse Electric Corporation

Docket No.: 52-003
AP600

cc:

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NOTICE OF NONCONFORMANCE

Westinghouse Electric Corporation
Pittsburgh, Pennsylvania

Docket Nos.: 52-003
99900404

Based on the results of a Nuclear Regulatory Commission (NRC) inspection conducted on April 17, 1997, of activities supporting Westinghouse Electric Corporation's AP600 design certification, it appears that certain activities were not conducted in accordance with NRC requirements.

- A. Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50, requires, in part, that measures be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly identified and corrected.

WCAP-12600, "AP600 Quality Assurance Program Plan," Revision 2, dated December 15, 1993, Section 16, "Corrective Action," states, in part, "Application of WCAP-8370 to AP600 activities includes the following:

- The root cause of significant conditions adverse to quality are determined and documented, and the impact of such conditions on completed or related items and activities is evaluated."

WCAP-8370, Quality Assurance Plan (QA Topical Report), Revision 12A, dated April 1992, Section 16, "Corrective Action," states, in part, in:

Section 16.0, "General," that conditions adverse to quality such as failures, malfunctions, nonconformances, and out-of control processes (including failure to follow procedures) shall be identified. These adverse conditions are also analyzed, documented, and corrected commensurate with their importance to safety.

Section 16.1, "Corrective Action," that personnel performing activities in accordance with this plan identify conditions adverse to quality and suggest, recommend or provide solutions to the conditions as appropriate. For significant conditions adverse to quality, the causes are determined and documented and the impact of such conditions on items and services is evaluated for significant trends and reported to the appropriate level of management.

Section 15.2, "Follow-up," that for corrective action resulting from reports (e.g., nonconformance reports, audit reports, computer software error reports, NRC inspection reports, customer audit reports, etc.) quality assurance participates in verifying that appropriate corrective action is documented and implemented.

Enclosure 1

Contrary to the above, Westinghouse:

1. Did not identify, analyze, document, and correct conditions adverse to quality as required by the AP600 Quality Assurance program. During a July 1994 NRC structural audit of the nuclear island foundation mat, errors were identified in calculations performed by INITEC that resulted in significant re-design of the AP600 foundation basemat. The findings described in the August 24, 1994, NRC "Summary of Audit of the AP600 Structural Design," report were not identified as a condition adverse to quality requiring or receiving quality assurance participation in verifying that appropriate corrective action is documented and implemented.
 2. Did not adequately determine and document the root cause of INITEC's basemat calculation errors nor evaluate the impact of such a condition adverse to quality on completed or related INITEC AP600 design deliverables and activities. (99900404/97-01-01)
- B. Criterion VII, "Control of Purchased Material, Equipment, and Services," of Appendix B to 10 CFR Part 50, requires, in part, that measures shall be established to assure that purchased material, equipment, and services, whether purchased directly or through contractors or subcontractors conform to the procurement documents.

WCAP-12600, "AP600 Quality Assurance Program Plan," Revision 2, dated December 15, 1993, Section 7, "Control of Purchased Items and Services," states, in part, "Application of WCAP-8370 to AP600 activities includes, but is not limited to, the following:

- The initial qualification and subsequent performance evaluation of suppliers to which *technical cooperation agreements* [emphasis added] apply is performed in the same manner as for suppliers of purchased items and services.
- The performance of each supplier is evaluated on an annual basis, commensurate with the complexity and importance to safety of items or services provided. The evaluation is documented and includes evidence, based on direct observation of work performed by the supplier, that the supplier's quality assurance program is continuing to operate successfully."

WCAP-8370, Quality Assurance Plan (QA Topical Report), Revision 12A, dated April 1992, Section 7, "Control of Purchased Items and Services," states, in part, in:

Section 7.3, "Supplier Performance Evaluation," that "A formal evaluation of suppliers is performed each year to determine if additional actions such as audits are required during the upcoming year. This evaluation includes a review of some or all of the following: prior quality program audits, supplier surveillance activities, *...results of audits from other sources (customers, ASME, NRC, etc.) if available* [emphasis added], ...and the suppliers's responsiveness and cooperation in resolving

quality questions or problems. As a result of this evaluation, suppliers requiring a complete quality program reaudit are identified...Regardless of the results of the evaluation, suppliers are reaudited every three years."

Contrary to the above, Westinghouse did not provide appropriate QA oversight of design activities performed by INITEC. After the basemat calculation errors were identified by the NRC in July 1994, Westinghouse did not evaluate or assess the impact of the errors on other work performed by INITEC. Specifically:

1. Westinghouse failed to adequately evaluate or assess INITEC's annual performance, as required by WCAP-8370, Part B, Section 7.3, "Supplier Performance Evaluation," for a supplier of AP600 design deliverables that had been the subject of an adverse NRC audit finding.
2. In its February 1995 triennial audit of INITEC, Westinghouse failed to conduct an evaluation of INITEC's response to Westinghouse's August 3, 1994, letter, and any associated corrective actions taken. The letter to INITEC described the basemat design calculation issues identified by the NRC during the July 1994 structural design audit. (99900404/97-01-02)

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, Special Inspection Branch, Division of Inspection and Support Programs, 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 the steps that were or will be taken to correct these items; (2) a description of the steps that have or will be taken to prevent recurrence; and (3) the dates your corrective actions and preventative measures were or will be completed.

Dated at Rockville, Maryland
This 2nd day of May, 1997

U. S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION

Report no.: 99900404/97-01

Organization: Westinghouse Electric Corporation
Nuclear and Advanced Technology Division
Pittsburgh, Pennsylvania 15230

Contact: Mr. Nicholas J. Liparulo, Manager
Nuclear Safety and Regulatory Activities

Nuclear Industry Activity: Nuclear steam supply system design, components and services

Date: April 17, 1997

Inspectors: Richard P. McIntyre, PSIB/DISP
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Special Inspection Branch
Division of inspection and Support Programs

Enclosure 2

1 INSPECTION SUMMARY

The purpose of the inspection was to evaluate the Westinghouse technical and quality oversight of Empresa Nacional de Ingenieria y Tecnologia, S.A. (INITEC) design activities in general, and to assess Westinghouse's thoroughness in its evaluation and disposition of the audit findings identified in the August 24, 1994, NRC "Summary of Audit of the AP600 Structural Design" concerning NRC staff-identified errors in INITEC calculations; as described in Section 3.2.

The inspection bases were:

- Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to Part 50 of Title 10 of the Code of Federal Regulations (10 CFR Part 50).
- AP600 SSAR, Revision 11, Section 17.3, "Quality Assurance"
- WCAP-12600, Revision 2, dated December 1993, "AP600 Quality Assurance Program Plan"

During this inspection, two instances where Westinghouse failed to conform to NRC requirements were identified. Also, one unresolved item was identified.

1.1 Nonconformance

- Nonconformance 99900404/97-01-01 was identified and is discussed in Section 3.3 of this report.
- Nonconformance 99900404/97-01-02 was identified and is discussed in Section 3.4 of this report.

1.2 Unresolved Item

- Unresolved Item 99900404/97-01-03 was identified and is discussed in Section 3.5 of this report.

2 STATUS OF PREVIOUS INSPECTION FINDINGS

No previous inspection findings were reviewed during this inspection.

3 INSPECTION FINDINGS AND OTHER COMMENTS

3.1 AP600 Quality Assurance Program

Chapter 17 of the AP600 standard safety analysis report (SSAR) describes the Westinghouse Electric Corporation quality assurance (QA) program for the design phase of the AP600 Advanced Light Water Reactor (ALWR) Plant Program.

AP600 SSAR, Revision 11, Section 17.3, "Quality Assurance," states that activities performed prior to March 31, 1996, were performed in accordance with the quality assurance plan described in Westinghouse topical report WCAP-8370, "Energy System Business Unit - Power Generation Business Unit, Quality Assurance Plan," Revision 12a, dated April 1992. WCAP-8370 applied to all Westinghouse activities affecting quality of items and services supplied to nuclear power plants and establishes Westinghouse's compliance with the provisions of Appendix B to 10 CFR 50.

WCAP-12600, "AP600 Quality Assurance Program Plan," dated December 1993, a project-specific QA plan, was developed by Westinghouse to enhance WCAP-8370 in specific areas and to establish additional commitments needed to support the AP600 Design Certification and First-Of-A-Kind (FOAKE) programs. WCAP-12600 establishes the responsibility of the Advance Technology Business Area of the Energy Systems Business Unit for AP600 Design Certification and FOAKE programs and for control of the technical interface between Westinghouse and engineering groups and suppliers providing engineering services under such programs.

Additionally, WCAP-12601, "AP600 Program Operating Procedures," Revision 13, dated July 8, 1994, was developed by Westinghouse to establish requirements and responsibilities for developing, approving, implementing, revising, and maintaining operating procedures to meet the QA and administrative requirements of the AP600 program. WCAP-12601 includes an "AP600 Program Procedure Matrix," currently Revision 15, dated April 4, 1995, which identifies the correlation between the Westinghouse commitments to the QA requirements of (1) ANSI/ASME NQA-1, "Quality Assurance Program Requirements for Nuclear Facilities," 1983 Edition (as endorsed by Regulatory Guide 1.28, Revision 3) and (2) ANSI/ASME NQA-1 1989 Edition through NQA-1b-1991 Addenda, and the corresponding implementing guidance embodied in WCAP-9565, "Nuclear and Advanced Technology Division (NATD) Quality Assurance Program" currently Revision 34, dated May 2, 1994, and in WCAP-12601. WCAP-9565 governed the implementation of all NATD activities related to areas within the scope of WCAP-8370.

3.1.1 AP600 Design Certification and FOAKE Programs Control of Purchased Items and Services

WCAP-12600, Section 7, "Control of Purchased Items and Services," describes the application of WCAP-8370, Part B, Section 7, provisions to AP600 activities and clarifies that the initial qualification and subsequent performance evaluation of

suppliers to which technical cooperation agreements apply [emphasis added] is performed in the same manner as for suppliers of purchased items and services.

WCAP-8370, Part B, Section 7.3, "Supplier Performance Evaluation," requires, in part, "A formal evaluation of suppliers is performed each year to determine if additional actions such as audits are required during the upcoming year. This evaluation includes a review of some or all of the following: prior quality program audits, supplier surveillance activities, nature and frequency of hardware discrepancies, *results of audits from other sources (customers, ASME, NRC, etc.)* [emphasis added]....." This section also specifies that as a result of this evaluation, suppliers requiring a complete quality program reaudit are identified.

3.1.2 AP600 Participation Program Between INITEC and Westinghouse Electric Corporation

On March 5, 1992, Westinghouse and INITEC signed an agreement under which INITEC would perform engineering, management and execution of certain structural and piping tasks associated with the AP600 Program. The following tasks were identified as INITEC's work scope: (1) Analysis and Detail Design of Pressurizer Safety and Relief Valve (PSARV) Module, (2) Structural Steel Framing (SSAR Section 3.8.4), (3) Floor Slabs (SSAR Section 3.8.4), (4) Nuclear Island Basemat (SSAR Section 3.8.5), (5) Nuclear Island Shear Walls (SSAR Section 3.8.4), (6) Analysis and Detail Design of Piping, and (7) Structural Steel Framing (SSAR Section 3.8.4).

Additionally, the agreement specified that design inputs, methods, required formats and other design information for structural tasks would be provided by Bechtel Power Corporation (Bechtel) and allowed for technical correspondence and interfaces for these tasks to take place directly between INITEC and Bechtel.

In Section 3.0, "Quality Assurance," the agreement specified that INITEC shall establish, implement, and maintain a quality assurance program meeting the requirements of ANSI/ASME NQA-1, "Quality Assurance Program Requirements for Nuclear Facilities" (1986 edition). The agreement also specified that a Quality Assurance Program Plan (QAPP) would be prepared by INITEC and be subject to review and approval by Westinghouse prior to performing any quality-related work.

3.2 Nuclear Island Basemat Design - Background

On July 11 through 14, 1994, the NRC performed an audit of the structural design of the AP600 at the Bechtel offices in San Francisco, California. The results of this audit were documented in a letter to Westinghouse dated August 24, 1994, "Summary of Audit of the AP600 Structural Design."

One of the key issues identified during the audit were errors found by the audit team in design calculations performed by INITEC (Calculation No. 1010-CCC-001, Rev. A). The NRC audit team identified the following deficiencies: (1) errors in shear and flexural rebar assessment, in the use of punching shear formula, and in the use of finite element dimension; (2) no consideration of accident pressure loads, and loads

from construction sequence, and (3) out of phase overturning moment from shield and containment buildings.

In its August 2, 1994, letter to the NRC, Westinghouse acknowledged its commitment to: (1) perform an independent review of the basemat design calculations, (2) verify the adequacy of INITEC's in-house post-process computer programs used for the foundation mat design, (3) perform simplified analyses as appropriate to confirm the existing design results, and (4) provide the results of this independent review to the NRC. (This issue was identified by the NRC in the AP600 DSER as DSER Open Item 3.8.5-21).

3.3 Review of Westinghouse Corrective Actions for July 1994 NRC Structural Audit Findings

a. Scope

The inspectors reviewed Westinghouse's evaluation and disposition of the audit findings identified in the August 24, 1994, NRC "Summary of Audit of the AP600 Structural Design" report concerning NRC-identified errors in INITEC calculations.

b. Observations and findings

As indicated above, in its August 2, 1994, letter to the staff regarding errors identified in INITEC post-process computer programs used for the AP600 foundation mat design, Westinghouse made a commitment to conduct an independent review of such calculations. In a letter to INITEC (FOK/INI0181) dated August 3, 1994, Westinghouse forwarded: (1) comments presented by an NRC consultant at the July 1994 meeting, (2) additional interpretation and comments by Westinghouse technical staff, and (3) a copy of the August 2, 1994, letter to NRC. Westinghouse also stated that a Bechtel employee had been selected to perform the independent review and the scope of basemat review was attached to the letter (Attachment 4).

The inspectors reviewed the independent review report, "Independent Review of AP600 Nuclear Island Basemat Design," dated November 11, 1994, performed by Bechtel to address the basemat calculation issues identified by the staff. The inspectors noted that in Section 6.0, "Summary and Recommendations," of the report, Bechtel made several observations and recommendations related to uncertainties in the INITEC calculation that required further evaluation or study.

The inspectors reviewed an INITEC letter to Westinghouse (INI/FOK0175), dated February 15, 1995, in which INITEC provided its response to address the root causes of the quality issue relative to the Nuclear Island Basemat Calculation, identified by NRC in its July 1994 structural design audit, as well as the measures taken by INITEC in order to avoid the occurrence of similar situations during the performance of present and future structural analysis. The inspectors noted that INITEC's response had been formulated almost contemporaneously with the triennial audit being conducted by Westinghouse on February 20 through 22, 1995, at INITEC's facilities. Yet Westinghouse's triennial audit report (QLA/INI0007) does not

provide any evidence that INITEC had identified this issue as a condition adverse to quality requiring root cause determination or corrective actions in accordance with INITEC's Westinghouse-approved QAPP (see Section 3.4.a.).

During the inspection, the inspectors inquired as to whether Westinghouse had initiated any root cause determinations or corrective actions, as required by WCAP-12600, Section 16, "Corrective Action," since this issue was first identified by the NRC in July/August 1994 or whether Westinghouse had formally accepted or rejected INITEC's proposed corrective actions identified in INITEC's February 1995 letter. Westinghouse representatives responded that, as of April 17, 1997, this issue had not been identified as a condition adverse to quality requiring a root cause determination or corrective actions in accordance with WCAP-12600 nor had Westinghouse formally responded to INITEC's February 1995 letter.

c. Conclusions

Based on the above, the inspectors concluded that Westinghouse: (1) failed to identify or recognize the NRC-identified basemat design deficiencies as a condition adverse to quality requiring a root cause determination or corrective actions in accordance with WCAP-12600, Section 16, and (2) failed to determine and evaluate the impact of such design deficiencies on completed or related INITEC AP600 design deliverables and activities. **This issue was identified as Nonconformance 99900404/97-01-01.**

3.4 Review of Westinghouse Oversight of INITEC AP600 Design Activities

a. Scope

The inspectors reviewed Westinghouse technical and quality oversight of INITEC design activities in general, including the documents describing the contractual agreements between Westinghouse, INITEC and Bechtel for AP600 program design activities.

b. Observations and findings

Westinghouse appropriately specified all technical and quality assurance requirements consistent with WCAP-12600. As required by the agreement signed on March 5, 1992, INITEC provided a QAPP for Westinghouse's review and approval.

As described in Section 3.3 above, in September 1994, Westinghouse contracted the services of Bechtel for an independent review of INITEC's analysis and design methodology for the nuclear island basemat. The results of Bechtel's independent review were documented and made available to Westinghouse in a report dated November 11, 1994.

Although Westinghouse had identified the submittal of this independent review report as a commitment in its August 2, 1994, response to the NRC, the inspectors were informed that a submittal of the report on the AP600 docket was still outstanding. No explanation was given as to why this report had not yet been made available for NRC review.

The inspectors learned that on August 3, 1994, Westinghouse had sent a letter to INITEC (FOK/INI0181) requesting that INITEC provide its response to the NRC audit findings (see Section 3.3.a.). However, it appeared that Westinghouse did not consider the results of the NRC structural audit findings and concerns in its January 1995 annual review of INITEC's performance.

Additionally, the inspectors reviewed Westinghouse's Audit Report QLA/INI0007, dated March 20, 1995, that documented a triennial audit conducted on February 20 through 22, 1995, at INITEC's facilities in Madrid, Spain. Upon reviewing the report, the inspectors found that: (1) an evaluation of INITEC's response to Westinghouse's August 3, 1994, letter had not been included in the audit scope, and (2) the audit did not identify any evidence to suggest that INITEC had initiated any internal root cause analysis, and evaluation. Further, the inspectors determined that no corrective actions had been formally identified by INITEC's QA organization to determine the cause, and document the impact of the design deficiencies identified in Westinghouse's August 3, 1994, letter, on INITEC's AP600 design deliverables.

Finally, the inspectors questioned Westinghouse's conclusion, in its March 22, 1995, letter to INITEC, "Westinghouse AP600 Audit WES-95-211," that "INITEC Design Quality Assurance Program and implementing procedures meet the applicable NQA-1 requirements for INITEC's AP600 work," in light of the fact that the audit report identified 10 findings of programmatic deficiencies in INITEC's implementation of its QAPP.

c. Conclusions

Based on the above, the inspectors concluded that Westinghouse's (1) failed to adequately evaluate or assess INITEC's performance, as required by WCAP-12600, for a supplier of AP600 design deliverables that had been the subject of an adverse NRC audit finding, and (2) failed to conduct an evaluation of INITEC's response to Westinghouse's August 3, 1994, letter, and any associated corrective actions taken.

This issue was identified as Nonconformance 99900404/97-01-02.

3.5 Westinghouse Oversight of AP600 Design Activities

Based on the nonconformances identified above, the NRC is concerned that these quality assurance deficiencies may have introduced a level of uncertainty on the acceptability of design deliverables provided by AP600 technical cooperation agreement participants. Of particular concern to the NRC, is Westinghouse's failure to recognize and appropriately address a condition adverse to quality, requiring a root cause evaluation and determination and appropriate corrective actions, even when

such a condition was identified by an NRC audit and resulted in re-design of the AP600 foundation basemat.

Westinghouse's failure to address this design and quality assurance program deficiency in a timely manner has raised the issue of whether this is an isolated case and that other design deliverables provided by AP600 technical cooperation agreement participants do in fact possess the level of integrity in design verification and quality assurance necessary to satisfy the design certification provisions of 10 CFR Part 52. **This issue was identified as Unresolved Item 99900404/97-01-03.**

3.6 Entrance and Exit Meetings

Since this was a one-day inspection, the entrance and exit meetings were both held on April 17, 1997. In the entrance meeting the NRC inspectors discussed the scope of the inspection and outlined the areas to be inspected. In the exit meeting the inspectors discussed the inspection findings and unresolved item.

4 PERSONNEL CONTACTED

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Donald Lindgren, AP600 Licensing

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

99900404/97-01-01	NON	inadequate corrective action
99900404/97-01-02	NON	inadequate quality and technical oversight of INITEC
99900404/97-01-03	URI	acceptability of AP600 design deliverables

Selected Generic Correspondence on the Adequacy of
Vendor Audits and the Quality of Vendor Products

<u>Identifier</u>	<u>Title</u>
Information Notice 97-15	Reporting of Errors and Changes in Large-Break Loss-of-Coolant Accident Evaluation Models of Fuel Vendors and Compliance with 10CFR50.46(a)(3)
Information Notice 97-32	Defective Worm Shaft Clutch Gears in Limitorque Motor-Operated Valve Actuators

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(See instructions on the reverse)

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Washington, DC 20555-0001

9. SPONSORING ORGANIZATION - NAME AND ADDRESS (If NRC, type "Same as above"; if contractor, provide NRC Division, Office or Region, U.S. Nuclear Regulatory Commission, and mailing address.)

Same as 8. above.

10. SUPPLEMENTARY NOTES

11. ABSTRACT (200 words or less)

This periodical covers the results of Inspections performed between April 1997 and June 1997 by the NRC's Special Inspection Branch, Vendor Inspection Section, that have been distributed to the inspected organizations.

12. KEY WORDS/DESCRIPTORS (List words or phrases that will assist researchers in locating the report.)

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